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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

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

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4 **Abstract**

5

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

22

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

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2 pour les personnes présentant un déficit pondéral, un surpoids ou une obésité

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4 **Abrégé**

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

25

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

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

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

15 In line with this observed paradox, research in the area of eating regulation has
16 developed in a somewhat fragmented manner and some approaches have received more
17 attention than others with regards to particular groups or forms of eating dysregulation
18 (Verstuyf et al., 2012). Verstuyf et al. highlighted the need to develop a generalised
19 framework for the study of eating regulation. They further emphasised the importance of
20 identifying global factors and particularly of identifying motivational processes that would
21 impact upon various forms of eating behaviour. Indeed, a number of studies have provided
22 support for the influence of the motivational processes presented within self-determination
23 theory (Deci & Ryan, 1985, 2002) on dieting behaviour (e.g., Edmunds, Ntoumanis, & Duda,
24 2007; Hagger, Chatzisarantis, & Harris, 2006b). However, research has found that the
25 proposed optimal and adaptive effects of self-determination theory constructs (See Deci &
26 Ryan, 2002) on dieting behaviour are not always evident and can sometimes run counter to
27 prediction (Hagger, Chatzisarantis, & Harris, 2006a). The current study expands upon this
28 research by investigating whether the direction of the effects of self-determination theory
29 constructs on dieting behaviour are dependent upon body mass index (BMI). Specifically, the

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

3 **Self-determination theory and motivation**

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

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

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

5 **Autonomous and controlled motives and dieting behaviour**

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

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

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

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

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

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

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

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

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

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

3 **Study Hypotheses**

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

29 **Method**

30 **Participants and Design**

1 137 University students and staff living in South East England volunteered to
2 participate in the study (96 women, 41 men; M age = 27.07, SD = 10.59). Sufficient statistical
3 power to detect small to moderate moderation effects is suggested to be obtained with sample
4 sizes of between 127 and 143 (Aiken & West, 1991). Participants were recruited via
5 opportunistic sampling and were approached in various locations on campus where they
6 would be expected to return two weeks later in order to complete a follow-up questionnaire
7 (e.g. within lectures, society meetings, and exercise or sports classes). BMI's ranged from
8 16.82 to 37.03 (M = 24.25, SD = 4.09). Using the World Health Organisation's international
9 BMI classification system (WHO, 2000, 2004), which is age and sex independent, the sample
10 was found to contain 5 underweight individuals (BMI < 18.50), 29 overweight individuals
11 (BMI = 25.00 to 29.99), and 15 obese individuals (BMI > 30.00). A prospective, correlational
12 design was employed. In line with previous research investigating self-determined
13 motivation, intentions and dieting behaviour (Hagger et al., 2006a; Hagger et al., 2006b),
14 self-report data were collected via two questionnaires distributed with a time lag of two
15 weeks in order to predict dieting behaviour prospectively and in order to minimise response
16 set bias and demand characteristics. Measures of self-determined motivation towards dieting
17 and intentions to watch one's diet were obtained at time 1, along with demographic data and
18 self-reported height and weight and measures. The first questionnaire took approximately 10
19 minutes to complete. The dependent variable of self-reported dieting behaviour was assessed
20 at time 2 and this questionnaire took no more than a few minutes to complete. All participants
21 completed questionnaires at both time points, however, in a few rare cases participants
22 completed the follow-up questionnaire slightly later, although all were within one week of the
23 follow-up time point. Data were analysed using moderated regression analysis in SPSS
24 followed by simple slopes analysis using the computational program recommended by
25 Preacher, Curran, and Bauer (2006). The study was approved by a University ethics
26 committee, all participants gave informed consent, and participants were not paid or
27 otherwise compensated for their participation.

