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THOUGHT SUPPRESSION AND DIETARY RESTRAINT

by

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Thesis Abstract

The thesis commences with a review of thought suppression research and focuses on the effects of suppressing personally relevant material. Limitations of the research are discussed, in addition to the current theoretical understandings of thought suppression phenomenon. Following this, the review focuses on the clinical applications of thought suppression research in relation to dietary restraint. However, results have been inconsistent and further studies are required to differentiate between the effects of dietary restraint and disinhibition and investigate individual differences in thought suppression attempts. In view of this, the empirical paper investigated the effects of thought suppression, dietary restraint and disinhibition on automatic cognitive processes, in addition to individual differences in thought control techniques. Participants classified as low restraint, inhibited restraint and disinhibited restraint were instructed to either suppress or not suppress their thoughts prior to completing a modified Stroop task. It was found that, contrary to predictions, thought suppression *decreased* reaction time on the Stroop task. Furthermore, disinhibited restrainers were more likely to engage in thought suppression attempts, experienced higher levels of anxiety and were less likely to use adaptive thought control techniques compared to low restrainers and inhibited restrainers. Results are considered in relation to previous research, and methodological limitations as well as clinical implications and suggestions for future research are discussed.

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The Effects of Thought Suppression and Dietary Restraint on Cognitive Processes. A Review of the Literature

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Abstract

Thought suppression is a common strategy used to keep unwanted and intrusive thoughts out of awareness. However, research shows that deliberate suppression of thoughts results in a paradoxical increase in their frequency – a phenomenon called the 'rebound' effect. This review considers studies that have focused on the clinically relevant effects of suppressing personally intrusive thoughts. However, results have been inconsistent and various methodological criticisms have been raised. For example, studies have been predominantly based on self-report, which may be confounded by response bias, particularly when the suppression material is considered to be personal or socially undesirable. Accordingly, another line of research has investigated the effects of thought suppression on automatic cognitive processes to provide a more objective measure. The review then considers the effects of thought suppression in relation to clinical disorders, particularly dietary restraint. Individuals with high dietary restraint may experience a preoccupation with food and frequently use thought suppression to control their thoughts. So far, results are inconsistent, possibly due to methodological limitations of studies. Additionally, researchers have proposed to differentiate between the effects of restraint and disinhibition on the rebound effect and further delineate the role of individual differences in thought suppression attempts.

Keywords: thought suppression, dietary restraint, disinhibition, Stroop interference

The Effects of Thought Suppression and Dietary Restraint on Cognitive Processes. A Review of the Literature

Structure of the Literature Review

The aims of the present review are to evaluate pertinent research within the thought suppression literature and highlight the effects of thought suppression on cognitive processes within the context of dietary restraint. In addition to establishing the current state of knowledge, this review will attempt to ascertain limitations of previous studies and to identify current theoretical understandings of thought suppression phenomenon. Following this, the review will focus on the clinical applications of thought suppression research, describe the impact of food-related preoccupations on behaviour and cognition, and provide a critical appraisal of studies investigating the impact of thought suppression and dietary restraint on automatic cognitive processes. Finally, it will aim to outline clinical implications and provide suggestions for future research.

Literature Search Strategy

A comprehensive search of the PsychINFO, Medline and Science Direct electronic databases was conducted to locate studies of thought suppression and dietary restraint. The literature search was limited to studies published in the English language since 1985. Key words used were thought suppression, rebound effect, restraint, restrained eating, disinhibition, behavioural/behavioral rebound, Stroop, Stroop interference, colour/color naming, cognition and cognitive bias. In addition, reference sections from literature reviews on eating disorders and Stroop interference

(Faunce, 2002), thought suppression (Wenzlaff & Wegner, 2000) and from studies of interest were carefully scrutinised.

