Unhealthy Snacking: An exploration of the theory of planned behaviour, impulsivity, reward sensitivity and BMI.

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Submitted in partial fulfilment of the requirements of the Higher Diploma in Arts in Psychology at Dublin Business School, School of Arts, Dublin.

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March 2014
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1. Acknowledgements

I would like to thank Dr. Katriona O’Sullivan for her guidance and advice while completing this thesis and also my partner, family and friends for their support and patience.
2. Abstract

Given the recent rise in obesity and high prevalence of unhealthy snacking this study aimed to explore the efficacy of the Theory of Planned Behaviour (TPB) model in predicting intentions to reduce unhealthy snacking. Personality constructs: impulsivity and reward sensitivity were explored for correlations with intentions, snacking and BMI. Participants (N=178) included yoga and social networking members and retail administrators. Measures included: the TPB, BIS-11, BAS Scale and snacking frequency. A mixed-quantitative designed found that attitudes and perceived behavioural control (PBC) explained 22% of the variance in intentions. Reward sensitivity explained an additional 2% and was positively related to BMI. PBC was significantly related to snacking and BMI. There were no significant results for social norms or impulsivity. This study validates the utility of the TPB as an intervention to diminish unhealthy snacking. Conversely findings suggest that impulsivity is not necessarily an integral factor of Irish adult snacking.
3. Introduction

Obesity has become a worldwide epidemic with over 1.4 billion adults obese (WHO, 2012, para. 1). In Ireland a recent study reported that 24% of the adult population are obese and 37% overweight (Irish Universities Nutrition Alliance, 2011, para. 1). This acceleration is of major public concern given the associated negative health consequences such as diabetes, stroke, CHD, high blood pressure and cholesterol (Flegal, Graubard, Williamson & Gail 2005). Obesity results from an imbalance between energy intake and expenditure and is defined as a body mass index (BMI) of >30 (Davis et al., 2004). The current widespread availability and excessive consumption of high fat palatable foods coupled with a sedentary lifestyle are reported risk factors for obesity (Farley, Baker, Futrell & Rice, 2010; Fortuna, 2012). Coinciding with this is the significant prevalence in the consumption of unhealthy snacks (Howarth, Huang, Roberts, Lin, & McCrory, 2007; Kerr et al., 2008; O’Brien et al., 2012). These types of foods are typically eaten outside of main meals, are energy dense, low in nutrient content and contribute to a persons overall calorie, saturated fat, sugar and salt intake (Ovaskainen et al., 2006; Whybrow et al., 2007). It is therefore imperative to examine the motivational and psychological determinants of this type of eating in order to design and promote interventions that help diminish this behaviour.

The Theory of Planned Behaviour (TPB: Ajzen, 1991) is a social cognitive model that has been applied widely in research to successfully determine, predict and promote many health related intentions and behaviours including; weight reduction
(Nejad, Wertheim & Greenwood, 2004), exercise (Brickell, Chatzisarantis & Petty, 2006), smoking cessation (Høie, Moan, Rise & Larsen, 2012) binge drinking (Norman, & Conner, 2006) and counselling seeking-behaviour (Hyland, McLaughlin, Boduszek & Prentice, 2012). According to Ajzen behavioural intentions are an immediate antecedent and reliable predictor of behaviour. There is mounting evidence to support the utility of this model in predicting dietary intentions and behaviour (Armitage & Conner, 2001; McEachan et al., 2011; Verplanken, 2006). Conversely, despite best intentions unhealthy snacks are often consumed in excess (Forslund, Torgerson, Sjöström & Lindroos, 2005). The question remains why some individuals fail to act upon their intentions and succumb to the temptation of unhealthy snacks more so than others and if consumption is positively associated with BMI? Individual differences in personality may explicate some of the variance in dietary intentions and behaviour; in particular emerging research has implicated the psychological constructs; impulsivity and reward sensitivity in obesity (Nederkoorn, Smulders, Havermans, Roefs & Jansen, 2006; van den Berg et al., 2011). Unhealthy snacks such as chocolate and biscuits are naturally rewarding, hence individuals with heightened impulsivity and reward sensitivity may be acutely vulnerable to over-eating these types of foods, engaging in non-reflective hedonic eating without factoring in the long term health consequences (Davenport, Houston & Griffiths, 2012; Jasinska et al., 2012). There is a scarcity of research that has examined these constructs within the context of the TPB. Hence the study that follows has a number of objectives; firstly to examine the utility of the TPB constructs; attitude, social norm and perceived behavioural control in predicting intentions to reduce unhealthy snacking in members of the general population.
Secondly it will examine if impulsivity and reward sensitivity moderate intentions to reduce unhealthy snacking and thus behaviour. Thirdly it will investigate the relationship between the TPB constructs, impulsivity, reward sensitivity, past snacking and BMI and examine differences in age and BMI levels.

The following literature review will analyse the efficacy of the TPB constructs in predicting approach and avoidance dietary intentions and behaviour, whilst also considering the variables; past snacking and personality. The review will discuss issues surrounding impulsivity, response inhibition and reward sensitivity, including; the association with addiction, consumption of high fat foods, BMI, age and moderators of intentions.

3.1 The theory of planned behaviour and dietary intentions and behaviour

The TPB was developed as an extension to the Theory of Reasoned Action (TRA: Ajzen & Fishbein, 1980) which postulates that an individual’s behavioural intention is an important determinant of behaviour (as cited by Ajzen, 1991). Behavioural intentions are based on a cognitive representation of an individual’s decision and motivation to exert effort to perform a particular behaviour (Ajzen, 1991, 2011). Two antecedents of intentions identified in the TRA model include: attitudes and subjective norms pertaining to the behaviour. A third antecedent, perceived behavioural control (PBC) was incorporated into the TPB to account for external factors influencing intentions and behaviour (Ajzen, 1991). All three components; are determined by a belief system about the behaviour, attitudes from behavioural
beliefs, subjective norms from normative beliefs and PBC from control beliefs. The TPB posits that if all three components are positive it will lead to favourable intentions to engage in the behaviour and increase the likelihood of the behaviour being enacted.

Attitudes represent an overall positive or negative evaluation of performing a particular behaviour. The research literature generally asserts that attitudes are the strongest predictor of intentions (McEachan et al., 2011; Nejad et al. 2004). They are particularly salient in avoidance intentions and behaviours, significantly predicting intentions to avoid fast food (Ajzen & Sheikh, 2013) and unhealthy snacks (Churchill & Jessop, 2010). An affective attitude (favourable attitude towards the food) may also be an important predictor in healthy eating intention (Payne, Jones & Harris, 2004).

Subjective norm is based on an individuals perception of significant others normative belief’s about a particular behaviour, it is operationally defined as the perceived social pressure to comply or not with the expected norms of significant others (Ajzen, 1991). Subjective norm indirectly effects behaviour through effecting intentions. This construct has been suggested as the weakest predictive component of the TPB model, with far greater efficacy for attitudes and PBC (Brickell et al., 2006). However in terms of construct validity, the type of measure used may have impacted findings as multiple-item scales have yielded stronger relationships between subjective norms and intentions than single item scales (Armitage & Connor, 2001,
Furthermore research has indicated that social norms are greater predictors of intentions for adolescent samples (Ajzen & Sheikh, 2013; McEachan et al., 2011).

PBC is based on an individual’s appraisal of their ability to carry out a particular behaviour considering internal and external factors. A mounting body of evidence suggests that greater PBC is positively associated with intention and behaviour. A meta-analytic review of 185 studies by Armitage and Conner (2001) supports the addition of PBC, independently accounting for 6% of the variance in intention and behaviour. According to Ajzen (1991), PBC is particularly useful in predicting behaviour types that encompass problematic volitional control (as cited by Armitage & Conner, 2001, p. 481). This implies that it would be a useful predictor of dietary behaviours in particular for reducing unhealthy snacking. Research by Povey, Conner, Sparks, James and Shepherd, (2000, p 1001) proposed that individuals with stronger intentions and higher PBC were more likely to eat a healthy diet. Mullan and Xavier (2013) reported that PBC was a significant predictor of intentions to reduce saturated fat intake and only variable to significantly predict behaviour. In contrast Ajzen and Sheikh (2013, p.158) suggested that PBC did not significantly correlate with intentions to eat fast food.

Collectively the TPB constructs have been applied in research to promote many dietary behaviours, including; healthy eating (Conner, Norman & Bell, 2002; Payne, Jones & Harris, 2004), fruit and vegetable consumption (Churchill & Jessop 2009; De Bruijn et al., 2007; Gratton, Povey & Clark-Carter, 2007) and breakfast consumption (Conner, Hugh-Jones & Berg, 2011; Wong & Mullan, 2009). They
have also been applied to diminish dietary behaviours including; saturated fat intake (Mullan & Xavier, 2013) high calorie snacking (Churchill, Jessop & Sparks, 2008) and a high fat diet (Armitage, 2004). Impressively studies have provided empirical evidence for the models behavioural predictability with a medium to large effect size reported between the TPB constructs and the percentage of variance in intentions and behaviour (Armitage & Conner, 2001; McEachan et al., 2011). There is also support for the longitudinal predictability of the model as an intervention to promote healthy eating, with intentions accounting for 9% of the variance in behaviour six years later (Conner, et al., 2002, p. 1999). A recent meta-analytic review of 237 studies by McEachan et al. (2011, p. 125) indicated that the TPB predicted 44.3% of the variation in intentions and 19.3% of the variance in behaviour, these results differ slightly compared to previous findings by Armitage and Connor (2001, p. 481) who reported a 39% variance in intentions and 27% in behaviour. According to McEachan et al. (2011) these variations are due to methodological moderators, namely; the type of behaviour, selected sample and length of follow-up. Although the reported variance in dietary behaviour was greater (21.2%) this varied depending upon the sample used with far greater predictability for adults (26.7%) compared to adolescents (9.6%). A limitation of this analysis it that it did not split dietary behaviours into approach or avoidance behaviours i.e. those that advocate increasing as opposed to decreasing consumption of a particular food. Although abstinence behaviours had the lowest reported variance in behaviour (8%) the study did not include dietary abstinence. This is important as upon reviewing studies that examined intentions and dietary behaviour there is far greater efficacy for intentions to increase healthy eating than diminish unhealthy eating (Adriaanse, Vinkers, De
Ridder, Hox & De Wit, 2010). Ajzen and Sheikh (2013, p. 160) reported that the TPB constructs accounted for 60% of the variance in intentions to eat fast food however this was reduced to 38% for intentions to avoid fast food. The TPB may therefore be less successful for complex health-related behaviours such as avoiding or diminishing unhealthy eating, therefore supplementary research is required to examine the utility of this model in predicting intentions to reduce unhealthy eating.

