RESEARCH ARTICLE

The effect of autonomous and controlled motives on eating dysregulation: Implications for individuals classified as underweight, overweight or obese

L'effet des motivations autonomes et contrôlée sur l'alimentation dysrégulation: Implications pour les personnes présentant un déficit pondéral, un surpoids ou une obésité

Jemma Harris[1] & Helen Standage[2]

[1] *University of East London, London, UK.* [2]*University of Essex, Colchester, UK.*

Address correspondence to:
Dr Jemma Harris
University of East London
Stratford Campus
Water Lane
London
E15 4LZ
UK

The effect of autonomous and controlled motives on eating dysregulation: Implications for individuals classified as underweight, overweight or obese

Abstract

Introduction: Controlled and autonomous motivational factors from self-determination theory have previously been highlighted as key factors in eating regulation. The present study examined controlled motives as an overarching motivational factor in eating dysregulation and examined its effects on dieting behaviour for those who are underweight, overweight or obese. **Objective:** To examine whether the influence of controlled motives on dieting behaviour would be moderated by body mass index (BMI). Specifically, it was hypothesised that controlled motives would be associated with high levels of dieting behaviour in underweight individuals and low levels of dieting behaviour in individuals classified as overweight or obese. **Method:** 137 participants completed the measures of height, weight, and motivation and intentions towards watching their diet. They subsequently completed a measure of dieting behaviour two weeks later. **Results:** Moderated regression and simple slopes analyses provided support for the hypothesised effects at underweight, overweight, and obese range BMIs. **Conclusion:** The effect of controlled motives on dieting behaviour is dependent upon BMI and therefore varies across underweight, overweight, and obese individuals. The implications of controlled motives and external pressures to watch one's diet are discussed.

Keywords: controlled motives; self-determination; eating regulation; eating dysregulation; dieting

L'effet des motivations autonomes et contrôlée sur l'alimentation dysrégulation: Implications pour les personnes présentant un déficit pondéral, un surpoids ou une obésité

Abrégé

Introduction: Les facteurs de motivation contrôlée et autonomes issus de la théorie de l'autodétermination ont été précédemment mis en évidence comme des paramètres essentiels de la régulation de l'alimentation. La présente étude s'est intéressée aux motivations contrôlée en tant que facteur de motivation fondamental pour le dérèglement de l'alimentation ainsi qu'à ses effets sur le comportement alimentaire des personnes présentant un déficit pondéral, un surpoids ou une obésité. **Objectif:** Déterminer si l'influence des motivations contrôlée sur le comportement alimentaire serait modérée par l'IMC. Plus spécifiquement, on a émis l'hypothèse selon laquelle les motivations contrôlée seraient associées à des niveaux élevés de comportement alimentaire chez les personnes présentant un déficit pondéral et, à l'inverse, à des niveaux peu élevés de comportement alimentaire chez les personnes en surpoids ou obèses. **Méthode:** 137 participants ont mesuré leur taille et leur poids, ainsi que leur motivation et leur volonté à surveiller leur régime alimentaire. Ils ont réalisé une évaluation de leur comportement alimentaire deux semaines plus tard. **Résultats:** Les analyses de régression avec variables modératrices et des pentes simples justifient l'hypothèse de l'effet de l'IMC sur les personnes présentant un déficit pondéral, un surpoids ou une obésité. **Conclusion:** L'effet des motivations contrôlée sur le comportement alimentaire dépend de l'IMC et varie par conséquent selon que les personnes présentent un déficit pondéral, un surpoids ou une obésité. Les implications des motivations contrôlée et des pressions externes sur la surveillance du régime sont abordées.

Mots-clés: motivations contrôlée; autodétermination ; régulation de l'alimentation ; dérèglement de l'alimentation ; régime alimentaire

The effect of autonomous and controlled motives on eating dysregulation: Implications for individuals classified as underweight, overweight or obese

Over the past few decades a paradox has emerged in which we have observed simultaneous increases in overly restricted eating and increases in overweight and obesity (Ogden, 2010; Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012). In 2007 almost 25% of adults in England were classified as obese (Craig & Shelton, 2008) and 6.4% of the general population of England, and, more specifically, 20.3% of women aged 16-24, screened positive for an eating disorder (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009). In light of the physical and psychological problems associated with such problematic eating regulation, there has been increased impetus to develop a deeper understanding of factors that influence eating regulation and to develop public health initiatives to prevent and reduce eating dysregulation (Verstuyf et al., 2012). Consequently, there is a clear need to investigate psychological factors that are differentially associated with overweight, obesity, and overly restricted eating.

In line with this observed paradox, research in the area of eating regulation has developed in a somewhat fragmented manner and some approaches have received more attention than others with regards to particular groups or forms of eating dysregulation (Verstuyf et al., 2012). Verstuyf et al. highlighted the need to develop a generalised framework for the study of eating regulation. They further emphasised the importance of identifying global factors and particularly of identifying motivational processes that would impact upon various forms of eating behaviour. Indeed, a number of studies have provided support for the influence of the motivational processes presented within self-determination theory (Deci & Ryan, 1985, 2002) on dieting behaviour (e.g., Edmunds, Ntoumanis, & Duda, 2007; Hagger, Chatzisarantis, & Harris, 2006b). However, research has found that the proposed optimal and adaptive effects of self-determination theory constructs (See Deci & Ryan, 2002) on dieting behaviour are not always evident and can sometimes run counter to prediction (Hagger, Chatzisarantis, & Harris, 2006a). The current study expands upon this research by investigating whether the direction of the effects of self-determination theory constructs on dieting behaviour are dependent upon body mass index (BMI). Specifically, the

study examined whether the relationships between controlled motives and dieting behaviour are different for individuals who are underweight, overweight, or obese.