Current Understanding Of Thought Suppression

Thought suppression is defined as a conscious attempt to keep certain thoughts out of awareness (Wegner, Schneider, Carter, & White, 1987). Unpleasant thoughts, ideas or images become the focus of avoidance as individuals attempt to suppress unwanted intrusive thoughts (Wegner, 1994). The experience of intrusive thoughts is reported in both clinical and non-clinical populations (Rachman, 1982). For example, Erdelyi and Goldberg (1978) found that 99% of surveyed college students reported to have tried on occasion to exclude distressing thoughts from consciousness in an effort to avoid the associated discomfort. However, research has also shown that thought suppression is a difficult task, irrespective of the thought suppressed (Wegner et al., 1987). In fact, attempts to suppress unwanted thoughts can lead to a paradoxical increase in the occurrence of the very thoughts that one is trying to suppress (Wenzlaff & Wegner, 2000).

Paradoxical Effects of Thought Suppression

The Basic Phenomena

Numerous studies have investigated the effects of thought suppression on subsequent thought recurrence within a laboratory context. The majority of these studies are essentially based on Wegner et al's (1987) seminal 'white bear' study, where for each participant, the number of target thoughts are recorded following a suppression manipulation. Wegner et al. (1987) instructed participants to either

verbalise or suppress thoughts about a white bear for 5 minutes. During the second phase of the experiment, those who were initially told to suppress their thoughts were required to express thoughts about a white bear, and vice versa. To measure the occurrence of the target thoughts, participants were required to verbalise their stream-of-consciousness into a tape recorder and ring a bell each time they had a thought about a white bear. The researchers found that the number of white bear thoughts recorded during the expression stage was significantly higher when participants had previously suppressed their thoughts, indicating that thought suppression leads to a subsequent resurgence in target thoughts. This was termed the 'rebound effect' (Wegner et al., 1987).

Various studies have replicated the rebound effect using various neutral suppression targets, such as green rabbits (Clark, Ball, & Pape, 1991) and vehicles (Lavy & van den Hout, 1990), indicating that thought suppression effects are fairly robust across a range of suppression material (Wenzlaff & Wegner, 2000). Furthermore, Wegner and Erber (1992) extended these findings to demonstrate that the rebound effect is further enhanced by the imposition of cognitive demands (e.g. time pressure, concurrent memory tasks). In their study, 56 undergraduate participants were instructed to either suppress or concentrate on a target thought (house, child, mountain or car) for 5 minutes. Following this, participants were required to continue to suppress or concentrate on their assigned target whilst performing a word association task for a further 5 minutes. Cognitive load was imposed by time pressure, whereby half the participants had ten seconds to respond during the word association task (low time pressure), and half had only three seconds to generate a word association (high time pressure). It was found that participants in the suppression condition gave the target word more often during the word association task under high

time pressure than participants attempting the word association task under low time pressure and those attempting to concentrate on the target. Wegner and Erber (1992) suggested that thought suppression renders a thought more accessible when cognitive control is undermined.

However, various methodological concerns have been identified with the design of the white bear paradigm. For instance, Wegner et al. (1987) used a Latin square design whereby participants were divided into two groups and either (a) suppressed the target thought first, then expressed it, or (b) expressed the target thought first, then suppressed it, to compare thought frequency across the suppression and expression groups. However, Clark et al. (1991) noted that participants who initially suppressed their thoughts had already engaged in thought monitoring for 5 minutes before they were instructed to express, whereas participants who expressed their thoughts first had just been introduced to the cognitive stimulus. Accordingly, an enhancement in the frequency of thoughts in the second interval for the suppress-first group may have been due to a greater level of familiarity with the thought monitoring procedure. Furthermore, studies using thought expression as a control condition introduce the possibility of ceiling effects which mask an immediate increase in thought frequency (Lavy & van den Hout, 1990) and also lack of ecological validity, since individuals rarely attempt to concentrate on neutral target thoughts in everyday life (Merckelback, Muris, van den Hout, & de Jong, 1991). To overcome these issues, Purdon and Clark (2000) suggest the use of a monitor-only control condition whereby participants are instructed to think about anything they like, and use personally meaningful cognitions as suppression targets, as a closer approximation of what would occur in everyday life.