Furthermore the model has been more successful in predicting intentions than behaviour and in reality there still remains a large amount of unexplained variance in both intentions and behaviour not accounted for by the TPB variables (Armitage & Conner, 2001; McEachan et al., 2011). Building upon previous research many theorists have incorporated additional variables alongside the TPB model to account for the unexplained variance and to enhance its predictability. Ajzen (2011) recognised that in conjunction with the TPB constructs, additional background factors may indirectly affect behaviour but recommends that such predictor variables “should be proposed and added with caution, and only after careful deliberation and empirical exploration” (p.1119). A moderator is a variable that affects the direction and strength of the relationship between two other variables (Baron & Kenny, 1986, p. 1174). Habit strength and past behaviour have been identified as important moderators of approach and avoidance goals. Research by De Bruijn et al., (2007) indicated that heightened habit strength moderated intentions to increase fruit and vegetable consumption. In relation to snacking both habit strength and past behaviour predicted future snacking (Verhoeven, Adriaanse, Evers, & de Ridder 2012; Verplanken, 2006). However McEachan et al. (2011, p. 112, 126) argue that
Past behaviour may be a weak predictor of abstinence intentions and behaviour. Consequently Ajzen (2011, p. 1120) evoked that past behaviour is more of a proxy for habit strength indicating that the reported variance in studies attributed to past behaviour may in fact be due to other external variables. Past snacking will be therefore analysed as an additional variable in this study.

Stable personality traits may also affect the strength of TPB predictors (Ajzen 2011, p. 1124). Interestingly few studies have examined the role of individual differences in personality within the context of the TPB for dietary intentions and behaviour. There is empirical evidence that personality dimensions conscientiousness and neuroticism have a role in health behaviours (Bogg & Roberts, 2004). Research examining personality dimensions in the context of exercise intentions and behaviour found that conscientious individuals (tendency to be self-disciplined and reliable) were more likely to follow through with their intentions then those less conscientious, whilst the dimension extraversion (those who seek stimulation, are sociable and assertive) did not significantly impact this relationship (Chatzisarantis, & Hagger, 2008). In dietary behaviours, De Bruijn, Brug and Van Lenthe (2009) proposed that neuroticism (tendency towards emotional instability and negative affect) rather than conscientiousness moderated fruit and vegetable consumption. This research does suggest that personality differences may moderate intentions and behaviour. Whiteside and Lynam (2001) hypothesized that neuroticism is related to impulsivity and extraversion to reward sensitivity. Therefore additional consideration will be given in this study to impulsivity and reward sensitivity to determine the
impact that these constructs have on intentions to reduce unhealthy snacking and past snacking.

3.2 Definition of Impulsivity

Impulsivity is a multidimensional psychological construct that involves a number of processes, it is typically characterised by an inability to wait and an immediate behavioural action to stimuli without forethought or planning for future consequences or inherent risks (Eysenck & Eysenck, 1985; Patton, Stanford & Barratt, 1995; Whiteside and Lynam, 2001). As a personality trait, impulsive behaviour is thought to consist of two main aspects: heightened reward sensitivity and an ineffective response inhibition (Guerrieri, Nederkoorn & Jansen, 2008a). Impulsivity arising from an ineffective response inhibition is characterised by a diminished ability to stop or suppress an already initiated response that is no longer required (Verbruggen & Logan, 2009). Whilst reward sensitivity encompasses a heightened detection and response to rewarding stimuli irrespective of potential punishments (Avila, 2001). Both are distinct but related systems and integral cognitive determinants in eating behaviour, as individuals who are impulsive may choose many small immediate rewards such as unhealthy snacks without thinking of the long-term health consequences.

Carver and White (1994, p. 330-331) developed the BIS/BAS scale to measure individual differences in the sensitivity of both systems. The BAS Reward Responsiveness Scale (Carver & White, 1994) will be used in this study to examine
self-reported reward sensitivity, assessing how individuals respond emotionally to potentially rewarding events. The Barratt Impulsiveness Scale (Patton, Stanford & Barratt, 1995) will be use to examine discrete aspects of impulsivity.


Gray (1987) theoretically conceptualised that two neuro-biological motivational systems control approach and withdrawal behaviour and affect: The Behavioural Activation System (BAS) and the Behavioural Inhibition System (BIS). This model is often referred to as the Reinforcement Sensitivity Theory (RST); it postulates that individual differences in reward detection and reactivity are dependent upon the sensitivity of their neuro-behavioural systems. According to Gray (1990) personality dimensions of anxiety and impulsivity may be represented by individual differences in the BIS and BAS systems (as cited by Leone, Perugini, Bagozzi, Pierro, & Mannetti, 2001, p. 373). The BAS is sensitive to reward and approach behaviour directed at attaining a desirable goal. It is thought to be responsible for controlling appetitive motivation and thus greater activation prompts individuals to seek novel and rewarding experiences resulting in positive emotions. The Behavioural Inhibition System (BIS) complements the BAS and is sensitive to signals of impending punishment and avoidance (inhibition) behaviour directed towards an undesirable goal. It is thought to be responsible for controlling aversive motivation and thus greater activation promotes individuals to inhibit responses in order to avoid punishment, resulting in heightened anxiety (Carver & White, 1994, p. 319).
Both systems have inhibitory connections to each other, activation of one leads to inhibition of the other (Whiteside & Lynam, 2001, p. 672). The RST theory was further revised to include advances in neurobiology and the addition of the fight-flight-freeze system (FFFS) to account for differences in fear and anxiety (Gray & Naughton, 2000). The neural basis of the BAS is thought to relate to dopaminergic pathways in the brain and the BIS controlled by a number of neural structures by the septohippocampal brain system and amygdale (Carver and White, 1994, p. 319, Gray & McNaughton, 2000). Research by Beck, Smits, Claes, Vandereycken and Bijttebier (2009) supports the neural basis of the BAS system, indicating that dopaminergic reward pathways in the brain were activated in response to food-related rewards.

3.4 Impulsivity and the association with addiction and food intake

The research literature on impulsivity asserts that heightened impulsivity and reward sensitivity are positively associated with many maladaptive and addictive behaviours including: drug abuse (Perry & Carroll, 2008), gambling (Brevers et al., 2012) alcohol abuse (Koob, 2013), compulsive buying (Davenport et al., 2012) and binge eating (Nasser Luck & Geliebter, 2004). Two distinct facets of impulsivity identified in the addiction literature include; impulsive choice (choosing small immediate reinforcers over a larger delayed reinforcer) and impaired inhibition (inability to inhibit an already initiated response) (Perry & Carroll, 2008). Emerging studies have begun to examine obesity and overeating from an addiction perspective, highlighting
the parallels between impulsivity and overeating and the corresponding neural responses. Some scholars hypothesize that excessive consumption of palatable foods produces neural changes in the brain similar to that of drug addiction (Kenny, 2011; Volkow & O’Brien, 2007). Studies on obese individuals have found negative associations between BMI and activity in the brains prefrontal cortex and cingulated gyrus (Volkow et al., 2009) and also greater neural activation in anticipation of palatable food (Stice, Spoor, Bohon, Veldhuizen & Small, 2008). Conversely others have argued that this relationship is ambiguous and requires further investigation (Ziauddeen, Farooqi & Fletcher, 2012). Nonetheless, this has stimulated research into examining the role that impulsivity has in dietary behaviours in overweight and obese populations.

### 3.4.1 Impulsive choice: reward sensitivity and the association with food.

Research asserts that individuals who are reward sensitive experience an enhanced detection of perceived rewarding stimuli and are therefore more likely to respond to these stimuli more frequently (Davis, et al., 2004). Empirical evidence suggests that individuals with heightened reward sensitivity have a greater vulnerability to developing unhealthy eating patterns (Beck, et al., 2009). Heightened BAS reactivity (reward sensitivity) and motor impulsivity (acting without thinking) was found to significantly correlate with binge eating (Nasser et al., 2004). In comparison elevated BIS and BAS reactivity was reported in bulimia patients and an elevated BIS reactivity in anorexia nervosa patients (Claes, Vandereycken, & Vertommen, 2002) both implicating impulsivity in both over and under-eating (Finzi-Dottan & Zubery,
In the current obesogenic environment palatable foods are natural reinforcers often eaten for hedonic reasons, therefore in a non-clinical sample reward sensitivity may be an important determinant of greater unhealthy snacking through hyper-responsivity to environmental snack cues.

An experiment by Ashby and Stritzke (2013) provided further support for the interdependence of the BAS and BIS systems in the revised reinforcement sensitivity theory (Gray & McNaughton, 2000), hypothesising that individuals high in reward sensitivity are susceptible to the rewarding value of high-fat foods but are unaffected by negative consequences of consuming high-fat foods. Conversely there is conflicting evidence regarding the relationship between reward sensitivity and BMI in non-clinical samples. According to Davis et al. (2004) reward sensitivity is positively associated with emotional overeating and BMI, in particular individuals who are overweight (BMI>25<30) are more likely have a greater sensitivity to reward compared to those who are a normal weight. Building upon this research Davis et al. (2007) examined reward sensitivity in a non-obese healthy adult population sample and found a predictive relationship between sensitivity to reward, overeating, BMI and a preference for foods high in fat and sugar. Davis and Fox (2008) reported similar findings for those in were in the normal and overweight category, however for individuals who were moderately or extremely obese this relationship was inversely related i.e. the more obese a person was the less sensitive they were to rewards. A possible explanation for this finding is over time the reward circuitry system becomes down regulated through over-stimulation (Guerrieri, et al., 2008a, p. 274) and inhibitory control is worn down due to reward responsiveness
(Ely, Winer & Lowe, n.d). These research findings imply that the relationship between reward sensitivity and BMI is not explicit and requires further examination. Therefore unhealthy snack consumption may vary depending upon a person’s weight, preference for palatable food and reward sensitivity.