Self-determination theory and motivation

Self-determination theory is a humanistic approach to motivation in which the satisfaction of basic psychological needs and autonomous motivational styles are viewed as necessary for optimal, healthy functioning (Deci & Ryan, 1985, 2002; Ryan, 1995; Vallerand, 1997). According to this theory, motivation lies upon a continuum of self-determination from intrinsic motives, where individuals are motivated by feelings such as enjoyment and interest, to external motives, where individuals are motivated by feelings of external control such as monetary reward (Deci & Ryan, 2002). According to the self-determination continuum, next to intrinsic motivation lie several subtypes of extrinsic motivation, the most autonomous of which is *integrated regulation.* A behaviour governed by integrated regulation has become assimilated and is consistent with one's goals, values, and aspirations. *Identified regulation* is slightly less self-determined and involves performing a behaviour due to it being deemed personally important. *Introjected regulation* is another form of extrinsic motivation that is partially internalised and involves performing a behaviour in order to avoid feelings such as guilt or shame. *External regulation* is the least autonomous and most controlled form of extrinsic motivation. It is a prototypical form of extrinsic motivation whereby an individual acts due to external contingencies such as social pressures, punishment, and incentives. At the extreme end of the continuum is a*motivation* which is considered a state which lacks intentionality and motivation (Ryan & Deci, 2000b). External and introjected motives are considered to be controlled forms of motivation, whereas identified, integrated and intrinsic motives are considered autonomous forms of motivation.

There is a wealth of research documenting differences in the quality of consequences that result from controlled and autonomous forms of motivation (e.g., Vallerand, 1997; Deci & Ryan, 2002). Such research generally demonstrates that autonomous forms of motivation lead to more positive outcomes and controlled forms of motivation lead to more negative outcomes. For example, there is a general consensus that people who engage in behaviours due to autonomous motives are more likely to continue in the absence of any external control (Deci & Ryan, 2002). Studies have also demonstrated that autonomous and controlled forms

of motivation result in different consequences with regards to well-being, effort, affect, and persistence (Benware & Deci, 1984; Deci, 1971; Deci & Flaste, 1995; Deci & Ryan, 1985; Grolnick & Ryan, 1987; Nix, Ryan, Manly, & Deci, 1999; Vansteenkiste, Niemiec, & Soenens, 2010; Weinstein, Przybylski, & Ryan, 2012).

Autonomous and controlled motives and dieting behaviour

Given the differences in the quality of outcomes associated with controlled and autonomous forms of motivation, the investigation of these motivational dynamics are important within the context of many health behaviours. It is felt that this is a particularly pertinent area of research for eating regulation as individuals are subjected to numerous external pressures encouraging them to restrict what they eat in order to possess a more lean, sleek or muscular body (Dittmar, 2008). Individuals may therefore perceive these external pressures to watch their diet and, as a result, may foster controlled motivation towards this behaviour. According to self-determination theory, if an individual holds controlled motives towards watching their diet, rather than more internalised and autonomous reasons, they will experience suboptimal or maladaptive consequences.

Research examining the effects of controlled motives on eating dysregulation has generally formed two separate strands. The first has examined the negative effect of controlled motives on healthy eating and weight-management (e.g., Edmunds et al., 2007; Hagger, Chatzisarantis, & Harris, 2006b; Williams, Grow, Freedman, Ryan, & Deci, 1996). The second has investigated the relationship between controlled motives and dysfunctional eating behaviours, such as fasting, skipping meals, and binging on large amounts of food (e.g., Pelletier & Dion, 2007, Strauss & Ryan, 1987). Overall, such research has demonstrated that controlled motives are associated with decreased levels of healthy eating and healthy weight control and increased levels of maladaptive and unhealthy eating behavior.

In a study simultaneously examining both healthy and dysfunctional eating behaviours, Pelletier, Dion, Slovinec-D'Angelo, and Reid (2004) found that whilst autonomous regulation was positively associated with healthy eating behaviour, controlled regulation was negatively associated with healthy eating behaviour and also positively associated with dysfunctional eating behaviour. Furthermore, healthy eating behaviour was

found to be associated with increased psychological well-being whilst dysfunctional eating behaviour was found to be associated with decreased psychological well-being. This line of research was further extended by Pelletier and Dion (2007) who examined the impact of controlled and autonomous motives on dysfunctional eating behaviours and healthy eating behaviours within an established sociocultural model of eating pathology (Stice, 2001). In line with their previous work, Pelletier and Dion found that controlled regulation was positively associated with dysfunctional eating and negatively associated with healthy eating, and that the reverse was evident for autonomous regulation.

Other studies investigating controlled and autonomous motives with regards to overall tendencies to watch one's diet have employed a composite indicator of self-determined motivation to investigate an integrated chain of influence from self-determination theory constructs through to decision-making as reflected within the theory of planned behaviour (TPB; Ajzen, 1991), and through to dieting behaviour. Hagger et al. (2006b) demonstrated that more controlled motivation was associated with negative effects on the constructs put forward within the TPB (Ajzen, 1991), and, ultimately, with decreased levels of dieting behaviour. Hagger et al. (2006a) examined an extended version of this motivational sequence from basic psychological need satisfaction to motivation, the TPB variables, and through to behaviour within both exercise and dieting contexts. Results demonstrated that basic psychological need satisfaction exerted significant effects on self-determined motivation and on constructs within the TPB across both contexts. However, results also demonstrated that basic psychological need satisfaction had a direct, negative effect on behaviour within the dieting context. Contrary to study hypotheses, this effect suggested that more satisfied needs lead some individuals to watch their diet to a lesser degree, independent of their motivation and decision-making.

The negative relationship between basic psychological need satisfaction and dieting behaviour reported by Hagger et al. (2006a) seems somewhat inconsistent with the literature describing the optimal effects of some constructs from self-determination theory (e.g., Deci & Ryan, 2002). If need satisfaction results in optimal healthy functioning, then it should not be associated with reduced tendencies to watch ones diet given that this behaviour could be seen as optimal for a large proportion of the population. However, whilst restricting one's

diet may be beneficial if an individual is overweight, the same behaviour may not be so beneficial if an individual is underweight. It is therefore likely that the effect of self-determination theory constructs on dieting behaviour may be moderated by an index of weight management, namely, BMI. Therefore the purpose of the present study is to investigate possible individual differences (specifically high and low BMI) in the impact of controlled motivational processes on eating regulation.