Suppression of Personally Intrusive Thoughts

Another line of research has applied the white bear paradigm to investigate the more clinically relevant effects of suppressing personally meaningful material. Salkovskis and Campbell (1994) noted that studies using personally irrelevant target thoughts (e.g. white bears, green rabbits and vehicles) are difficult to apply to personally meaningful cognitions because the emotional impact of the target thoughts may affect the way they are processed, and also impact on motivation to engage in thought suppression strategies. Additionally, personally intrusive thoughts may differ in terms of their familiarity, how easy they are to imagine, and how frequently they have been previously suppressed (Kelly & Kahn, 1994). Luciano, Algarabel, Tomas, and Martinez (2005) postulated that suppression of personally meaningful thoughts may also be more complex than suppression of neutral stimuli, since emotional thoughts are associated with increased physiological arousal for both positive (e.g. Wegner, Shortt, Blake, & Page, 1990) and negative (e.g. Cioffi & Holloway, 1993) stimuli.

Magee and Zinbarg (2007) investigated the effects of thought suppression in a sample of 58 undergraduate students with high and low social anxiety traits. Participants were randomly assigned to either (a) suppress their thoughts about a negative social interaction, (b) focus on their thoughts, or (c) think about anything that came to mind. Results indicated that thought suppression and thought focusing increased the accessibility of thoughts about the negative social interaction, evidenced by a self-reported increase in the number of unwanted thoughts for all participants, regardless of social anxiety.

However, findings have been mixed in relation to whether suppression of personally relevant thoughts results in a rebound effect, with some studies

demonstrating no rebound in the number of target thoughts (e.g. Belloch, Morillo, & Giménez, 2004; Purdon, 2001) and others demonstrating a *decrease* in the number of target thoughts following suppression, denoting a 'reverse-rebound' effect (e.g. Cougle, Smits, Lee, Powers, & Telch, 2005; Kelly & Kahn, 1994).

Belloch et al. (2004) randomly assigned 87 undergraduate students to either suppress or not suppress (a) personally intrusive thoughts, or (b) thoughts about a white bear. Following this, all participants were instructed to not suppress their target thoughts. Results revealed that suppression attempts had no effect on the frequency of subsequent thought occurrence, although deliberate thought suppression efforts were associated with an increase in annoyance due to the failed suppression attempts. Furthermore, Purdon (2001) instructed 84 participants to identify their most upsetting thought, and imagine a scene involving the thought for 30 seconds. Following this, participants were randomly assigned to either a suppression or non-suppression group and received instructions to either suppress their target thought for 4 minutes, or not suppress any thoughts at all. In the second period, all participants were instructed to not suppress any thoughts for a further 4 minutes. To ensure that participants remained task-focused during the thought monitoring intervals, they were also required to complete a simple vigilance task by pressing the space bar on a computer keyboard whenever a letter appeared on the screen. Results did not provide support for the rebound effect, since suppression attempts were not associated with a subsequent increase in thought frequency. However, it is important to note that Purdon (2001) administered an easy vigilance task, whereas research has indicated that a cognitive load is required to enhance the rebound of target thoughts (Wegner & Erber, 1992). Accordingly, without sufficient cognitive load, the task may not have

been sensitive enough to find any differences in suppression related effects (Bratton, 2003).

Another line of research has demonstrated a 'reverse-rebound' effect following suppression of personally relevant thoughts. Cougle et al. (2005) instructed 138 undergraduate students with high social anxiety traits to either suppress or not suppress thoughts about presenting a controversial speech. This was followed by a monitoring period whereby all participants were instructed to think about anything that came to mind. Results revealed that thought suppression under conditions of heightened anxiety resulted in fewer thought intrusions compared to the non-suppression group. Additionally, Kelly and Kahn (1994) instructed 104 participants to write down their thoughts for 9 minutes whilst either trying not to think about their most pleasant or unpleasant intrusive thoughts (initial suppression condition), or whilst keeping their pleasant or unpleasant intrusive thoughts in mind (initial expression condition). Following this, participants were again instructed to write down their thoughts for 9 minutes, but this time the instructions were reversed whereby those who were initially told to suppress their thoughts were required to concentrate on them, and vice versa. Results indicated a reverse-rebound effect whereby participants who initially suppressed their thoughts reported fewer thoughts during the subsequent expression condition compared to those who initially expressed their thoughts. However, these results were not replicated in a follow-up study (Kelly & Kahn, 1994) which compared suppression of personally relevant thoughts with thoughts about a white bear. The procedure was identical to the first study, except that participants either thought about their most frequently occurring intrusive thought, or thought about a white bear. Results revealed a significant main effect for type of thought, whereby participants suppressing thoughts about a white bear experienced an

increase in target thoughts during the subsequent expression condition, whereas no rebound effect emerged following suppression of personally intrusive thoughts.