28 **Measures**

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

1 Connell, 1989) developed and employed within similar studies in this area (Hagger et al.,
2 2006a; Hagger et al., 2006b). Participants were asked “why do you watch your diet?” and
3 were asked to score a number of reasons along a scale of 1 to 5 (“*very true*” to “*not true at*
4 *all*”). Reasons spanned four regulatory styles including intrinsic motivation (e.g., “because I
5 enjoy watching my diet”), identified regulation (e.g., “because I value the benefits of
6 watching my diet”), introjected regulation (e.g., “because I will feel guilty if I don’t watch
7 my diet”) and external regulation (e.g., “because others want me to watch my diet”). It must
8 be noted that the integrated regulatory subtype is not included within this scale. Integrated
9 regulation is often omitted from some scales and from the formulae commonly used to
10 calculate composite scores of self-determined motivation (Guay, Mageau, & Vallerand, 2003;
11 Vallerand & Ratelle, 2002) due to difficulties in distinguishing between the integrated and
12 identified regulatory subtypes. The construct, predictive, and nomological validity of this
13 adapted scale has been supported within factor analytic studies conducted by Hagger et al.
14 (2006a, 2006b). Scores for autonomous and controlled regulation were calculated by using
15 the appropriate section of the formula commonly used to calculate a composite self-
16 determined motivation score (Guay et al., 2003; Vallerand & Ratelle, 2002). Therefore
17 autonomous regulation scores were formed by weighting and summing intrinsic motivation
18 and identified regulation subscores ($2 \times \text{intrinsic motivation} + 1 \times \text{identified regulation}$).
19 Controlled motivation was formed by weighting and summing introjected regulation and
20 external regulation subscores ($2 \times \text{external regulation} + 1 \times \text{introjected regulation}$).

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

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

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

13 **Procedure**

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

29 **Results**

30 **Preliminary Analyses**

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

19 Insert Table 1 here.

20 The use of autonomous and controlled regulation constructs was further supported
21 through the examination of potentially masked differences between the autonomous and
22 controlled motive subtypes. Bivariate correlations were examined in order to examine
23 whether the regulatory subtypes showed a similar pattern of relationships with the study
24 variables. The controlled regulation subtypes showed a similar pattern of relationships with
25 dieting intentions (external regulation: $r = .47, p < .001$; introjected regulation: $r = .64, p$
26 $< .001$) and with dieting behaviour (external regulation: $r = .33, p < .001$; introjected
27 regulation: $r = .45, p < .001$). The autonomous regulation subtypes showed a similar pattern
28 of relationships with dieting intentions (intrinsic motivation: $r = .70, p < .001$; identified
29 regulation: $r = .74, p < .001$) and with dieting behaviour (intrinsic motivation: $r = .53, p$
30 $< .001$; identified regulation: $r = .57, p < .001$). With regards to BMI, no significant

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

10 **Moderated Regression Analysis**

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

18 The results of this analysis can be found in Table 2. In the first step, only intention
19 was found to significantly predict behaviour. The group of predictor variables accounted for
20 56% of the variance in dieting behaviour, $F(3,133) = 56.23, p < .001$. The addition of BMI in
21 the second step resulted in a non-significant change in this variance accounted for and BMI
22 was not found to be an independently significant predictor of behaviour ($R^2_{change} = .01, F_{change}$
23 $= 1.37, p = .244$). Intention remained the only significant predictor of behaviour in this step.
24 The addition of the two interaction terms comprising of autonomous and controlled
25 regulation each multiplied by BMI in the third step resulted in a significant change in
26 variance accounted for ($R^2_{change} = .03, F_{change} = 5.05, p = .008$). Collectively this set of
27 predictors accounted for 60% of the variance in behaviour. Intention remained a significant
28 predictor of behaviour and as hypothesised the interaction term comprising of controlled
29 regulation multiplied by BMI was also found to be significant. This significant interaction
30 term indicated that the effect of controlled regulation was dependent on, and therefore varied

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

5 Insert Table 2 here.

6 **Simple slopes analysis**

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

23 The results of the initial analysis provided support for the direction of the
24 hypothesised difference in the effect of controlled motives on dieting behaviour for those
25 classified as underweight and those classified as obese. The effect of controlled motives on
26 dieting behaviour was negative for those with a BMI at the obese range cut-off ($B = -.61$,
27 $t(130) = 2.63$, $p = .009$) and positive for those with a BMI at the underweight range cut-off (B
28 $= .43$, $t(130) = 2.08$, $p = .040$). The effect of controlled motives on dieting behaviour at the
29 mean BMI of the sample, i.e. within the normal BMI range, was not found to reach
30 significance ($B = -.09$, $t(130) = -0.79$, $p = .434$). An interaction plot depicting these effects