According to self-determination theory, controlled motives predict maladaptive dietary behaviour (e.g., Pelletier & Dion, 2007) and therefore a logical extension of this prediction is that the direction of the effect of controlled motivation on dieting behaviour will be dependent upon what might be maladaptive for that particular individual. Therefore, one might expect that controlled motives would be associated with higher levels of dieting in underweight individuals and lower levels of dieting in overweight or obese individuals. This theoretical prediction is both intuitive and is substantiated by some previous empirical findings. Firstly, the psychological and behavioural impact of external pressures to watch one's diet or to obtain the ideal body have been demonstrated to be moderated by BMI (e.g., Henderson-King & Henderson-King, 1997; Smeesters et al., 2010). Smeesters et al. (2010) reported that media images of the body have different effects on social comparison, self-evaluative processes, and behaviour depending upon an individual's BMI. Secondly, Verstuyf et al. (2012) suggest that psychological need frustration (e.g., feeling less autonomous) can lead to rigid behaviours as well as to engagement in compensatory behaviours in the context of dieting. This link between controlled motives and rigid weight-loss behaviours has also been demonstrated by Strong and Huon (1999). .

It is therefore clear that the influence of controlled motives on dieting behaviour is not as simplistic as has previously been documented and that a number of factors could potentially influence this process. As yet, these processes are not fully understood and no studies to date have investigated potential moderators of this relationship. As BMI has been found to influence the effect of external pressures regarding dieting and the ideal body on psychological and behavioural outcomes in the dieting context (e.g., Henderson-King & Henderson-King, 1997; Smeesters et al., 2010) this individual difference factor presents as potential moderator of the effects of controlled motives on dieting behaviour. The present

study examines whether the effect of controlled motives upon dieting behaviour is dependent upon an individual's BMI.

Study Hypotheses

It was hypothesised that the effect of controlled motives on dieting behaviour would be moderated by BMI and would thus differ across underweight and overweight or obese individuals. In line with previous links to eating dysregulation, it was expected that controlled motives would be predictive of high levels of dieting behaviour (e.g., forbidding snacks, reducing portion sizes, eating low fat or low calorie foods) in underweight individuals and low levels of dieting behaviour in overweight and obese individuals. It was expected that no significant relationship would emerge between controlled motives and dieting behaviour for individuals with BMIs within the normal range. Although moderation effects were also examined with regards to autonomous motivation, it was not expected that the effect of autonomous motives would be moderated by BMI. This is based upon previous research linking autonomous forms of regulation to healthy eating behaviours rather than restrictive dieting behaviours (e.g. Pelletier & Dion, 2007). Self-determination theory asserts that autonomous motives lead to healthy and adaptive consequences across both general and diet specific contexts (e.g., Deci & Ryan, 2002; Pelletier & Dion, 2007), therefore it was not expected that the effect of this construct, and therefore the adaptive consequence, should differ according to BMI. Intentions were controlled for within the analyses as this predictor can be considered to reflect the quantity of motivation and the focus of the current study was on the quality of motivation towards dieting behaviour reflected by controlled and autonomous forms of motivation, independent of quantity. This allowed the investigation of the impact of controlled motives on dieting behaviour over and above this proximal predictor. Previous studies in the area have suggested that the effects of self-determination theory variables can operate over and above decision making variables such as intention (e.g., Hagger et al., 2006a, 2006b) and it is expected that it is these direct effects, i.e., those that operate over and above this proximal predictor, that may be moderated by individual differences such as BMI.

Method

Participants and Design

137 University students and staff living in South East England volunteered to participate in the study (96 women, 41 men; *M* age = 27.07, *SD* = 10.59). Sufficient statistical power to detect small to moderate moderation effects is suggested to be obtained with sample sizes of between 127 and 143 (Aiken & West, 1991). Participants were recruited via opportunistic sampling and were approached in various locations on campus where they would be expected to return two weeks later in order to complete a follow-up questionnaire (e.g. within lectures, society meetings, and exercise or sports classes). BMI's ranged from 16.82 to 37.03 (*M* = 24.25, *SD* = 4.09). Using the World Health Organisation's international BMI classification system (WHO, 2000, 2004), which is age and sex independent, the sample was found to contain 5 underweight individuals (BMI < 18.50), 29 overweight individuals (BMI = 25.00 to 29.99), and 15 obese individuals (BMI > 30.00). A prospective, correlational design was employed. In line with previous research investigating self-determined motivation, intentions and dieting behaviour (Hagger et al., 2006a; Hagger et al., 2006b), self-report data were collected via two questionnaires distributed with a time lag of two weeks in order to predict dieting behaviour prospectively and in order to minimise response set bias and demand characteristics. Measures of self-determined motivation towards dieting and intentions to watch one's diet were obtained at time 1, along with demographic data and self-reported height and weight and measures. The first questionnaire took approximately 10 minutes to complete. The dependent variable of self-reported dieting behaviour was assessed at time 2 and this questionnaire took no more than a few minutes to complete. All participants completed questionnaires at both time points, however, in a few rare cases participants completed the follow-up questionnaire slightly later, although all were within one week of the follow-up time point. Data were analysed using moderated regression analysis in SPSS followed by simple slopes analysis using the computational program recommended by Preacher, Curran, and Bauer (2006). The study was approved by a University ethics committee, all participants gave informed consent, and participants were not paid or otherwise compensated for their participation.

Measures

Self-determined motivation. Self-determined motivation towards dieting was assessed using an adapted version of the Perceived Locus of Causality Scale (Ryan &

Connell, 1989) developed and employed within similar studies in this area (Hagger et al., 2006a; Hagger et al., 2006b). Participants were asked "why do you watch your diet?" and were asked to score a number of reasons along a scale of 1 to 5 ("*very true"* to "*not true at all"*). Reasons spanned four regulatory styles including intrinsic motivation (e.g., "because I enjoy watching my diet"), identified regulation (e.g., "because I value the benefits of watching my diet"), introjected regulation (e.g., "because I will feel guilty if I don't watch my diet") and external regulation (e.g., "because others want me to watch my diet"). It must be noted that the integrated regulatory subtype is not included within this scale. Integrated regulation is often omitted from some scales and from the formulae commonly used to calculate composite scores of self-determined motivation (Guay, Mageau, & Vallerand, 2003; Vallerand & Ratelle, 2002) due to difficulties in distinguishing between the integrated and identified regulatory subtypes. The construct, predictive, and nomological validity of this adapted scale has been supported within factor analytic studies conducted by Hagger et al. (2006a, 2006b). Scores for autonomous and controlled regulation were calculated by using the appropriate section of the formula commonly used to calculate a composite self-determined motivation score (Guay et al., 2003; Vallerand & Ratelle, 2002). Therefore autonomous regulation scores were formed by weighting and summing intrinsic motivation and identified regulation subscores (2*intrinsic motivation + 1*identified regulation). Controlled motivation was formed by weighting and summing introjected regulation and external regulation subscores (2*external regulation + 1*introjected regulation).