Several explanations have been proposed to account for the inconsistencies in research regarding the suppression of personally relevant thoughts. Firstly, studies do not typically control the content of the suppressed thought (e.g. Cougle et al., 2005; Kelly & Kahn, 1994; Purdon, 2001; Wegner et al., 1990) and therefore participants may have varied with regard to the emotional valence of the target stimuli they suppressed. This is a particular concern since research has indicated that valence of the suppression material (i.e. positive, neutral, negative) influences the degree of the rebound effect (Purdon & Clark, 2000). Furthermore, it may be difficult to identify target thought occurrences when the target stimuli are not directly defined, since the participants and the experimenter cannot reliably assess the relevance of various potentially related thoughts (Wenzlaff & Wegner, 2000). Another possible explanation involves the effects of practice (Fikretoglu, 2003; Kelly & Kahn, 1994). Intrusive thoughts occur frequently in everyday life (Wenzlaff & Wegner, 2000) and therefore an individual may develop techniques that are relatively effective for suppressing unwanted thoughts (Wegner, 1994). Accordingly, individuals may be better equipped to suppress personally intrusive thoughts in an experimental setting, compared to suppression of infrequently encountered thoughts supplied by experimenters (e.g. white bears, green rabbits, vehicles). Finally, it is possible that individuals expend more effort suppressing personally relevant targets in everyday life and therefore, may never completely relinquish suppression as instructed, thus precluding a rebound effect (Wegner & Gold, 1995). This is supported by Letarte, Ladouceur, Freeston, and Rheaume (1997), who found that providing incentives to

suppress thoughts can lead to increased persistence and extended short-term success during thought suppression tasks.

Studies investigating thought suppression using the white bear paradigm have predominantly used self-report data to measure preoccupation with the target thoughts, which is likely to be confounded by demand characteristics, particularly if the target thoughts are personal, socially undesirable or embarrassing (Hermans, Pieters, & Eelen, 1998). Accordingly, Wenzlaff and Wegner (2000) emphasised the importance of using measures of automatic cognitive processes such as Stroop interference, word completion or sentence unscrambling in addition to self-report data to reduce the confound of self-report bias.

Effect of Thought Suppression on Automatic Cognitive Processes

Studies based on measurements of automatic cognitive processing have been used to provide an objective measure of the effects of thought suppression. Kozak, Sternglanz, Viswanathan, and Wegner (in press) investigated the effects of thought suppression on participants' ability to recall information on a subsequent word association task. Participants were initially instructed to suppress the words *chair* or *rug* for 5 minutes. Following this, they were required to generate word associations for each of two given target words (*table* and *carpet*), whereby the word that was initially suppressed was semantically related to one of the two target words. Results revealed that participants produced fewer responses, and experienced a greater sensation of being mentally blocked, when attempting to produce associates for a target word that was semantically related to the word they initially suppressed. In a second experiment, Kozak et al. (in press) instructed participants to either suppress or concentrate on a series of words prior to attempting a word fragment completion task.

During the task, participants were shown word fragments (e.g. A_L_ _GY) and were instructed to write the complete word (e.g. ALLERGY) on a blank sheet of paper. The researchers found that when participants suppressed a word (e.g. ANALOGY) that was orthographically related to the target word (e.g. ALLERGY), they took longer to identify the target word during a subsequent word fragment completion task (e.g. "A_L_ _GY"). The researchers concluded that suppression of semantically and orthographically related material produces a rebound effect which can obstruct performance on subsequent tasks.