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

13 Insert Figure 1 here.

14

Discussion

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

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

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

15 Furthermore, other factors may well co vary with BMI and may play an explanatory
16 role in the complex effects of external pressures and the controlled regulation of diet. These
17 factors might include traits such as impulsivity and low inhibitory-control (e.g., Jasinska et
18 al., 2012; van den Berg, et al. 2012), and self-evaluative processes (e.g., Higgins, 1987). Self-
19 evaluative processes present as a key factor in this regard and self-discrepancies have been
20 found to play a significant role in maladaptive eating behaviour (e.g., Strauman, Vookles,
21 Berenstein, Chaiken, & Higgins, 1991). According to self-discrepancy theory (Higgins,
22 1987), feeling discrepant from how we feel we should look according to hopes and
23 aspirations (i.e., an 'ideal' physical self guide) would be associated with dejection-related
24 emotions (e.g., depressive affect), a lack of control, and a higher risk of bulimic type eating
25 behaviours such as emotional eating (Higgins, Tykocinski, & Vookles, 1992). In contrast,
26 feeling discrepant from how we feel that we should look according to perceived expectations
27 or obligations (i.e., an 'ought' physical self guide) would be associated with agitation-related
28 emotions (e.g., anxiety) and potential over restriction of one's diet (Higgins et al., 1992).
29 Importantly, research has shown that individuals with bulimic symptoms tend to hold actual-
30 ideal, dejection evoking, self-discrepancies whilst individuals with anorexic symptoms tend

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

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

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

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

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

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

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

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

10

11 Conflict of interest: None

12

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7
8

1 Table 1
 2 Reliability coefficients (α), means (M), standard deviations (SD), and correlations among
 3 study variables.

Variables	α	<i>M</i>	<i>SD</i>	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

5

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

7

1 Table 2
 2 Summary of moderated hierarchical regression of behaviour on intention, autonomous and
 3 controlled motives, body mass index (BMI), and BMI by motive interaction terms.
 4

	Step 1	Step 2	Step 3
Variables Entered	β	β	β
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*

5

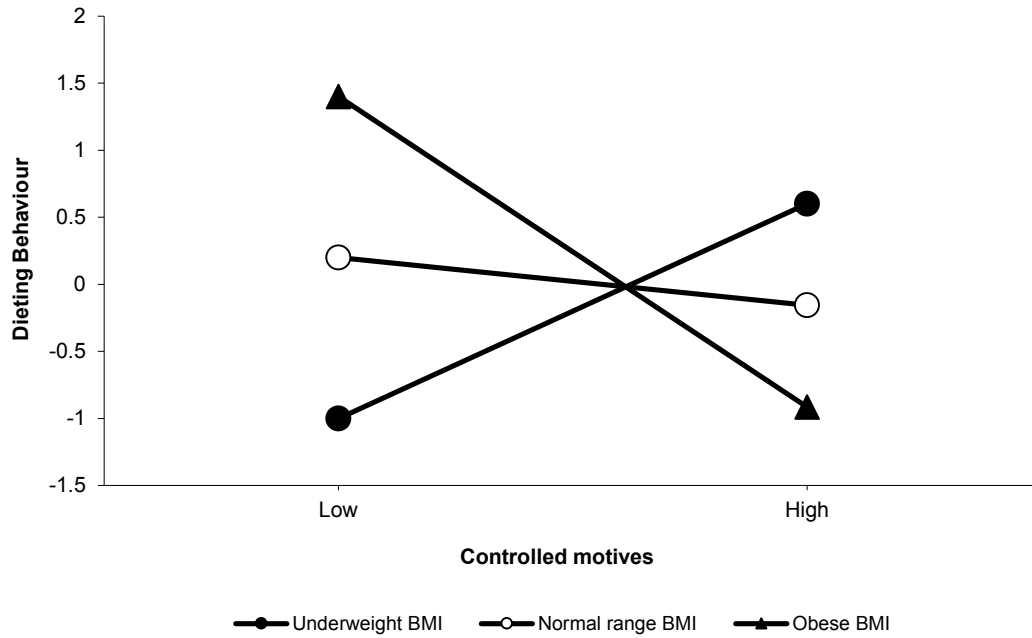
6 * $p < .05$ ** $p < .001$ ^a $p = .006$

7

1 Figure 1

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

4



5
6