Intentions. Measures of intentions to watch one's diet were developed according to recommended guidelines (Ajzen, 1991) and were in line with those employed in previous studies (Hagger et al., 2006b). Intention was assessed using four items (e.g., "I intend to watch my diet during the next two weeks") and responses were made on a 6-point scale from *"extremely likely"* to *"extremely unlikely"*. The construct, predictive, and nomological validity of such items has previously been supported within factor analytic studies of decision making and dieting behaviour (Hagger et al., 2006a; Hagger et al., 2006b). The items have been found to demonstrate positive factor loadings that exceed the accepted minimum (e.g., Hagger et al., 2006a).

Self-reported behaviour. Self-reported behaviour was measured using two items: "In the course of the past two weeks, how often have you watched your diet?" and "I watched my diet the following number of times per week in the past two weeks" with responses made on six-point scales ranging from 1 ("almost never") to 6 ("everyday"). The concurrent and criterion validity of the self-report dietary measures used have been confirmed against diary methods (Conner & Armitage, 2002). The construct, predictive, and nomological validity of these items has also been supported within factor analytic studies (Hagger et al., 2006a; Hagger et al., 2006b). The term 'watching your diet' was defined within the introduction to the questionnaires and is outlined within the procedure section below.

Body Mass Index (BMI). BMI was calculated using the formula dividing weight in kilograms by height in metres squared. Height and weight data were self-reported by the participants.

Procedure

Participants were asked to participate in a survey of dieting habits and were subsequently presented with the questionnaire. At the beginning of each questionnaire it was emphasised to participants that "watching your diet" did not necessarily imply being on a specific diet or dietary programme but for the purpose of the study included any of the following activities: cutting down on sugary foods (e.g., sweets, soft drinks, chocolate); cutting down on fatty foods (e.g., butter, bacon, chips); reducing snacks between meals; decreasing food intake in general by eating lighter meals, not having seconds and not overeating; taking medications to help to control weight; or eating diet foods (e.g., reduced calorie salad dressing, diet soft drinks etc.). This list of behaviours was compiled from a study examining dieting behaviours in adolescents (Krowchuk, Kreiter, Woods, Sinal, & DuRant, 1998) and used within a number of other studies investigating eating regulation from a self-determination theory perspective (Hagger et al., 2006a; Hagger et al., 2006b). Participants were informed that there would be a further questionnaire that would be distributed two weeks later. Participants were informed that all answers were anonymous and that they had the right to withdraw at any time.

Results

Preliminary Analyses

Internal consistency values for all scales exceeded .70 indicating that all scales exhibited acceptable reliability. Collinearity diagnostics also revealed that all tolerance values were above .20, the value below which multicollinearity problems are indicated (Cohen, Cohen, & West, 2003; Tabachnick & Fidell, 2001). Correlations between the four motivational subtypes that were used to create the controlled and autonomous motive variables were examined and were found to be positive and to display a simplex pattern (Guttman, 1954) whereby adjacent subtypes displayed stronger correlations than distant subtypes. This provided support for the use of the formula for calculation of composite self-determined motivation scores in order to form autonomous and controlled motivation variables. Bivariate correlations among the study constructs are shown in Table 1 along with means and standard deviations. Dieting behaviour was found to correlate positively with all study variables and was most strongly correlated with intentions and autonomous regulation. Interestingly, a positive correlation was found between autonomous and controlled regulation. This is in line with previous research suggesting that autonomous and controlled motives are not necessarily mutually exclusive (e.g., Judge, Bono, Erez & Locke, 2005). Autonomous and controlled forms of motivation might not therefore be viewed as polar opposites and participants reporting autonomous motives for watching their diet within the current study also simultaneously reported controlling motives for watching their diet.

Insert Table 1 here.

The use of autonomous and controlled regulation constructs was further supported through the examination of potentially masked differences between the autonomous and controlled motive subtypes. Bivariate correlations were examined in order to examine whether the regulatory subtypes showed a similar pattern of relationships with the study variables. The controlled regulation subtypes showed a similar pattern of relationships with dieting intentions (external regulation: $r = .47$, $p < .001$; introjected regulation: $r = .64$, $p < .001$) and with dieting behaviour (external regulation: $r = .33$, $p < .001$; introjected regulation: $r = .45$, $p < .001$). The autonomous regulation subtypes showed a similar pattern of relationships with dieting intentions (intrinsic motivation: $r = .70$, $p < .001$; identified regulation: $r = .74$, $p < .001$) and with dieting behaviour (intrinsic motivation: $r = .53$, $p < .001$; identified regulation: $r = .57$, $p < .001$). With regards to BMI, no significant

relationships emerged between BMI and either of the controlled regulation subtypes (external regulation: r = -.17, p = .051; introjected regulation: r = .10, p = .271). However, for the autonomous regulation subtypes, the intrinsic motivation showed no significant correlation with BMI (r = .13, p = .135), whilst the identified regulation subtype was found to correlate significantly with BMI (r = .22, p = .009). This relationship indicated that individuals with a higher BMI tended to report more identified motives for watching their diet. Although this difference was significant it was not deemed to be problematic considering that the correlation was weak and that autonomous regulation was not hypothesised to show any moderated effects and was not the focus of the current study.

Moderated Regression Analysis

A moderated regression analysis was conducted with dieting behaviour as the criterion in order to examine the effect of autonomous and controlled motives whilst controlling for intention. The specific procedure recommended by Aiken and West (1991) was employed and variables were standardised prior to analysis. Intention, autonomous regulation, and controlled regulation were entered in the first step, BMI (the moderator) was entered in the second step, and the interaction terms between each form of behavioural regulation and BMI were entered in the third step.