In the modified Stroop task (Stroop, 1935), participants are required to name the colour of a printed word whilst attempting to ignore the meaning of the word itself. It is proposed that the increased attention required to process previously suppressed words requires greater processing capacity, therefore resulting in longer reaction times on the competing colour-naming task (Dobson & Dozois, 2004). Wegner, Erber, & Zanakos (1993) investigated the impact of suppressing mood-related thoughts on Stroop reaction time. Participants were required to write down their thoughts about a past success or failure for 5 minutes, whilst either suppressing or concentrating on their experience. Following this, participants began a Stroop colour-naming task whilst rehearsing a 9-digit number. Results showed that suppression of personally relevant material under cognitive load resulted in increased accessibility of the thoughts they intended to suppress, evidenced by slower reaction times on the Stroop task.

Why do Paradoxical Effects Occur?

To explain the paradoxical effects observed in thought suppression studies, Wegner et al. (1987) proposed an 'environmental cueing' hypothesis, which suggests

that individuals attempt to distract themselves from the target thought using cues in the immediate environment. However, when thoughts are expressed, the environmental cues serve as reminders of the suppressed stimuli and thus induce a rebound effect. To investigate the environmental cueing hypothesis, Wegner et al. (1987) repeated the original white bear study and instructed participants to distract themselves during the suppression condition with a single cue, a red Volkswagen. In support of the environmental cueing hypothesis, results revealed that use of a single distracter led to fewer occurrences of the target thought during the subsequent expression condition, compared to when no distracter instructions were given, suggesting that environmental cues become associated with the target thought, resulting in the observed rebound effect.

Wegner (1994) extended the environmental cueing hypothesis and formulated the 'ironic process theory' to account for the effects of cognitive load on subsequent thought frequency. According to this theory, thought suppression involves the interplay of two cognitive processes: the 'intentional operating process' and the 'ironic monitoring process'. The intentional operating process searches for distracters from the suppression target (i.e. cognitions or environmental stimuli that are unrelated to the suppressed thought), whilst the ironic monitoring process simultaneously scans for evidence of the unwanted thought and alerts the individual if suppression has not been achieved. The intentional operating process is part of conscious awareness and involves deliberately selecting alternative distracting thoughts from memory to achieve thought suppression. Accordingly, this operating process requires conscious effort, remains in awareness and can be intentionally initiated or inhibited (Bargh, 1989). In contrast, the ironic monitoring process is not part of conscious awareness. It is ironic in the sense that it opposes the overall goal of suppression by remaining

vigilant for occurrences of the target thought to determine when the intentional operating process should be reactivated. The ironic monitoring process requires relatively less effort and cannot be intentionally inhibited whilst cognitive control is maintained. In this sense, it shares some similar properties with automatic mental processes (Bargh, 1989). Wegner (1992) hypothesised that the paradoxical effects of thought suppression occur when the operating process is voluntarily terminated by the individual or disrupted by cognitive load, thus impeding the search for distracters. It was proposed that cognitive load disables the conscious and effortful operating process, thus attenuating participants' ability to suppress their thoughts and leaving the automatic monitoring process searching for the unwanted thought (Wenzlaff & Wegner, 2000). In turn, this results in an increased accessibility of the target thought and the individual is presented with a failed suppression attempt.

Support for the existence of two sub-processes during thought suppression is provided by Wegner (1992) who found that during stream-of-consciousness reporting, participants described an effortful search for 'anything but' the target thought, and at the same time they also reported intrusions of the unwanted thought, indicating that some part of the mind continued to be engaged with the suppression topic. This supported the notion that an unconscious monitoring process runs in parallel to the operating process. However, Shoham and Rohrbaugh (1997) criticised the ironic process theory, since it is not specific regarding if and when the monitoring process stops its search for occurrences of the target thought. Therefore, the theory is unable to address questions pertaining to the cumulative impact of repeated suppression and the role of practice on suppression attempts (Monteith, Sherman, & Devine, 1998). Furthermore, the ironic process theory does not consider the influence of motivational

states, or whether individual differences in the tendency to use particular thought control strategies mediate the rebound effect (Wells & Davies, 1994).