3.4.2. impaired response inhibition and diet.

The research literature asserts that in addition to a heightened sensitivity to external food cues and preference for immediate rewards, obese individuals are more likely to have difficulties controlling their food consumption (Davis et al., 2007; Nederkoorn, et al., 2006; Weller, Cook, Avsar & Cox, 2008). There is a general consensus that an ineffective response inhibition contributes to a person’s inability to resist tempting foods (Davenport, et al., 2012), to an unhealthy diet and potentially elevated BMI (Nederkoorn, Houben, Hofmann, Roefs & Jansen, 2010; Janinska et al., 2012). Additionally a positive implicit attitude and preference for snack foods may also be positively associated with BMI (Hofmann & Friese, 2008; Nederkoorn, et al., 2010; Pirjo, Svein Ottar, Bas, & Ho Huy, n.d.). It is important to note these studies were based on student samples limiting generalisation. However it does highlight the importance of determining attitudes towards unhealthy snacking and the potential viability of the TPB (Ajzen, 1991).

The reported association between impulsivity (reward sensitivity and response inhibition) and overeating has varied depending upon the sample analysed. A study on obese children reported that reward sensitivity was associated with
calorie intake but not BMI, yet an ineffective response inhibition was positively associated with BMI suggesting it plays a part in maintaining childhood obesity (Guerrieri, Nederkoorn and Jansen, 2008b, p 713). In adolescent samples hypofunctioning of the brains inhibitory control regions and elevated response of the food reward regions were positively associated with BMI and cognitive anxiety (Batterink, Yokum & Stice, 2010). Supporting this finding Davenport, et al. (2008) reported that heightened reward sensitivity positively predicted excessive adolescent eating. Conversely the findings on adolescent and young adult samples may be mitigated by the fact that this age group is at a developmental stage where impulsivity is at a heightened level (Ezinga, Weerman, Westenberg & Bijleveld, 2008; Stautz & Cooper, n.d.), potentially due to an under developed brain executive function which is responsible for controlling behaviour (Hall, Fong, Epp & Elias, 2008). Interestingly, only a small number of studies have examined impulsivity and snacking in the general population. An experimental study by Guerrieri, Nederkoorn and Jansen, (2007a) examined impulsivity in a healthy adult population sample, proposing that those with higher self-reported impulsivity (BIS-11 scale) consumed more food in a taste test, however this was a female only sample.

Many studies have focused on obese samples (Guerrieri et al., 2008; Nasser et al., 2004; Nederkroon et al., 2006) and the majority of healthy non-obese samples have mainly consisted of younger student samples (Nederkoorn et al., 2010, Davenport et al., 2012) or female only samples (Guerrieri, et al., 2007a; Guerrieri et al., 2007b; Nederkoorn et al., 2010). Therefore further research is required to examine the relationship between impulsivity, reward sensitivity, unhealthy snacking
and BMI in a general population sample. The question remains are non-obese individuals with heightened impulsivity and reward sensitivity susceptible to frequent snacking regardless of their intentions hence increasing their risk of becoming overweight or obese?

3.5 Snacking and BMI

Past research has indicated that the relationship between unhealthy snacking and BMI level is ambiguous. Some studies have found positive associations between snack consumption and overall calorie, energy and saturated fat intake (Berteus et al., 2005; Whybrow et al., 2007). However other studies have questioned this association due to methodological differences between studies and the variability in what is defined as a snack (Gregori, Foltran, Ghidina & Berchialla, 2011). Research by Viskaal^van Dongen, Kok and de Graaf (2011) reported that snack consumption over eight weeks did not significantly impact overall body weight. A limitation of this study was that it only included healthy weight adults and did not measure compensatory behaviours that may have counteracted snacking. Therefore the relationship between snacking and BMI warrants further investigation.

3.6 Impulsivity as a moderator of intentions and behaviour

As discussed impulsivity involves a lack of self-regulation that may reduce the intention behaviour gap for unhealthy snacking. A study by Churchill, Jessop and Sparks (2008) was one of the first to examine the relationship between impulsivity
and snacking within a TPB context. This study proposed that impulsivity explained 10% of the variance in snacking over and above the TPB constructs, implicating that impulsivity may overrule initial intentions to avoid unhealthy snacks. However there was no significant correlation between the impulsivity subscales and behavioural intentions and the only dimension of impulsivity found to significantly moderate intentions was the trait, urgency. Urgency is defined by Whiteside and Lynam (2001, p. 685) as a tendency to act rashly in distress, this facet of impulsivity is akin motor impulsivity on the BIS-11 scale (Patton et al. 1995). Consequently follow up studies by Churchill and Jessop, (2010, 2011) also advocated the role of urgency in moderating intentions, suggesting that only when individuals are upset they will act rashly engaging in unhealthy eating overriding intentions. It would therefore be conducive to examine if an alternative self-report measure of impulsivity the (BIS-11) would yield similar results.

It is important to highlight some limitations of these studies, no baseline measure of snacking was used which can influence intentions (Brickell, et al., 2006) and no distinct measure of reward sensitivity was used which is integral to research examining unhealthy snack consumption (Davis et al., 2007). Furthermore these studies were based on younger student samples (Churchill & Jesssop, 2010, 2011) and internet samples (Churchill et al., 2008; Churchill & Jesssop, 2010, 2011) which may not be representative of the general population.

Interestingly many of the studies mentioned in this review have examined impulsivity and dietary behaviour in student samples, which are predominantly
younger samples (Ajzen & Sheikh, 2013; Brickell et al., 2006; Churchill & Jessop 2008, 2010, 2011; Jasinska et al., 2012; Friese et al., 2008; Guerrieri, et al., 2007; Mullan et al., 2014; Nederkoorn et al., 2007). This may be a confounding variable as these individuals more likely to respond to and make more impulsive food choices. In conjunction the efficacy of the TPB in predicting dietary behaviour may be diminished for this type of sample (McEachen et al. 2011, p. 116). Therefore the target sample in this study is a general population sample of mixed ages.

3.7 Conclusion

In conclusion the prevalence of obesity has coincided with the significant rise in the frequency of unhealthy snacking. The TPB has proven a useful model in investigating the motivational determinants of dietary behaviour, however the research literature asserts that there is far greater efficacy for this model in predicting intentions to increase healthy eating than diminish unhealthy eating (Ajzen & Sheikh, 2013; Adriaanse, et al., 2010). Furthermore research has indicated that attitudes are the strongest predictor of dietary intentions, followed by PBC and social norms, conversely this may vary depending upon the type of behaviour and sample used (McEachan et al., 2011; Mullan & Xavier, 2013; Povey et al., 2000). It is not clear if the TPB constructs would significantly predict intentions to reduce unhealthy snacking in a healthy adult sample as reported in previous studies (Armitage & Conner, 2001; McEachan et al. 2011). Unhealthy snacks are often eaten on impulse overriding initial intentions, therefore individual differences in impulsivity and reward sensitivity will also be examined in this study as there is currently a gap in
the research literature addressing these variables collectively within a TPB framework. In addition the relationship between the TPB constructs, impulsivity, reward sensitivity, past snacking and BMI requires further examination. There is an established link between impulsivity facets: reward sensitivity and response inhibition with unhealthy eating in clinical and obese samples (Nasser et al., 2004; Guerrieri et al., 2008). However, in non-clinical samples the relationship between reward sensitivity and BMI has yielded conflicting results, finding both positive (Davis et al., 2007) and negative associations (Davis & Fox, 2008). There is also a scarcity of research in this specific area using a general population sample, as many studies have focused on obese, gender specific or student samples, limiting generalisation. Therefore this investigation is conducted in anticipation that it will advance understanding of the psychological mechanisms that contribute to intentions and unhealthy eating. If the alternative hypothesis is statistically significant it will highlight the importance of screening for impulsivity and reward sensitivity and yield clinically useful information on improving dietary interventions.

3.8. Hypotheses

H1. It is hypothesised that there will be a statistically significant positive correlation between the TPB variables i.e. attitude, social norm and PBC with intentions to reduce unhealthy snacking.
H2. It is hypothesised that there will be a statistically significant negative correlation between impulsivity and intentions to reduce snacking and between reward sensitivity and intentions to reduce snacking.

H3. It is hypothesised that there will be a statistically significant negative correlation between attitudes, PBC, intentions and past snacking.

H4. It is hypothesised that there will be a statistically significant positive correlation between impulsivity and past snacking and between reward sensitivity and past snacking.

H5. It is hypothesised that there will be a statistically significant positive correlation between impulsivity and BMI and between reward sensitivity and BMI.

H6. It is hypothesised that there will be a statistically significant positive correlation between past snacking and BMI.

H7. It is hypothesised that there will be a statistically significant negative correlation between PBC, attitude, intentions and BMI.

H8. It is hypothesised that there will be a statistically significant difference in levels of impulsivity and reward sensitivity between those in the normal weight, overweight and obese groups.
H9. It is hypothesised that there will be a statistically significant difference in levels of impulsivity and reward sensitivity between those in the under 35 age group and over 35 age group.
4. Method

4.1 Participants

Participants were obtained through a convenient, non-probability sample including; administration employees of a major discount retailer, members of three yoga classes and online users of a social networking site. This sample was purposive, selected in anticipation of providing a representative sample of Irish adults who eat unhealthy snacks. All participants were over 18 years old and gave informed consent to participate. No incentives were offered for participation. In total 178 participants took part in this study of which 33% were male (N=60) and 66% female (N=118). Age brackets ranged from 18 to 65+ years, the mode age bracket was 35-44 years which included 44% (N=78) of participants. One third of participants were aged between 18 and 34 (N= 59) and two thirds aged 35 years and older (N=119).