The results of this analysis can be found in Table 2. In the first step, only intention was found to significantly predict behaviour. The group of predictor variables accounted for 56% of the variance in dieting behaviour, $F(3,133) = 56.23$, $p < .001$. The addition of BMI in the second step resulted in a non-significant change in this variance accounted for and BMI was not found to be an independently significant predictor of behaviour (R^2_{change} = .01, F_{change} = 1.37, p = .244). Intention remained the only significant predictor of behaviour in this step. The addition of the two interaction terms comprising of autonomous and controlled regulation each multiplied by BMI in the third step resulted in a significant change in variance accounted for (R^2_{change} = .03, F_{change} = 5.05, p = .008). Collectively this set of predictors accounted for 60% of the variance in behaviour. Intention remained a significant predictor of behaviour and as hypothesised the interaction term comprising of controlled regulation multiplied by BMI was also found to be significant. This significant interaction term indicated that the effect of controlled regulation was dependent on, and therefore varied

according to, BMI. This provided support for the hypothesised moderation effects and indicated that controlled motives exert significant moderated effects on dieting behaviour over and above intentions. The effect size associated with this interaction effect was found to be small to moderate (f^2 = .08).

Insert Table 2 here.

Simple slopes analysis

The significant interaction was decomposed using simple slopes analysis (Preacher et al., 2006) in order to examine the effect of controlled motives on dieting behaviour at specified BMI cut-offs. This allowed the estimation of slopes and therefore yielded regression coefficients for the effect of controlled motives on dieting behaviour at specified values of BMI. These conditional values of BMI were specified using the World Health Organisation's international classification system (WHO, 2000, 2004). Conditional BMI values were specified as the cut-off for classification as being underweight (BMI < 18.50) and obese (BMI > 30.00). An intermediate BMI value was specified by using the mean BMI of the current sample (BMI = 24.25) and this value was found to fall within the WHO normal range classification. These values were specified for the purpose of the initial stage of analysis, however, subsequent stages of the analysis allowed for regions of significance to be obtained and therefore for the identification of BMI cut-off points where significant slopes emerged. Thus, these analyses allowed for the identification of the BMI cut-off point or points at which controlled motives began to exert significant effects on dieting behaviour and thus allowed for the consideration of effects across underweight, overweight, and obese BMI ranges.

The results of the initial analysis provided support for the direction of the hypothesised difference in the effect of controlled motives on dieting behaviour for those classified as underweight and those classified as obese. The effect of controlled motives on dieting behaviour was negative for those with a BMI at the obese range cut-off (B = -.61, $t(130) = 2.63$, p = .009) and positive for those with a BMI at the underweight range cut-off (B = .43, $t(130) = 2.08$, p = .040). The effect of controlled motives on dieting behaviour at the mean BMI of the sample, i.e. within the normal BMI range, was not found to reach significance (B = -.09, $t(130) = -0.79$, p = .434). An interaction plot depicting these effects

can be seen in Figure 1. These results are in line with the hypothesised effects of controlled regulation and indicate that controlled motives are associated with less dieting behaviour in those who are classified as obese and more dieting behaviour in those who are underweight. The region of significance yielded via this analysis indicated that the effects of controlled regulation on dieting behaviour are significant and positive below BMIs of 19.00 and significant and negative at BMIs above 26.43. Within this BMI range the effect of controlled motives on dieting behaviour is non-significant. Notably, these boundaries closely approximate to the WHO cut-off criteria for classification of underweight (BMI < 18.50) and overweight (BMI > 25.00) individuals. The simple slope at the exact BMI cut-off for overweight classification would not therefore reach significance, however, the regions of significance demonstrate that for the majority of the overweight BMI range, controlled motives were found to be associated with less dieting behaviour.

Insert Figure 1 here.

Discussion

In light of previous research demonstrating the relationship between the controlled regulation of dieting behaviour and dysfunctional eating patterns, the aim of the current study was to investigate the effect of controlled motives on the dieting behaviour of individuals classified as underweight, overweight or obese according to international classification criteria (WHO, 2000, 2004). In line with previous research (e.g., Hagger et al., 2006a; Hagger et al., 2006b), autonomous and controlled motives were not found to exert a significant and direct main effect on dieting behaviour. However, moderated regression analyses demonstrated that the effect of controlled motives on dieting behaviour was moderated by BMI. The results of a subsequent simple slopes analysis provided clear support for the hypothesis that controlled motives would be predictive of high levels of dieting behaviour in underweight individuals and low levels of dieting behaviour in overweight and obese individuals. These effects were independent of individuals' intentions to watch their diet and, as expected, BMI was not found to moderate the effect of autonomous motives on dieting behaviour.

The maladaptive effects of controlled motives on dieting behaviour were evident across those classified as underweight, overweight, and obese. These findings provide further

support for the importance of controlled motives for dieting as a generalised and overarching motivational factor with regards to eating dysregulation. Results suggest that this regulatory style may lead to increased dieting behaviour in those for whom dieting may actually be harmful and decreased dieting behaviour in those for whom dieting may be beneficial. Thus BMI as an individual indifference factor further validates self-determination theory as a global and reliable predictor of behaviour and more specifically that its predictions are pertinent within a dieting context. Future studies are required in order to shed light upon the exact mechanisms underlying the pattern of findings. It is proposed that differences in affective responses to external pressures to watch one's diet and to obtain the ideal body (e.g., Henderson-King & Henderson-King, 1997; Smeesters et al., 2010) may play a key role in explaining the interaction between a controlled motivational style and BMI status. As controlled motives also refer to introjected forms of motivation within self-determination theory, it is likely that differences in the effects of feelings such as guilt or shame might also be found to play a key role in this interaction.