Summary of Thought Suppression Research

Research has demonstrated that thought suppression attempts frequently lead to a paradoxical resurgence of suppressed thoughts. However, research investigating the effects of suppressing personally intrusive thoughts has revealed inconsistent results, and various methodological criticisms of the studies have been considered. For example, studies based on self-report data may be confounded by response bias, particularly if the target thoughts are considered personal or socially undesirable (Hermans, Pieters, & Eelen, 1998). Accordingly, Wenzlaff and Wegner (2000) emphasised the importance of using measures of automatic cognitive processes such as Stroop interference, to provide a more objective measure of the rebound effect.

The effects of thought suppression have also been explored within the context of psychopathology (Soetens, Braet, Dejonckheere, & Roets, 2006). Accordingly, this review will now shift focus to the clinical applications of thought suppression research.

Clinical Applications of Thought Suppression Research

Rebound effects have been studied extensively in a variety of clinical disorders, and thought suppression plays a key role in cognitive-behavioural models of depression (Wenzlaff & Bates, 1998), post-traumatic stress disorder (Shipherd & Beck, 1999) and in particular obsessive-compulsive disorder (OCD; Janeck & Calamari, 1999; Salkovskis & Campbell, 1994). In OCD, it is proposed that

obsessional and unwanted thoughts give rise to wilful suppression efforts. However, such suppression attempts often fail, leading to a decrease in mood and an increase in the accessibility of negative obsessional thoughts (Salkovskis, 1985, 1989, 1996, 1998). However, despite the fact that eating disorders are also characterised by obsessions and preoccupying thoughts (Anderluh, Tchanturia, Rabe-Hesketh, & Treasure, 2003), the role of thought suppression in such problems has been understudied and many researchers have expressed the need for more studies in this area (Herman & Polivy, 1993; Wenzlaff & Wegner, 2000).

Eating Disorders

Individuals with eating disorders are the most obvious at-risk group to develop obsessive food-related thoughts. Food and weight preoccupations are a core characteristic and diagnostic criterion for eating disorders (DSM-IV; American Psychiatric Association, 1994), whereby a vicious circle can arise in which a focus on food and weight increases the risk of eating problems, and the eating problems in turn maintain and increase the focus on food and eating (Cooper & Todd, 1997; Jones-Chesters, Monsell, & Cooper, 1998).

Individuals with eating disorders often show high levels of dietary restraint, denoting the intention to restrict food intake in order to achieve weight reduction or weight maintenance (Gorman & Allison, 1995; Herman & Mack, 1975). Dietary restraint is proposed to exacerbate food-related preoccupations (Ward, Bulik, & Johnston, 1996) and has been identified as a risk factor in the development of eating disorders (Soetens, Braet, & Moens, 2008; Stice, Cameron, Killen, Hayward, and Taylor, 1999). Herman and Mack (1975) found that highly restrained eaters frequently use thought suppression as a way of controlling unwanted thoughts about

food. These thought suppression strategies have been shown to undermine cognitive control of eating behaviour, leading to an increased risk of binge eating (O'Connell, Larkin, Mizes, & Fremouw, 2005). Accordingly, thought suppression is proposed to play a key role in the maintenance of unsuccessful dietary restraint, whereby thought suppression failures increase the focus on food, which leads to an increased risk of binge eating and further attempts at thought suppression (O'Connell, 2002).

Dietary Restraint

Dietary restraint is widespread among young women (Baptisa, Sampaio, Carmo, Reis, & Galvao-Teles, 1996) and is thought to be a relatively stable and habitual style of eating and cognition over the adult lifespan (Tiggemann, 2004). Restrained eaters are defined as individuals who are consciously aware of monitoring their food intake, whereas unrestrained eaters are defined as individuals who are not concerned with monitoring their quantity of food consumption (Herman & Mack, 1975). Dietary restrainers share similar stressors to individuals with eating disorders, such as negative feelings about body weight and preoccupations with food-, body- and weight-related thoughts (Delinksy & Wilson, 2008). Indeed, numerous studies have demonstrated an association between dietary restriction and food-related preoccupations. For instance, Mann and Ward (2001) found that when participants were prohibited to eat a particular food for 5 days, the urge to eat the target food significantly increased, and Stewart and Samoluk (1997) found that dietary restraint was more strongly associated with selective processing of food cues than short-term food deprivation. Although restrained eaters frequently attempt to control food-related thoughts (Herman & Mack, 1975), thought control endeavours are ultimately unsuccessful and result in paradoxical effects on behaviour and cognition.