4.2 Design

The research design employed for this study was a mixed-quantitative design including correlational and cross-sectional aspects. The first part of this study used a correlational design to explore the relationship between a number of predictor variables with intentions, past snacking and BMI. The predictor variables: attitudes, social norms, PBC, impulsivity, reward sensitivity and past snacking were examined with the criterion variable: intention to reduce snacking. Secondly the predictor variables: attitudes, PBC, intentions, impulsivity and reward sensitivity were
examined with the criterion variable: past snacking. Thirdly the predictor variables: attitudes, PBC, intentions, impulsivity and reward sensitivity and past snacking were examined with the criterion variable: BMI. For any multiple significant findings a multiple regression analyses was used to identify significant predictor variables.

The second part of the study employed a cross-sectional between participants design to test for differences associated with age and BMI. The first independent variable was age where participants were assigned to one of two groups dependant upon their age bracket: 18 - 34 and 35+ years. The second independent variable was BMI where participants were assigned to one of three BMI groups dependent upon their BMI level: normal weight group (18.5-24.99), overweight group (25-29.99) and obese group (30+). The dependent variables included: impulsivity and reward sensitivity.

4.3 Materials

Data was collected through the use of a self-administered paper based and online questionnaire. A total of 76 paper based questionnaires were completed and 102 online questionnaires. The questionnaire consisted of an introductory cover page, demographic questions, unhealthy snacking frequency and three standardised questionnaires: the Theory of Planned Behaviour (Azjen & Fishbein, 1991), the Barratt Impulsiveness Scale (BIS-11) (Patton, Stanford & Barratt, 1995) and the BAS Scale (Carver & White, 1994). See appendices for more details.
4.3.1 The Theory of Planned Behaviour (Azjen & Fishbein, 1980, 1991)

Participants were given a definition of what constitutes an unhealthy snack and asked to carefully read a number of statements relating to unhealthy snacking. These questions were drafted based on the guidelines set forth by Ajzen, (1991, 2002) and were consistent with previous applications following a semantic seven-point Likert scale from (+1 to +7). The variables measured participants; attitudes, social norms and perceived behavioural control in relation to unhealthy snacking and also their intentions to reduce unhealthy snacking. Each variable was totalled with higher scores indicating stronger constructs. Actual behaviour was measured by means of past snacking and not future snacking.

4.3.2 Attitude

Attitudes to unhealthy snacking were assessed with the following statement, “For me to eat fewer unhealthy snacks would be:” and included five semantic differentials: bad/good, harmful/beneficial, unpleasant/pleasant, unenjoyable/enjoyable, and worthless/worthwhile. Scores closer to 35 indicated stronger attitudes towards reducing unhealthy snack consumption. The Cronbach’s alpha reliability for the attitudinal measure was $\alpha=0.71$. 
4.3.3 Subjective Norm

Two items measured the degree to which significant others would approve of and support one's decision to reduce unhealthy snacks. To control for the possibility of transfer effects, both item responses were reverse scored from 1 (strongly disagree) to 7 (strongly agree). Scores closer to 14 indicated stronger subjective norms. The Cronbach’s alpha reliability for the social norm measure was $\alpha=0.88$.

4.3.4 Perceived Behavioural Control

PBC was measured using three items for example “I have complete control over whether I can eat fewer unhealthy snacks:” 1 (strongly disagree) to 7 (strongly agree). Scores closer to 21 indicated greater perceptions of control in relation to reducing future unhealthy snacking. The Cronbach’s alpha reliability for the PBC measure was $\alpha=0.66$.

4.3.5 Behavioural Intentions

Intentions to reduce future unhealthy snacking were measured by three items. For example: “I intend to eat fewer unhealthy snacks on a regular basis:”, 1 (unlikely) to 7 (likely). A higher score denotes stronger intentions to reduce unhealthy snacking. The Cronbach’s alpha reliability for the behavioural intention measure was $\alpha=0.81$. 


4.3.6 Barratt Impulsiveness Scale (version 11), BIS-11 (Patton, Stanford & Barratt, 1995)

The BIS-11 (Patton, Stanford & Barratt, 1995) consists of 30 items that measure common impulsive and non-impulsive behaviours or attitudes. Participants were informed that this was a test measuring how individuals think and act in different situations, they were asked to choose from one of four responses picking the one that most applies to them for each of the 30 items, answering quickly and honestly. Items were scored on a four point Likert scale, 1 (rarely/never), 2 (occasionally), 3 (often), 4 (almost/always), non-implusive items were reverse scored. The scale consists of three second order factors of impulsivity: attentional (8 questions), motor (11 questions) and nonplanning (11 questions). The attentional scale measures how focused one is on the task at hand, the motor scale measures how much one acts without thinking and non-planning measures how future orientated one is. The total subscale score range is from 30 to 120, with scores closer to 120 indicating higher levels of impulsivity, the mean score in this study was (M=61.06) indicating that this sample had moderate levels of impulsivity. In relation to reliability Patton, Stanford and Barratt (1995) reported that this scale has a Cronbach’s alpha score ranging from $\alpha=0.79 - 0.83$, consistent with this finding the Cronbach’s alpha in this study was, $\alpha=0.80$ indicating a high level of reliability. This scale has been validated by previous research and is one of the most widely used self-reporting measure of the personality construct of impulsivity (Stanford et al., 2009). The total sum score of the BIS-11 is most commonly used in research due to reservations about the construct validity of the three-factor model (Steinberg, Sharp, Stanford & Tharp 2013).
4.3.7 BAS Scale (Carver & White, 1994)

The BAS Scale is a subscale of the BIS/BAS scales of Carver and White (1994). It consists of 13 items that measure sensitivity differences to potentially rewarding events and corresponding emotional responses (Leone, et al., 2001, p. 375). Participants were asked to choose from one of four responses and rate how much they agree or disagree with each of the 13 items, answering each question quickly and honestly. Items were scored on a four point Likert scale, 1 (very true for me), 2 (somewhat true for me), 3 (somewhat false for me), 4 (very false for me), all scores were then reverse scored. The scale consists of three subscales, Reward Responsiveness (5 questions), Drive (4 questions) and Fun-Seeking (4 questions). Reward responsiveness measures individual’s sensitivities in anticipation of and positive response to rewards, drive measures the persistence to achieve appetitive goals and fun-seeking the tendency to seek out and approach goals. The total subscale score range is from 13 to 52 with scores closer to 52 indicating higher levels of reward sensitivity. In this study the mean score was (M=39.92) indicating that this sample had above average levels of reward sensitivity. Research by Smits and De Boeck, (2006) support this scales reliability reporting a Cronbach’s alpha of $\alpha=0.73$, in contrast this study found the scale to have a stronger reliability of $\alpha=0.84$. The construct validity and generalisability of the BAS scale has been validated by previous research across different samples in various countries (Leone et al., 2001).
4.3.8 Demographics

Participants were asked to indicate their age, gender, weight (stones & lbs or kilograms) and height (feet & inches). Body mass index (BMI) was calculated for each participant, BMI= (kg)/(height (m))². Participants were also asked if they were currently on a weight reducing diet.

4.3.9 Snacking

An 8-item food frequency questionnaire (FFQ) was used to measure participants weekly snacking. This was adapted from the sweets and snacks scale of the Oxford FFQ (Bingham et al., 1994) and replicated similarly to the scale used by Payne et al. (2004). Participants were asked to tick the appropriate number of times they consumed the following items in the last week: Crisps, Biscuits, Chocolate/Bars, Sweets, Cakes/Desserts, Pastries/Scones, Icecream, Salted/Roasted Nuts. Response and scoring for each item was as follows: 0 (not at all), 1 (once a week), 3 (2-4 times a week), 5.5 (5-6 times a week), 7 (once a day), 17.5 (2-3 times a day), 31.5 (4-5 times a day) and 42 (6+ times a day). Items were totalled, higher scores represented high consumption. In relation to reliability Payne et al. (2004) reported that this scale had a Cronbach’s’s alpha of α=0.62, in this study it was found to have a slightly stronger reliability of α=0.69.


4.4 Procedure

Questionnaires were distributed through three separate mediums: to administration staff of a discount retailer, to three yoga groups and through the internet via the use of a social networking site. An introductory sheet was included at the beginning the questionnaire which specified that the survey would take 5 - 7 minutes to complete, participation was voluntary and that confidentiality and anonymity would be ensured. Participants were given the option to withdraw (waivering anonymity) from the survey following completion through writing a personal code down (for paper based questionnaires) on the top of the survey and contacting the researcher at the email address provided, for electronic surveys taking note of the date and time was sufficient. Participants were informed that the research was exploring individual’s thoughts and feelings about unhealthy snacking and informed that some of the questions asked could induce some negative feelings, this provided them with the opportunity to make an informed decision about participating.

For paper based questionnaires support information was provided at the end of the separate introductory sheet, a telephone number and web link was given for the Samaritans and Bodywhys (for any eating behaviour concerns). For online questionnaires this information was provided at the end of the completed survey.

In order to distribute the paper based surveys, permission was got from the office manager of the discount retailer and leader of the yoga groups. An email was sent to 60 administration employees requesting assistance with this research. Surveys
were left in the staff canteen over a two week period and a secure file box was provided to collect completed surveys (this was locked away each evening). For the yoga groups, surveys were handed out at the end of class and collected over a two week period. The online survey was created through google docs and distributed through a link posted on a social media site, collection took place over a four week period.

4.5 Data Analyses

Data was analysed using IBM SPSS Statistics version 21 for windows. Online surveys were exported into excel and merged with the paper-based data surveys before they were imported into SPSS. Data was recoded and computed as required.
5. Results

Preliminary analysis confirmed internal reliability of all scales. The data was then analysed to ensure there was no serious violation of the assumptions of normality, linearity and homoscedasticity.