Furthermore, other factors may well co vary with BMI and may play an explanatory role in the complex effects of external pressures and the controlled regulation of diet. These factors might include traits such as impulsivity and low inhibitory-control (e.g., Jasinska et al., 2012; van den Berg, et al. 2012), and self-evaluative processes (e.g., Higgins, 1987). Self-evaluative processes present as a key factor in this regard and self-discrepancies have been found to play a significant role in maladaptive eating behaviour (e.g., Strauman, Vookles, Berenstein, Chaiken, & Higgins, 1991). According to self-discrepancy theory (Higgins, 1987), feeling discrepant from how we feel we should look according to hopes and aspirations (i.e., an 'ideal' physical self guide) would be associated with dejection-related emotions (e.g., depressive affect), a lack of control, and a higher risk of bulimic type eating behaviours such as emotional eating (Higgins, Tykocinski, & Vookles, 1992). In contrast, feeling discrepant from how we feel that we should look according to perceived expectations or obligations (i.e., an 'ought' physical self guide) would be associated with agitation-related emotions (e.g., anxiety) and potential over restriction of one's diet (Higgins et al., 1992). Importantly, research has shown that individuals with bulimic symptoms tend to hold actual-ideal, dejection evoking, self-discrepancies whilst individuals with anorexic symptoms tend

to hold actual-ought, agitation evoking, self-discrepancies (Strauman et al., 1991). Studies examining social comparison processes have shown that the effects of external pressures to watch one's diet or to be thin can 1) differ across individuals (Henderson-King & Henderson-King, 1997), 2) are sometimes based upon the perceived attainability of thinness (Mills, Polivy, & Tiggeman, 2002), and 3) are intertwined with BMI (Smeesters et al., 2010). Thus a research focus on the integration of BMI with these self-evaluative factors may provide a fruitful avenue for further study.

The illustration of the maladaptive and clearly non-optimal outcomes of controlled motives highlights the hazards of external pressures to watch one's diet. It is likely that these social pressures come not just from health professionals and a widespread concern for the benefits of a healthier lifestyle, but also from social pressures to possess the ideal body (Dittmar, 2008; Stice, 2001). It is interesting that the results of the present study found no significant correlation between BMI and controlled motives for watching one's diet. This suggests that as BMI decreases, there is no associated decrease in dieting due to external pressures or due to feelings of guilt and shame. It would be expected that although most underweight individuals will be exposed to the usual cultural pressures to be thin these individuals would also be exposed to messages from friends, family and perhaps even health professionals to gain or to maintain weight. Despite this, the present results indicate that whether an individual is of a low or a high BMI bares no significant relationship to these controlled motives. Future research is required in order to disentangle these sources of external pressures so as to determine whether the deleterious effects of such controlled regulatory styles are more strongly associated with certain types or sources of social pressure and particularly to investigate why underweight individuals might report dieting due to external pressures and feelings of guilt and shame despite perhaps receiving alternative external pressures to the contrary. Furthermore, it may be that the exact nature of individuals' goals may also be an important factor. For example, overweight individuals might be more controlled in their motivation to improve their health whereas underweight individuals may be more controlled in their motivation to achieve the ideal bodies that are portrayed within the media. The subtle differences and potential interactions between types of goals and types

of motivation for eating regulation need to be further explored in order to enhance our understanding of how these processes might differ according to BMI status.

The current study represents a valuable initial investigation into the overarching influence of controlled motives on the dieting behaviour of underweight, overweight, and obese individuals. However, it should be noted that there are a number of limitations that should be addressed within future studies. Dieting behaviour was assessed using a general definition that encompassed both dieting behaviours that may be seen as healthy (e.g., eating low fat foods) and those that may be seen as less healthy or potentially as dysfunctional (e.g., taking medications to aid weight loss). It is possible that the effects of controlled motives may be specific or strongest with regards to particular forms of dieting behaviour for individuals of different BMI's. Controlled motives have been shown to be more strongly linked to dysfunctional dieting behaviours than healthy dieting behaviours (e.g., Pelletier & Dion, 2007) and the current study suggests that these effects should be further investigated giving consideration to BMI. Future research should address this issue and examine the degree to which the effects of controlled motives on different forms of dieting behaviour (e.g., healthy and unhealthy or dysfunctional dieting behaviours) might be moderated by BMI. The current study is also based on self-report measures and is of a correlational design. Whilst such studies have proved invaluable in the development of psychological theory and knowledge, further investigations involving experimental designs are subsequently warranted in order to determine causality. The use of self-reported data to generate BMIs might also be problematic in that it may mean that BMI values are not wholly accurate. Future investigations should endeavour to gain objective measures of height and weight at the time of testing. Lastly, it should also be acknowledged that the sample contained only 5 individuals who could be classified as underweight according to the WHO criteria and investigations based upon larger samples or samples with a greater proportion of underweight participants are therefore warranted.

The evidence accumulating within social and health psychology suggests that the effects of autonomous and controlled motivation are wide-reaching and multi-faceted, exerting effects on behaviours and constructs ranging from participation in regular physical activity (Ryan & Deci, 2007), behavioural persistence (Deci, 1971; Deci & Ryan, 2002),

happiness, vitality and well-being (Nix et al., 1999; Ryan & Deci, 2000c), and even alienation and mental health problems (Ryan & Deci, 2000a). Autonomous and controlled motivation therefore present a viable and potentially fruitful avenue for the development of interventions within a health context and, as the current findings indicate, may be particularly valuable with regards to eating dysregulation. Interventions based upon the internalisation of behavioural regulation (i.e., moving away from more controlled forms of motivation towards more autonomous and self-determined forms of motivation) have proved effective (e.g., Williams, Freedman, & Deci, 1998; Williams, Gagne, Ryan, & Deci, 2002). Such interventions focus upon facilitating the internalisation process through the provision of autonomy supportive contexts. Similar interventions may prove highly efficacious within a dieting context both in terms of encouraging healthy eating behaviours and discouraging dysfunctional and maladaptive eating behaviours. The results of the current study highlight the value of moving individuals away from a focus upon external forces and pressures such as body image, body ideals, and feelings of guilt and shame when regulating what they consume and suggests that interventions to reduce controlled forms of behavioural regulation will be beneficial across underweight, overweight, and obese individuals. However, it should also be noted that an increase in autonomous motives to diet may not necessarily go hand in hand with a reduction in controlled motives for dieting. Therefore, in addition to supporting autonomy, implementing techniques to minimise or reduce controlled motives for watching one's diet may have particular benefits for obese or overweight individuals who are struggling to watch their diets and also for underweight individuals who are overly restricting their diets.