Impact of Food Preoccupations on Behaviour

According to restraint theory (Herman & Mack, 1975), dietary restraint is the key determinant of eating style whereby restrained eaters cognitively control their eating behaviour under normal circumstances, but demonstrate anomalous eating patterns when cognitive control is undermined. Herman and Mack (1975) divided 45 female participants into high and low restrainers and randomly assigned them to either a preload or no preload condition. Participants allocated to the preload condition were instructed to consume a 7.5-oz chocolate milkshake and rate it according to taste. Following this, all participants were required to participate in a taste-test and rate the flavour of three types of ice cream. The containers of ice cream were then weighed to calculate the amount of ice cream consumed. Results revealed that unrestrained eaters showed caloric compensation by eating less after the milkshake preloads. In contrast, highly restrained eaters consumed more ice cream after the milkshake preload, compared to those in the no preload condition. Hence, attempts to control food cravings may make it more difficult for restrained eaters to refrain from eating, which ultimately results in behavioural excess (Polivy, 1998). A number of studies have replicated these findings using the Restraint Scale (RS; Herman, Polivy, Pliner, Threlkeld, and Munic, 1978) to classify participants as restrained or unrestrained eaters (e.g. Fedoroff, Polivy, & Herman, 1997; Polivy, Coleman, & Herman, 2005). Furthermore, results have been verified using a range of experimental disinhibitors, including ingestion of alcohol (Polivy & Herman, 1976), induction of dysphoric mood (Schotte, Cools, & McNally, 1990), distraction (Boon, Stroebe, Schut, & Ijntema, 2002) and olfactory cues (Fedoroff et al., 1997) (see Ruderman, 1986 for a review). This suggests that various disinhibitors can undermine cognitive control of eating behaviour, resulting in counter-regulatory behaviour (O'Connell et al., 2005).

An alternative explanation for the link between restrained eating and over consumption following a preload is that restrained eaters overeat due to the physiological consequences of food deprivation and that the preload simply acts as an 'appetiser' to stimulate hunger (Pietrowsky, Straub, & Hachl, 2003). Support for this suggestion may already have been provided by Polivy (1976), who divided 45 participants into restrained or unrestrained eaters using the RS and administered a chocolate pudding preload which was either high in calories (750 kcal) or low in calories (325 kcal). The researchers found that restrained eaters who consumed the high caloric preload and were subsequently told that it was high in calories, ate 61% more on a subsequent taste test, compared to restrained eaters who consumed the high caloric preload and were told that it was low in calories. In contrast, unrestrained eaters ate less on a subsequent taste test following the preload, regardless of actual or perceived caloric content. The researchers concluded that when restrained eaters believed that they had broken their diet boundary, cognitive control was undermined, thus increasing the accessibility of food preoccupations and resulting in behavioural disinhibition.

Studies have been relatively ubiquitous in demonstrating the experimental disinhibition effect among restrained eaters when participants are classified as restrained or unrestrained according to the RS (Herman et al., 1978). However, disinhibition among restrained eaters has not been demonstrated when participants are divided according to the restraint scale of the Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985, 1988) or the restraint scale of the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers & Defares, 1986) (Dritschel, Cooper, & Charnock, 1993). Furthermore, van Strien (1999) criticised the validity of the RS, since it contains 10 items that reflect restrained eating as well as

disinhibited eating and weight fluctuation (e.g. Do you eat sensibly in front of others and splurge alone?). Accordingly, Ouwens, van Strien, and van der Staak (2003) noted that the RS may be biased towards selecting restrained eaters with a high tendency towards disinhibition or overeating, whereas the restraint subscales of the TFEQ and DEBQ measure intention to restrict caloric intake. This suggests that the over consumption following a preload among restrained eaters is not related to restraint per se, but to a susceptibility towards disinhibition of restraint (Ouwens et al., 2003). Furthermore, it suggests that restraint theory may only be valid for a subpopulation of restrained eaters who show a tendency towards disinhibition.