5.1 Descriptive Statistics

Descriptive statistics were carried out to establish frequencies, percentages and means and standard deviations across predictor and criterion variables. There were a total of 178 participants in this study of which (N=60) were male and (N=118) female. The majority of participants (N=78) were in the 34-44 age bracket for both males (M=28) and females (N=50). See figure 1 for more details.

![Age differences for Males and Females](image)

*Figure 1: Age differences between males and females*
Total snacking scores ranged from 0 to 119, the mean score for total snacking was (M=13.50), this represents on average a low score of snacking between once a week and 2-4 times a week. On average biscuits (M=3.31) and chocolate/bars (M=3.41) were the most popular type of snack, eaten between 2-4 times a week (equivalent to a score of 3). Overall men had a higher mean score for total snacking (M=17.29, SD=18.28) compared to females (M=11.57, SD=8.99). An independent samples T-test found that there was a statistically significant difference between snacking scores of males and females (t (74) = 2.29, p = 0.02, CI (95%) 0.74 – 10.7). See Table 1 and Figure 2.

Table 1: Descriptive statistics of snacking frequency

<table>
<thead>
<tr>
<th>Snack Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisps</td>
<td>2.01</td>
<td>3.05</td>
</tr>
<tr>
<td>Biscuits</td>
<td>3.31</td>
<td>4.59</td>
</tr>
<tr>
<td>Chocolate/Bars</td>
<td>3.41</td>
<td>4.20</td>
</tr>
<tr>
<td>Sweets</td>
<td>1.61</td>
<td>2.88</td>
</tr>
<tr>
<td>Cakes/Desserts</td>
<td>1.19</td>
<td>2.17</td>
</tr>
<tr>
<td>Pastries/Scones</td>
<td>0.78</td>
<td>1.33</td>
</tr>
<tr>
<td>Icecream</td>
<td>0.39</td>
<td>0.81</td>
</tr>
<tr>
<td>Salted/Roasted Nuts</td>
<td>0.80</td>
<td>2.84</td>
</tr>
</tbody>
</table>

Figure 2: Male and female mean snack scores split by age bracket.
Only 20% of participants were on a weight reducing diet therefore differences between dieters and non-dieters could not be explored due to an unequal homogeneity of variance. BMI scores ranged from 18.02 to 42.32. In order to analyse BMI differences, scores were split into three groups, a normal weight group (18.5-24.99), an overweight group (25-29.99) and an obese group (30+). Four participants had a score of less than 18.5 which was deemed underweight and excluded from BMI analyses due an unequal homogeneity of variance. The mean BMI score was (M=26.67), men had a slightly higher BMI (M=27.08) than women (M=26.46). However an independent samples T-test found that there was no statistically significant difference between BMI levels of males and females (t (175) = 0.76, p = .44). Nearly half of all males (47%) were overweight compared to females (28%) and only one third of all males (33%) were normal weight compared to half of all females (50%). Male and female BMI descriptive statistics are presented in Table 2 and Figure 3.

Table 2: Descriptive statistics for males and female BMI scores.

<table>
<thead>
<tr>
<th>BMI</th>
<th>Frequency</th>
<th>Percent</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Weight</td>
<td>4</td>
<td>2%</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>79</td>
<td>43%</td>
<td>20</td>
<td>59</td>
</tr>
<tr>
<td>Overweight</td>
<td>61</td>
<td>34%</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>Obese</td>
<td>34</td>
<td>19%</td>
<td>12</td>
<td>22</td>
</tr>
</tbody>
</table>
Figure 3: Male and female BMI differences.

A report of means (M) and standard deviations (SD) of all scale variables are shown below in Table 3. Attitudes had a mean score of (M=26.41) out of a possible score range from 5 to 35, this indicated above average positive evaluations towards reducing snacking. Social norms were slightly above average with a mean score of (M=9.91) out of a possible score range from 2 to 14. Participants scored above average on PBC and intentions with mean scores of (M=15.28) and (M=15.87), out of a possible score range from 3 to 21. This indicated that on average participants had strong appraisals of their ability to reduce snacking and strong intentions to reduce snacking. The mean score for impulsivity was (M=61.06) out of a possible score range from 30 to 120, this indicated that participants had moderate levels of impulsivity. Overall the total range of scores for impulsivity varied from 34 to 89. In comparison the mean score for reward sensitivity was (M=39.92) out of a possible score range from 13 to 52 which indicated that on average participants had high levels of reward sensitivity.
There were no significant differences for attitudes, social norms, intentions, impulsivity and reward sensitivity between males and females. However an independent samples t-test revealed that men had significantly lower PBC (M=14.15, SD=3.11) than females (M=15.86, SD = 3.92), (t (176)= -2.93, p = .004, CI (95%) -2.85 - -.56).

### 5.2 Inferential Statistics

The first aim of this study was to examine the utility of the TPB model in predicting intentions to reduce snacking and secondly to examine if impulsivity and reward sensitivity moderate this relationship. Table 4 presents a summary of all bivariate correlations.

Table 3: Bivariate correlations between the TPB constructs, impulsivity, reward sensitivity, snacking and BMI.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intention</th>
<th>PBC</th>
<th>Social Norms</th>
<th>Attitude</th>
<th>Impulsivity</th>
<th>Reward Sensitivity</th>
<th>Snack Total</th>
<th>BMI</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentions</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>.30**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.28</td>
<td>3.75</td>
</tr>
<tr>
<td>Social Norms</td>
<td>.10</td>
<td>-.04</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.91</td>
<td>3.83</td>
</tr>
<tr>
<td>Attitudes</td>
<td>.37**</td>
<td>.13</td>
<td>.20**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26.41</td>
<td>5.15</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>-.11</td>
<td>-.36**</td>
<td>-.07</td>
<td>-.23**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>61.06</td>
<td>9.90</td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>.14</td>
<td>-.05</td>
<td>.09</td>
<td>-.07</td>
<td>.13</td>
<td>1</td>
<td></td>
<td></td>
<td>39.92</td>
<td>5.56</td>
</tr>
<tr>
<td>Snack Total</td>
<td>-.12</td>
<td>-.15*</td>
<td>-.05</td>
<td>-.02</td>
<td>.12</td>
<td>.02</td>
<td>1</td>
<td></td>
<td>13.50</td>
<td>13.12</td>
</tr>
<tr>
<td>BMI</td>
<td>.12</td>
<td>-.20**</td>
<td>-.01</td>
<td>-.05</td>
<td>.10</td>
<td>.16*</td>
<td>-.00</td>
<td>1</td>
<td>26.67</td>
<td>6.10</td>
</tr>
</tbody>
</table>

Note: **p is significant at the 0.01 level (2-tailed)
*p is significant at the 0.05 level (2-tailed)
5.2.1 Predictors of intentions to reduce snacking.

5.2.1.1 Hypothesis 1: There will be significant positive relationship between attitudes, PBC, social norms and intentions to reduce snacking.

Firstly a pearson correlation coefficient was employed in order to measure the relationships between the predictor variables: attitudes, PBC and social norms and the criterion variable; intentions to reduce snacking. Results are presented above in Table 3.

A 2-tailed Pearson correlation coefficient found a moderate positive significant relationship between attitudes and intentions ($r (173) = 0.37, p < 0.01$). This suggests that the more positive participants attitudes towards reducing snacking are the greater their intentions to reduce unhealthy snacking. This relationship can account for 13.69% of variation of scores. Similarly a 2-tailed pearson correlation coefficient found a moderate positive significant relationship between PBC and intentions ($r (176) = 0.30, p < 0.01$). This indicates that the stronger participants PBC to reduce snacking the greater their intentions to reduce unhealthy snacking. This relationship can account for 9% of variation of scores. No significant relationship was found between social norms and intentions to reduce snacking ($r (176) =0.10, p > 0.05$). Therefore the null can be partially accepted for the social norms hypothesis.

5.2.1.2 Hypothesis 2: There will be a statistically significant negative relationship between impulsivity and intentions to reduce snacking and between reward sensitivity and intentions to reduce snacking.
A 2-tailed pearson correlation coefficient found there was a negative relationship between impulsivity and intentions to reduce snacking, however this result was not significant ($r (176) = -0.11, p > 0.05$). Similarly the results between reward sensitivity and intentions to reduce snacking were not significant ($r (176) = 0.14, p > 0.05$).

In order to assess the total amount of variance in intentions to reduce snacking explained by each of the predictor variables in hypothesis one and two a stepwise hierarchical multiple regression analyses was carried out. Preliminary analyses revealed there were no serious violations of the assumptions of normality, linearity and homoscedasticity. In addition the histogram and QQ plots were normally distributed. Inspection of the VIF and tolerance indicated that multicollinearity was unlikely to be a problem and there was also no violations of the mahalanobis.