In conclusion, the findings of the current study shed light upon the detrimental effects of controlled motives within a dieting context. Results indicate that controlled motives have an overarching influence on eating regulation and importantly are associated with high levels of dieting behaviour in those who are underweight and low levels of dieting behaviour in those who are classified as obese or overweight. Thus BMI needs to be heeded when understanding dietary behaviour from the perspective of self-determination theory. Co-variation of BMI with other self-evaluative individual difference factors related to dieting behaviour has been discussed and suggestions to pursue an integrated line of enquiry have

been made. The findings of the current study are of value to both practitioners and researchers working within the area of dieting behaviour and potentially social and health psychology at large in that they provide further converging evidence for a universal and reliable framework from which to understand and predict dietary behaviour. In keeping with self-determination theory the results of the current study suggest that external pressures to watch one's diet may have deleterious effects that may result in outcomes opposite to those that were intended. External pressures and contingencies should therefore be used with caution and key importance should be placed upon the internalisation of behavioural regulation and moving individuals away from controlled motives for regulating what they eat.

Conflict of interest: None

References

Aiken, L. S., & West, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Benware, C., & Deci, E. L. (1984). The quality of learning with an active versus passive motivational set. *American Educational Research Journal, 21*, 755-765. Doi: 10.3102/00028312021004755.

Cohen, J., Cohen, P., & West, R. R. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. London, UK: Lawrence Erlbaum.

Conner, M., & Armitage, C. J. (2002). *The social psychology of food.* Buckingham, UK: Open University Press.

Craig, R., & Shelton, N. (2008). *Health Survey for England 2007: Volume 1 – Healthy lifestyles: knowledge, attitudes and behaviours.* Leeds, UK: The NHS Information Centre.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18*, 105-115. doi: 10.1037/h0030644.

Deci, E. L., & Flaste, R. (1995). *Why we do what we do: Understanding self-motivation*. New York: Penguin Books.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour.* New York: Plenum.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. New York: University of Rochester Press.

Dittmar, H. (2008). *Consumer society, Identity, and Well-being: The Search for the 'Good Life' and the 'Body Perfect'.* London and New York: Psychology Press.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme. *Psychology of Sport and Exercise, 8*, 722-740. Doi: 10.1016/j.psychsport.2006.07.006.

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52*, 890-898. Doi: 10.1037/0022-3514.52.5.890.

Guay, F., Mageau, G. A., & Vallerand, R. J. (2003). On the hierarchical structure of self-determined motivation: A test of top-down, bottom-up, reciprocal, and horizontal effects. *Personality and Social Psychology Bulletin, 29*, 992-1004. Doi: 10.1177/0146167203253297.

Guttman, L.A. (1954). A new approach to factor analysis: The radex. In P.F. Lazarsfeld (Ed.). *Mathematical thinking in the social sciences.* New York: Columbia University Press.

Hagger, M. S., Chatzisarantis, N. L. D., & Harris, J. (2006a). From psychological need satisfaction to intentional behavior: Testing a motivational sequence in two behavioral contexts. *Personality and Social Psychology Bulletin, 32*, 131-148. Doi: 10.1177/0146167205279905.

Hagger, M. S., Chatzisarantis, N. L. D., & Harris, J. (2006b). The process by which relative autonomous motivation affects intentional behaviour: Comparing effects across dieting and exercise behaviours. *Motivation and Emotion, 30*, 307-321. Doi: 10.1007/s11031-006-9046-5.

Henderson-King, E., & Henderson-King, D. (1997). Media effects on women's body esteem: Social and individual difference factors. *Journal of Applied Social Psychology,* 27, 399-417. Doi: 10.1111/j.1559-1816.1997.tb00638.x.

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94*, 319-340.

Higgins, E. T., Tykocinski, O., & Vookles, J. (1992). Self and health: How "patterns" of self-beliefs predict types of emotional and physical problems. *Social Cognition, 10*, 125-150. Doi: 10.1521/soco.1992.10.1.125.

Jasinska, A.J., Yasuda, M., Burant, C.F., Gregor, N., Khatri, S., Sweet, M., & Falk, E.B. (2012). Impulsivity and inhibitory control deficits are associated with unhealthy eating in young adults. *Appetite*, 59, 738-747. Doi: 10.1016/j.appet.2012.08.001.

Judge, T. A., Bono, J. E., Erez, A., & Locke, E. A. (2005). Core self-evaluations and job and life satisfaction: The role of self-concordance and goal attainment. *Journal of Applied Psychology, 90*, 257-268. Doi: 10.1037/0021-9010.90.2.257.

Krowchuk, D. P., Kreiter, S. R., Woods, C. R., Sinal, S. H., & DuRant, R. H. (1998). Problem dieting behaviors among young adolescents. *Archives of pediatrics and Adolescent Medicine, 152*, 884-888.

McManus, S., Meltzer, H., Brugha, T., Bebbington, P., & Jenkins, R. (2009). *Adult Psychiatric Morbidity in England*. Leeds, UK: The NHS Information Centre.

Mills, J.S., Polivy, J.,Herman, C.P., & Tiggeman, M. (2002). Effects of exposure to thin media images: Evidence of self-enhancement among restrained eaters. *Personality and Social Psychology Bulletin*, 28, 1687-. Doi: 10.1177/014616702237650.

Nix, G. A., Ryan, R. M., Manly, J. B., & Deci, E. L. (1999). Revitalization through self-regulation: The effects of autonomous and controlled motivation on happiness and vitality. *Journal of Experimental Social Psycholgy, 35*, 266-284. Doi: 10.1006/jesp.1999.1382.

Ogden, J. (2010). *The psychology of eating: From healthy to disordered behavior.* Malden, MA: Blackwell.

Pelletier, L. G., & Dion, S. C. (2007). An examination of general and specific motivational mechanisms for the relations between body satisfaction and eating behaviors. *Journal of Social and Clinical Psychology, 26*, 303-333. Doi: 10.1521/jscp.2007.26.3.303.