In the first step of the hierarchical multiple regression model, the criterion variable and two predictor variables, attitudes and PBC were entered. The results indicated that both variables: attitudes and PBC explained 22% of the variance of intentions to reduce snacking ($R^2 = 0.22, F (2, 172) = 25.57, p < 0.01$). It was found that attitudes were the strongest significant predictor of intentions to reduce snacking ($\beta = .33, p < 0.01, 95\% CI = 0.13 - 0.32$). PBC also significantly predicted intentions to reduce snacking ($\beta = .30, p < 0.01, 95\% CI = 0.17 - 0.43$). At step two, impulsivity and reward sensitivity were entered into this model to examine if either significantly predicted intentions to reduce snacking, it was expected that neither would significantly predict intentions due to the non-significant correlation. This model was also significant indicating that three of the predictor variables: attitudes, PBC and
reward sensitivity explained 24% of the variance of intentions to reduce snacking ($R^2 = 0.24$, $F (4, 170) = 14.56$, $p < 0.01$). Reward sensitivity significantly predicted intentions to reduce snacking accounting for an additional 2% of the variance ($\beta = .15$, $p = 0.02$, 95% CI = .01 - .18) Impulsivity did not significantly predict intentions to reduce snacking ($\beta = .05$, $p > 0.05$). See table 4 below:

Table 4: *Multiple regression table of intentions to reduce snacking*

<table>
<thead>
<tr>
<th>Model 1</th>
<th>R</th>
<th>adj$R^2$</th>
<th>$R^2$ Change</th>
<th>$\beta$</th>
<th>t</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>.479</td>
<td>.229</td>
<td>.229</td>
<td>-.33</td>
<td>4.90</td>
<td>.000**</td>
</tr>
<tr>
<td>PBC</td>
<td>.30</td>
<td></td>
<td>.30</td>
<td>-.30</td>
<td>4.50</td>
<td>.000**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>.505</td>
<td>.255</td>
<td>0.02</td>
<td>.35</td>
<td>5.14</td>
<td>.000**</td>
</tr>
<tr>
<td>PBC</td>
<td>.32</td>
<td></td>
<td></td>
<td>.32</td>
<td>4.53</td>
<td>.000**</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.05</td>
<td></td>
<td></td>
<td>.05</td>
<td>.64</td>
<td>.52</td>
</tr>
<tr>
<td>Reward</td>
<td>.15</td>
<td></td>
<td></td>
<td>.15</td>
<td>2.28</td>
<td>.025**</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: **p is significant at the 0.01 level

5.2.2 Predictors of snacking

The second aim of this study was to examine the relationship between the TPB constructs, impulsivity, reward sensitivity and past snacking.

5.2.2.1 Hypothesis 3: There will be a significant negative relationship between intentions to reduce snacking, attitudes, PBC and past snacking.

The only theory of planned behaviour construct to significantly correlate with snacking was PBC. A 2-tailed pearson correlation coefficient found a weak negative significant relationship between PBC and snacking ($r (176) = -0.15$, $p = 0.04$). This
indicates the more perceived control participants felt they had over reducing their snacking the less they snacked. Although the relationship between intentions and past snacking were negative, the result was not significant \( r (176) = -0.12, p > 0.05 \), similarly the relationship between attitudes and past snacking was negative but not significant \( r (176) = -0.02, p > 0.05 \). See table 3 for results.

### 5.2.2.2 Hypothesis 4: There will be a significant positive relationship between impulsivity, reward sensitivity and past snacking.

A 2-tailed pearson correlation coefficient found there was a positive relationship between impulsivity and past snacking, however this result was not significant \( r (176) = 0.12, p > 0.05 \). Similarly the relationship between reward sensitivity and past snacking was positive but not significant \( r (176) = .02, p > 0.05 \). Therefore the null can be accepted. See table 3 for results.

As hypothesis 3 & 4 were not significant and the only variable to significantly predict snacking was PBC there was no requirement to run a multiple regression analysis.

### 5.2.3 Predictors of BMI.

The third aim of this study was to explore the relationship between the TPB constructs, impulsivity, reward sensitivity, past snacking and BMI.

#### 5.2.3.1 Hypothesis 5: There will be a significant positive relationship between impulsivity, reward sensitivity and BMI.
A 2-tailed pearson correlation coefficient found there was a weak positive significant relationship between reward sensitivity and BMI (r (176) = 0.16, p = 0.04). This suggests that participants who had greater sensitivity to rewards had higher BMI levels. Although there was a positive relationship between impulsivity and BMI, this result was not significant (r (176) = 0.10, p > 0.05).

5.2.3.2 Hypothesis 6: There will be a significant positive relationship between past snacking and BMI.

A 2-tailed pearson correlation coefficient found a non-significant negative relationship between past snacking and BMI, (r (176) = -0.04, p = > 0.05). Therefore the null can be accepted.

5.2.3.3 Hypothesis 7: There will be a significant negative relationship between PBC, attitudes, intentions and BMI.

A 2-tailed pearson correlation coefficient found there was a weak negative significant relationship between PBC and BMI (r (176) = -.20, p = 0.01). Therefore this indicates that the greater perceived control participants felt they had in their ability to reduce snacking the lower their BMI levels were. There was a negative non-significant relationship between attitudes and BMI (r (176) = -0.05, p > 0.05), and between intentions and BMI (r (176) = 0.12, p > 0.05).
A direct multiple regression was run to determine if either reward sensitivity or PBC were significant predictors of BMI. The results indicated that the two predictors only explained 5% of the variance of BMI ($R^2 = 0.05$, $F (2, 175) = 5.62$, $p < 0.01$). It was found that PBC was a significant predictor of BMI ($\beta = -0.12$, $p=0.01$, 95% CI = -0.54 - -0.07) as was reward sensitivity ($\beta = 0.15$ $p=0.04$, 95% CI = 0.04 – 0.32). PBC explained 3% of the variance of BMI whilst reward sensitivity explained an additional 2%. See results in Table 5 below.

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>adj$R^2$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBC</td>
<td>.246</td>
<td>.05</td>
<td>-.19</td>
<td>-2.58</td>
<td>.011**</td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>.15</td>
<td>2.02</td>
<td>.004**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: **$p$ is significant at the 0.01 level

5.2.4 Differences in BMI, split into three groups: normal weight, over weight and obese.

5.2.4.1 Hypothesis 8: There will be a significant difference in levels of impulsivity and reward sensitivity for those in the normal weight group compared to those in the overweight group and obese group.

A one-way analysis of variance showed that there was no statistically significant difference between the three groups levels of impulsivity ($F (2, 171) = .492$, $p > 0.05$) and reward sensitivity ($F (2, 171) = 1.701$, $p > 0.05$).

Therefore the null can therefore be accepted. See table 6 for results.
As PBC was found to be a significant predictor of BMI a one-way analysis of variance was run to identify any differences in PBC between the three BMI groups, a statistical significant difference was found (F (2, 171) = 4.399, p = 0.01). Post hoc analysis confirmed that the differences were significant in nature between the normal BMI group and obese BMI group in scores of PBC (Mean difference = 2.23, p =0.01, CI (95%) .44 – 4.02). There were no significant differences in PBC between the normal and overweight group and between the overweight and obese group. See Table 6 and Figure 4.

Table 6: An ANOVA table displaying the differences in impulsivity, reward sensitivity and PBC between three BMI groups.

<table>
<thead>
<tr>
<th></th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impulsivity</strong></td>
<td>Normal</td>
<td>60.29</td>
<td>9.92</td>
<td>.49</td>
<td>171</td>
<td>.61</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>61.57</td>
<td>9.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>62.09</td>
<td>11.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reward Sensitivity</strong></td>
<td>Normal</td>
<td>39.28</td>
<td>5.11</td>
<td>1.70</td>
<td>171</td>
<td>.186</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>40.03</td>
<td>6.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>41.32</td>
<td>5.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PBC</strong></td>
<td>Normal</td>
<td>15.85</td>
<td>3.68</td>
<td>4.40</td>
<td>171</td>
<td>.014*</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>15.36</td>
<td>3.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>13.29</td>
<td>4.31</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *p is significant at the 0.05 level
5.2.5 Age Differences

5.2.5.1 Hypothesis 9: There will be a significant difference in levels of impulsivity and reward sensitivity for those in the under 35 group compared to over 35 group

Participants under 35 (M = 61.88, SD = 10.82) were found to have slightly higher levels of impulsivity than participants over 35 (M =60.66, SD =9.43). However an independent samples t-test found that there was not a statistically significant difference between impulsivity levels of those aged under and over 35 (t (176) = 0.78, p = 0.44).

Participants under 35 (M = 40.41, SD = 4.64) were found to have slightly higher levels of reward sensitivity than participants over 35 (M=39.67, SD =5.97). However an independent samples t-test found that there was not a statistically significant difference between reward sensitivity levels of those aged under and over
35 (t (144) = 0.90, p = 0.37). Therefore the null can be accepted. See Table 7 for results.

Table 7: An independent Samples T-test table displaying differences between those under 35 and those over 35 for impulsivity and reward sensitivity

<table>
<thead>
<tr>
<th></th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impulsivity</strong></td>
<td>Under 35</td>
<td>61.88</td>
<td>10.82</td>
<td>.78</td>
<td>176</td>
<td>.44</td>
</tr>
<tr>
<td></td>
<td>Over 35</td>
<td>60.66</td>
<td>9.43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reward Sensitivity</strong></td>
<td>Under 35</td>
<td>40.41</td>
<td>4.63</td>
<td>.90</td>
<td>144</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>Over 35</td>
<td>39.67</td>
<td>5.97</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Discussion

The TPB is a proven model for determining, predicting and promoting dietary intentions and behaviour, therefore given the recent rise in obesity and significant rise in unhealthy eating the aim of this research was to explore the efficacy of this model in predicting intentions to reduce snacking. As unhealthy snacks are often eaten on impulse the current study examined the variables impulsivity and reward sensitivity collectively within a TPB framework to determine if they explicate some of the unaccounted variance between intentions and behaviour. Finally the relationship between the TPB constructs, reward sensitivity, impulsivity, snacking and BMI were examined and age and BMI differences explored.

6.1 Summary of Findings

The results support the utility of the TPB model in predicting intentions to diminish dietary behaviours, it was found that attitudes towards unhealthy snacking and PBC significantly predicted intentions to reduce snacking, collectively accounting for 22% of the variance of intentions. However the utility of social norms in predicting intentions was not supported. In contrast no significant relationship was found between impulsivity and intentions, however a multiple regression analyses confirmed that reward sensitivity significantly predicted intentions accounting for 2% of the variance.
In relation to snacking no significant relationship was found with intentions, attitudes, impulsivity and reward sensitivity. Therefore the fourth hypothesis was not supported however there was partial support for the third, as a significant relationship was found between PBC and snacking.

Hypotheses 5-7 examined the predictors of BMI, supporting the relationship between reward sensitivity and BMI and between PBC and BMI. However, the remaining predictor variables: attitudes, intentions and impulsivity were not significant.

There were no significant differences in impulsivity and reward sensitivity between participants under 35 and over 35 years and also between those in the normal, overweight and obese group. Therefore null was accepted for the eighth and ninth hypotheses.

The following section discusses the results of each hypothesis presented in section 5 in greater detail.

6.2 Predictors of Intentions

6.2.1 Hypotheses 1 & 2

The finding that attitudes and PBC were significant predictors of intentions to reduce snacking was consistent with previous literature (Armitage & Connor, 2001, Ajzen, 1991, McEachan et al., 2011). Both accounted for 22% of the variance in intentions
to reduce snacking, in contrast this finding was significantly lower than previous findings by Azjen and Sheikh, (2013) who reported a 38% variance for intentions to avoid fast food. Nonetheless this result strengthens the efficacy of the TPB model in predicting dietary abstinence behaviours. Also in line with previous research social norms were the weakest component of this model and did not significantly correlate with intentions. As identified by McEachan et al. (2011) previous studies that used multiple-item scales to measure social norms yielded stronger relationships with intentions. For this reason a two item scale was used in this study but was not consistent with previous findings. Past research has asserted that social norms are particularly significant predictors of intentions for younger aged samples who give greater prominence to the influence of their peers and significant others beliefs about a particular behaviour (Ajzen & Sheikh; McEachan et al., 2011). This may explicate the non-significance between social norms and intentions as the sample in this study was predominantly older, with only (4%) aged between 18-24 years and the majority (44%) aged between 35-44.

Hypothesis two predicted there would be a negative relationship between impulsivity, reward sensitivity and intentions to reduce snacking. Whilst the results did support a negative relationship between impulsivity and intentions the result was not significant. Interestingly these results were consistent with the findings by Churchill, Jessop and Sparks (2008) indicating that impulsivity does not predict intentions to reduce snacking. The relationship between reward sensitivity and intentions was also negative but insignificant. Consequently results of the multiple regression analyses yielded that reward sensitivity was a significant predictor of
intentions adding an additional 2% to the overall model, in total attitudes, PBC and reward sensitivity accounted for 24% of the variance of intentions. This suggests that reward sensitivity may be a potential addition to the TPB model.

6.3 Predictors of Snacking

6.3.1 Hypotheses 3 & 4

It was expected that there would be a significant positive relationship between impulsivity and past snacking and between reward sensitivity and past snacking, indicating that higher levels of impulsivity and reward sensitivity predict higher levels of snacking regardless of intentions to reduce snacking. Previous research has reported that impulsivity and reward sensitivity are positively associated with high calorie food intake (Davenport et. al., 2008; Guerrieri et. al., 2007a; Nasser et al., 2004). Churchill, Jessop and Sparks (2008) proposed that impulsivity was a significant predictor of snacking accounting for 10% of the variance in snacking over and above the TPB constructs. Surprisingly the fourth hypothesis found no significant relationship between impulsivity and past snacking and between reward sensitivity and past snacking. The potential reason for this finding may be due to methodological differences between this study and previous studies, for example the study by Churchill, Jessop and Sparks (2008) consisted mainly of younger adults in comparison to this study. Ezinga et al. (2008) reported that younger adults have higher levels of impulsivity due to their developmental stage. This is an important factor as it may explicate why participants in this study had moderate levels of impulsivity (M=61.06) and why the findings were insignificant. In addition the
snacking measure used in this study examined daily and weekly snacking in order to factor in items that are not eaten daily but may be eaten on a weekly basis (Payne et al., 2004). In contrast the reported findings by Churchill, Jessop and Sparks (2008) were based solely on daily snacking on a 7 point Likert-scale from 1 (no snacking) to 7 (4 or more times a day). Furthermore participants in this study reported moderate levels of snacking (M=13.50) which may have impacted results.

Although this study was not prospective and did not measure future snacking as a consequence of intentions, it was hypothesised (Hyp 3) that attitudes, PBC and intentions would negatively correlate with past snacking as previous findings have indicated that past behaviour is a powerful predictor of future behaviour, particularly when the behaviour is habitual and compatible with intentions (Azjen, 2002; Verhoeven et al., 2012, Verplanken, 2006). PBC was the only variable to significantly correlate with past snacking, signifying that the more perceived control participants felt they had over their ability to reduce snacking the less their reported snacking was. This is consistent with previous research where it was identified that PBC was particularly salient in predicting behaviours that encompass problematic violational control such as snacking (Armitage & Connor, 2001; Mullan & Xavier, 2013).

Inconsistently, attitudes and intentions to reduce snacking were not significantly correlated with reported snacking. Past research literature has supported the importance of attitudes in predicting intentions and subsequent behaviour and also of intentions in predicting behaviour (Churchill, Jessop & Sparks, 2008;
Churchill & Jessop, 2010; Conner, Norman & Bell, 2002). The only rationale for this inconsistent finding is that the measure of snacking was one of past snacking and not future snacking, diminishing the significance. However this finding does not diminish the efficacy of the TPB in predicting intentions and behaviour, as although attitudes did not significantly correlate with past snacking they did significantly predict intentions. In addition the research literature asserts that intentions are powerful antecedents of future behaviour (Armitage & Connor, 2001 & Mc Eachan et al., 2011), indicating that a measure of future snacking would potentially produce significant findings.

6.4 Predictors of BMI

6.4.1 Hypotheses 5, 6, 7 & 8

The fifth hypothesis found there was a positive relationship between impulsivity, reward sensitivity and BMI, however only the relationship between reward sensitivity and BMI was significant. As discussed previously the moderate levels of impulsivity may explicate the non-significant finding in hypotheses five and eight. Although there was a weak relationship between reward sensitivity and BMI, a multiple regression found that it accounted for 2% of the variance in BMI, therefore supporting the findings from Davis et al. (2007). This suggests that individuals with higher sensitivity to rewards may have an increased vulnerability to elevated BMI levels. The eight hypothesis was not consistent with research findings by Davis and Fox (2008) who suggested an inverse relationship between reward sensitivity and BMI levels for those who were obese. This study found no significant difference in
levels of reward sensitivity between those who were in the normal, overweight and obese groups. This also contradicts research by Guerrieri, et al., (2008a) who suggested that individuals who are obese have lower sensitivity to rewards due to over-stimulation of the BAS system.

The sixth hypothesis found no significant relationship between snacking and BMI, this may be explained by the moderate snacking levels reported. This finding supports research by Viskaal\(^{\text{van Dongen, Kok and de Graaf (2011)}}\) who reported that snack consumption over eight weeks did not significantly influence body weight. A possible extraneous factor that may have influenced both studies is compensatory behaviour where individuals compensate for snacking through reducing additional calorie intake or engage in additional physical exercise to expel excess calories consumed. A measure of compensatory behaviour would be a useful addition to future research.

Hypothesis seven anticipated there would be negative relationship between PBC, attitudes, intentions and BMI. There was partial support for this hypothesis as PBC was significantly negatively associated with BMI, accounting for 3% of the variance in BMI. This was consistent with the research literature that has reported a lack of self-control as an added vulnerability to obesity (Weller, et al., 2008). Unexpectedly attitudes were not significantly correlated with BMI, this finding is inconsistent with previous research by Hoffmann and Friese (2008) who found that positive attitudes towards unhealthy foods were important predictors of BMI. A
possible rationale for this finding was that this study measured attitudes towards reducing snacking and not participants overall attitudes towards unhealthy foods.

6.5 Differences in Age

6.5.1 Hypothesis 9

As discussed previously, research has indicated that younger age groups have higher levels of impulsivity than older age groups (Ezinga et. al., 2008; Stautz & Cooper, n.d.). This research did not support this finding possibly explained by overall moderate levels of impulsivity and very low numbers of respondents aged between 18-24 years. Similarly, there was no significant differences in reward sensitivity between the two age groups. Future research is necessary on a more diverse sample that includes a mix of age groups so that comparisons can be made between younger and older adults.

6.6 Additional Findings

Although the aim of this study was not to examine sex differences in any of the predictor or criterion variables, descriptive statistics identified a number of interesting significant findings. In this sample men had significantly higher snacking levels, lower PBC and higher BMI levels than women. In total 67% of men were in the overweight and obese category compared to only 46% of women. Future research is required to examine if there are any differences between men and women in energy expenditure and calorie intake to identify if these significantly impact BMI.
One of the main strengths of this study is that it addresses the scarcity of research literature that has examined reward sensitivity and impulsivity within the context of the TPB. The findings build upon and provide strong empirical support for the utility of the TPB model in predicating and diminishing unhealthy eating. Although impulsivity and reward sensitivity had no significant impact on intentions to reduce snacking and past snacking, these findings deepen our understanding of these variables suggesting that both may not be as pertinent a factor in adult snackings as they are younger adult snacking (Churchill, Jessop & Sparks, 2008; Churchill & Jessop, 2010). These results also emphasised the importance of PBC in reducing snacking as a strong belief in one’s ability to control snacking indicates higher intentions to reduce snacking, lower snacking levels and lower BMI levels.

Despite the strengths of this study there are a number of limitations that need to be acknowledged. Although efforts were made to include a more heterogeneous sample, the majority of the participants (44%) were in the age bracket 34-44 years with very few participants in the youngest (4%) and oldest age bracket (5%). Therefore it was not possible to compare impulsivity and reward sensitivity levels for those aged 18-24 against an older age bracket. In addition the sample used may not be truly representative of the general population as it included participants who were employed, active and who had access to the internet, therefore this may limit generalisability of findings. Also as this study design was correlational and cross-sectional, the results reflect correlations and predictions and cannot infer any
causality. Albeit the self-report measures used in this study were reliable and well validated from previous research, they are open to biases and social desirability. They rely on participants to answer questions honestly and not to respond to what is perceived as socially acceptable or desirable.