Pelletier, L. G., Dion, S. C., Slovinec-D'Angelo, M., & Reid, R. (2004). Why do you regulate what you eat? Relationships between forms of regulation, eating behaviors, sustained dietary behavior change, and psychological adjustment. *Motivation and Emotion, 28*, 245-277. Doi: 0146-7239/04/0900-0245/0.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437-448. Doi: 10.3102/10769986031004437.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63*, 397-427. Doi: 10.1111/j.1467-6494.1995.tb00501.x.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*, 749-761. Doi: 10.1037/0022-3514.57.5.749.

Ryan, R. M., & Deci, E. L. (2000a). The darker and brighter sides of human existence: basic psychological needs as a unifying concept. *Psychological Inquiry, 11*, 319-338. Doi: 10.1207/S15327965PLI1104_03.

Ryan, R. M., & Deci, E. L. (2000b). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67. Doi: 10.1006/ceps.1999.1020.

Ryan, R. M., & Deci, E. L. (2000c). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78. Doi: 10.1037110003-066X.55.1.68.

Ryan, R. M., & Deci, E. L. (2007). Active human nature: Self-determination theory and the promotion and maintenance of sport, exercise, and health. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 1-19). Champaign, IL: Human Kinetics.

Smeesters, D., Mussweiler, T., & Mandel, N. (2010). The effects of thin and heavy media images on overweight and underweight consumers: Social comparison processes and behavioral implications. *Journal of Consumer Research*, 36, 930-949. Doi: 10.1086/648688.

Stice, E. (2001). A prospective test of the dual-pathway model of bulimic pathology: Mediating effects of dieting and negative affect. *Journal of Abnormal Psychology, 110*, 124-135. Doi: 10.1037//0021-843X.110.1.124.

Strauman, T. J., Vookles, J., Berenstein, V., Chaiken, S., & Higgins, E. T. (1991). Self-discrepancies and vulnerability to body dissatisfaction and disordered eating. *Journal of Personality and Social Psychology, 61*, 946-956. Doi: 10.1037/0022-3514.61.6.946.

Strauss, J., & Ryan, R. M. (1987). Autonomy disturbances in subtypes of anorexia nervosa. *Journal of Abnormal Psychology, 96*, 254-258. Doi: 10.1037/0021-843X.96.3.254.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Boston, MA: Allyn and Bacon.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology, 29*, 271-360. Doi: 10.1016/S0065-2601(08)60019-2.

Vallerand, R. J., & Ratelle, C. F. (2002). Intrinsic and extrinsic motivation: A hierarchical model. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of Self-Determination Research* (pp. 37-64). New York: University of Rochester Press.

Van den Berg, L., Pieterse, K., Malik, J.A., Luman, M., Willems van Dijk, K., Oosterlaan, J., Delemarre-van de Waal, H.A. (2011). Association between impulsivity, reward responsiveness and body mass index in children. *International Journal of Obesity*, 35, 1301-1307. Doi:10.1038/ijo.2011.116.

Vansteenkiste, M., Niemiec, C., & Soenens, B. (2010). *The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions*. In T. Urdan & S. Karabenick (Eds.). Advances in motivation and achievement, vol. 16: The decade ahead (pp. 105-166). UK: Emerald Publishing.

Verstuyf, J., Patrick, H., Vansteenkiste, & Teixeira, P.J. (2012). Motivational dynamics of eating regulation: A self-determination theory perspective. *Journal of Behavioral Nutrition and Physical Activity*, 9:21. Doi:10.1186/1479-5868-9-21.

Weinman, N., Przybylski, A.K., & Ryan, R.M. (2012). The index of autonomous functioning: development of a scale of human autonomy. *Journal of Research in Personality*, 46, 397-413. Doi: 10.1016/j.jrp.2012.03.007.

WHO. (2000). Obesity: Preventing and managing the global epidemic: Report of a WHO consultation. *WHO Technical Series; 894*. Geneva: World Health Organisation.

WHO. (2004). Expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet*, 157-163. Doi: 10.1016/S0140-6736(03)15268-3.

Williams, G. C., Freedman, Z. R., & Deci, E. L. (1998). Supporting autonomy to motivate patients with diabetes for glucose control. *Diabetes Care, 21*, 1644-1651. Doi: 10.2337/diacare.21.10.1644.

Williams, G. C., Gagne, M., Ryan, R. M., & Deci, E. L. (2002). Facilitating autonomous motivation for smoking cessation. *Health Psychology, 21*, 40-50. Doi: 10.1037//0278-6133.21.1.40.

Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintainance. *Journal of Personality and Social Psychology, 70*, 115-126. Doi: 10.1037/0022-3514.70.1.115.

Table 1

Reliability coefficients (α), means (M), standard deviations (SD), and correlations among study variables.

Variables	α	*M*	*SD*	1	2	3	4
1. Dieting behaviour	.88	3.70	1.57	-			
2. Intention	.94	3.28	1.32	.75**	-		
3. Autonomous motives	-	8.22	2.95	.56**	.73**	-	
4. Controlled motives	-	10.47	2.73	.42**	.60**	.61**	-
5. Body Mass Index (BMI)	-	24.25	4.09	.20*	.16	.16	-.08

* $p < .05$ ** $p < .001$.

Table 2

Summary of moderated hierarchical regression of behaviour on intention, autonomous and controlled motives, body mass index (BMI), and BMI by motive interaction terms.

	Step 1	Step 2	Step 3
Variables Entered	*ß*	*ß*	*ß*
Intention	.75**	.73**	.76**
Autonomous regulation	.041	.03	.01
Controlled regulation	-.05	-.03	-.06
Body mass index (BMI)	-	.07	.048
Autonomous motives X BMI	-	-	.05
Controlled motives X BMI	-	-	-.21[a]
R^2	.56	.56	.60
Model F	56.23**	42.63**	31.86**
Df	(3,133)	(4,132)	(6,130)
F_{change}	-	1.37	5.05*

* $p < .05$ ** $p < .001$ [a] $p = .006$

Figure 1

Interaction plot illustrating the effects of controlled regulation on dieting behaviour according to body mass index (BMI).