Overall participants had low levels of reported unhealthy snacking, an extraneous variable affecting this could be a lower preference for these type of foods. Research indicates that a preference for snack foods is positively associated with BMI (Nederkoorn et al., 2010). Although this study measured participants overall positive or negative evaluation towards reducing snacking this cannot not be inferred as having a preference or not for these type of foods. Therefore it would be conducive to conduct future research on snacking, firstly identifying if participants have a preference for unhealthy snacks. Furthermore a more objective and accurate measure of snacking is required in future research, it would be constructive to examine the level of association between intentions and behaviour through a longitudinal study measuring snacking through the use of a daily food diary. Also by incorporating a measure of daily activity levels and calorie intake it would counteract the extraneous variable of compensatory behaviour. Future research is required to examine if impulsivity and reward sensitivity are predictors of snacking for younger adults and older adults who snack as both groups were misrepresented in this study.
6.8 Application

Practical implications can be drawn from this reported study. Worryingly, 34% of participants in this sample were overweight and 19% obese which highlights the necessity for research in this area. This study provided empirical support for the TPB as an intervention to reduce unhealthy snacking. In particular it highlighted the need to design individual interventions that target attitudes and PBC, both of which are imperative in fostering positive intentions to reduce unhealthy eating and thus behaviour. Behavioural and nutritional strategies should acknowledge and screen for individual differences in reward thresholds and perceived ability to resist and reduce unhealthy snacking as both may be added vulnerabilities for snacking and higher BMI levels.

6.9 Conclusion

This study was undertaken because of the current rise in obesity and high prevalence of unhealthy snacking. It has provided empirical support for utility of the TPB model in predicting dietary abstinence behaviours in a general population sample. Attitudes towards unhealthy snacking and PBC significantly predicted intentions to reduce snacking, collectively accounting for 22% of the variance in intentions. Reward sensitivity was responsible for an additional 2% of the variance in intentions. Impulsivity had no significant association with intentions, past snacking or BMI levels, one possible explanation for this finding was the moderate levels reported and predominantly older sample used in this study. Reward sensitivity had no significant
impact on past snacking, however it was positively associated with BMI, accounting for 2% of the variance in BMI. Furthermore and inconsistent with previous research, there were no significant differences found in impulsivity and reward sensitivity between the two age groups and three BMI levels. Conversely an important finding in this study was the significant association between PBC and attitudes, past snacking and BMI levels. Future interventions should therefore focus on enhancing individuals belief in their ability to control and diminish unhealthy dietary behaviour.
7. References


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yourself or just eat what you like? Weight gain over a year is predicted by an 
interactive effect of response inhibition and implicit preference for snack 

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T. T., & Pakkala, H. H. (2006). Snacks as an element of energy intake and 


Dear participant

My name is Sabrina Sheridan and I am currently conducting research exploring your thoughts and feelings about unhealthy snacks. This research is being conducted as part of my studies for a Higher Diploma in Psychology in Dublin Business School and will be submitted for examination.

You are invited to take part in this study by completing the attached survey. The survey should take approximately 5-7 minutes in total to complete. Participation is completely voluntary and so you are not obliged to take part. It is also anonymous so that responses can not be attributed to any one participant. To ensure this, responses are not allocated a code, however if you wish to withdraw your response at a later date please write the date and time you completed the survey on the first page, take note of it and contact me at the email address below.

All information collected will be kept strictly confidential; the data will be transferred to and securely stored on a password protected computer. While the survey asks some questions that might cause some slight negative feelings, it has been used widely in research. If any of the questions do raise any difficult feelings for you, contact information for support services are listed below.

Should you require any further information about the research please contact me at: 1681552@mydbs.ie or my supervisor, Dr. K atriona O’Sullivan at: or kat riona.osullivan@dbs.ie
Thank you for taking the time to complete this survey.

For any concerns please contact:
Samaritans who run a helpline 24 hours a day, 365 days a year. Phone : 1850 60 90 90. http://www.samaritans.org/your-community/samaritans-work-ireland
Bodywhys (for eating behaviour concerns) who run a helpline for 2 hours per day, times are listed on the website: http://www.bodywhys.ie Phone: 1890 200 444
Please answer all questions honestly as are no right or wrong answers. Please tick (✓)

Gender: Male ____ or Female ___

Age Bracket: 18–24___ 25-34 ___ 35-44 ___

45-54 ___ 55-64___ 65 or older ___

If you do not know your exact height or weight please estimate:

Height :  _____ Inches or Cms  _____

Weight:  _____ Lbs or Kgs  _____

Are you currently on a weight reducing diet? (✓) Yes___ or No___

Read each statement carefully and tick the appropriate number of times you have consumed the following items in the last week. Please choose 1 response per line.

<table>
<thead>
<tr>
<th></th>
<th>not at all</th>
<th>once a week</th>
<th>2-4 times a week</th>
<th>5-6 times a week</th>
<th>once a day</th>
<th>2-3 times per day</th>
<th>4-5 times a day</th>
<th>6+ times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biscuits</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Chocolate / Bars</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Sweets</td>
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<tr>
<td>Cakes / Desserts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pastries / Scones</td>
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<td></td>
</tr>
<tr>
<td>Icecream</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salted / Roasted Nuts</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Unhealthy snacks are foods that are high in calories, saturated fat, sugar and salt and low in fiber and nutrients and are not essential for good health. The Department of Health’s Food Pyramid Guide recommends avoiding these types of foods, to do this a starting point would be to limit consumption to no more than 1 serving per day and ideally not everyday.

The following are statements about unhealthy snacks. Please read each statement carefully and circle the appropriate number based on the strength of your feeling to each statement.

1. For me to eat fewer unhealthy snacks would be:

   Bad: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Good

   Harmful: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Beneficial

   Unpleasant: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Pleasant

   Unenjoyable: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Enjoyable

   Worthless: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Worthwhile

2. Most people who are important to me would approve of me eating fewer unhealthy snacks:

   Strongly Agree: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Strongly Disagree

3. Most people who are important to me would support my decision to try to eat fewer unhealthy snacks:

   Strongly Agree: __1__:__ 2__:__3__:__4__ :__5__:__6__:__7__ :  Strongly Disagree
4. I have complete control over whether I can eat fewer unhealthy snacks:

*Strongly Disagree:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *Strongly Agree*

5. It is likely if I try I will manage to eat fewer unhealthy snacks:

*Strongly Disagree:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *Strongly Agree*

6. For me to try to eat fewer unhealthy snacks would be:

*Extremely Difficult:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *Extremely Easy*

7. I intend to eat fewer unhealthy snacks on a regular basis:

*Unlikely:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *Likely*

8. I want to try to eat fewer unhealthy snacks on a regular basis:

*Unlikely:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *Likely*

9. I am determined to eat fewer unhealthy snacks on a regular basis:

*False:* __1__: __2__: __3__: __4__: __5__: __6__: __7__: *True*
Directions: People differ in the ways they act and think in different situations. This is a questionnaire that measures the ways you think and act. Read each statement and put a tick (✓) in the circle on the right hand side of this page that applies most to you. Do not spend too much time on each question. Choose only one response to each statement and answer quickly and honestly.

<table>
<thead>
<tr>
<th></th>
<th>Rarely/ Never</th>
<th>Occasionally</th>
<th>Often</th>
<th>Almost/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I plan tasks carefully.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2</td>
<td>I do things without thinking.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3</td>
<td>I make-up my mind quickly.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4</td>
<td>I am happy-go-lucky.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5</td>
<td>I don’t “pay attention.”</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6</td>
<td>I have “racing” thoughts.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7</td>
<td>I plan trips well ahead of time.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8</td>
<td>I am self controlled.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9</td>
<td>I concentrate easily.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>10</td>
<td>I save regularly.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11</td>
<td>I “squirm” at plays or lectures.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12</td>
<td>I am a careful thinker.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>13</td>
<td>I plan for job security.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>14</td>
<td>I say things without thinking.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>15</td>
<td>I like to think about complex problems.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>16</td>
<td>I change jobs.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>17</td>
<td>I act “on impulse.”</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>18</td>
<td>I get easily bored when solving thought problems.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rarely/Never</td>
<td>Occasionally</td>
<td>Often</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>--------------</td>
<td>--------------</td>
<td>-------</td>
</tr>
<tr>
<td>19</td>
<td>I act on the spur of the moment.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>20</td>
<td>I am a steady thinker.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>21</td>
<td>I change residences.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>22</td>
<td>I buy things on impulse.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>23</td>
<td>I can only think about one thing at a time.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>24</td>
<td>I change hobbies.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>25</td>
<td>I spend or charge more than I earn.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>26</td>
<td>I often have extraneous thoughts when thinking.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>27</td>
<td>I am more interested in the present than the future.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>28</td>
<td>I am restless at the theatre or lectures.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>29</td>
<td>I like puzzles.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>30</td>
<td>I am future oriented.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
The following are statements you may either agree with or disagree with. On each line indicate how much you agree or disagree with what the item says by putting a tick (√) in the circle. Choose only one response to each statement and answer quickly and honestly.

Choose from the following four response options: 1 = very true for me, 2 = somewhat true for me, 3 = somewhat false for me, 4 = very false for me.

<table>
<thead>
<tr>
<th></th>
<th>Very True for me</th>
<th>Somewhat true for me</th>
<th>Somewhat false for me</th>
<th>Very false for me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 When I get something I want, I feel excited and energized.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2 When I'm doing well at something, I love to keep at it.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3 When good things happen to me, it affects me strongly.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4 It would excite me to win a contest.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5 When I see an opportunity for something I like, I get excited right away.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6 When I want something, I usually go all-out to get it.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7 I go out of my way to get things I want.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8 If I see a chance to get something I want, I move on it right away.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Very True for me</td>
<td>Somewhat true for me</td>
<td>Somewhat false for me</td>
<td>Very false for me</td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>9</td>
<td>When I go after something I use a &quot;no holds barred&quot; approach.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I will often do things for no other reason than that they might be fun.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11</td>
<td>I crave excitement and new sensations.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12</td>
<td>I'm always willing to try something new if I think it will be fun.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>13</td>
<td>I often act on the spur of the moment.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Thank you very much for taking the time to complete this survey on factors that influence snacking behaviour.