In line with this, Westenhoefer (1991) suggests that dietary restraint is not a homogenous construct and that restrained eaters should be divided into two subpopulations: 'successful' or 'inhibited' restrainers, characterised by high restraint and a low tendency towards disinhibition; and 'unsuccessful' or 'disinhibited' restrainers, characterised by high restraint and a high tendency towards disinhibition. Disinhibition refers to the tendency to overeat and is often a consequence of dieting to lose weight (Herman & Polivy, 1984). Disinhibited restrainers are proposed to follow the predictions of restraint theory and become disinhibited following a high caloric preload, whereas inhibited restrainers are expected to maintain their restraint (Williams, Michela, Contento, Gladis, & Pierce, 1996). Support for this two-factorial classification has been derived using the TFEQ and DEBQ, which contain separate scales to measure restraint and tendency towards overeating (disinhibition in the TFEQ and emotional and external eating in the DEBQ). For instance, Westenhoefer, Broeckmann, Műnch, and Pudel (1994) randomly assigned 133 female participants to either a milkshake preload or no-preload condition, followed by an ice cream taste test. The researchers found that disinhibited restrainers scoring high on the restraint

and disinhibition subscales of the TFEQ ate significantly more following the preload, compared to inhibited restrainers, who ate the least amount of ice cream regardless of whether they consumed a preload or not. This indicated that the combination of high restraint and high disinhibition may be a better prediction of overeating than restraint per se (van Strien, Cleven, & Schippers 2000).

Preload studies using milkshakes have been criticised by Ogden and Wardle (2006) for their limited cross-cultural validity, since in the UK, milkshakes are not perceived as high caloric threats to the same degree as in North America. In response, Pelchat (1997) suggested that chocolate is the most frequently craved food, and hence chocolate preloads would be a more valid experimental disinhibitor. Furthermore, Johnston, Bulik, and Anstiss (1999) noted that direct measurements of food consumption may not be accurate due to the social norms and pressures associated with eating in public. Accordingly, another line of research has investigated the impact of food-related preoccupations among restrained eaters on automatic cognitive processes.

Impact of Food Preoccupations on Cognitive Processes

Cognitive processing differences based on attentional biases of food and weight-related stimuli can serve as an objective measure for assessing information processing biases among restrained eaters (Dobson & Dozois, 2004). Recently, investigators have used the modified Stroop paradigm to evaluate cognitive processes in psychopathology, whereby studies make comparisons between clinical and general population samples to develop knowledge about information-processing mechanisms among diverse clinical populations (Williams, Mathews, & MacLeod, 1996). Research shows that individuals generally demonstrate an attentional bias towards

emotionally relevant words, which interferes with colour naming and results in longer colour-naming responses compared to neutral words (Williams et al., 1996)

Stroop interference for food and body words has been observed among restrained eaters, suggesting that dietary restrainers are particularly concerned with food- and body-related stimuli (Dobson & Dozois, 2004). For instance, Green and Rogers (1993) contrasted colour-naming latencies for food and body words with neutral words in a sample of 13 current dieters, 27 low restrainers and 15 high restrainers, classified using the restraint scale of the DEBQ. The researchers found that high dietary restrainers and current dieters had significant colour-naming disruptions for food- and body-related words compared to neutral words. No differences in colour naming were found for the low restraint group. Additionally, Ogden and Greville (1993) found slower colour naming of food and body size words among restrained eaters compared to unrestrained eaters following consumption of a high calorie preload. However, no difference was found between the two restraint groups in the no-preload condition. The researchers concluded that the preload increased preoccupying thoughts about food, thus interfering with response times on the Stroop task.

A parallel-distributed processing model (Cohen, Dunbar, & McClelland, 1990) has been proposed to account for the observed Stroop effects (Williams, Watts, MacLeod, & Mathews, 1997). According to this model, Stroop information is processed via several pathways that work in parallel to process word and colour stimuli (see Figure 1). Each pathway has input units representing colours or words, intermediate units, and output units to name the colour or read the word. Interference occurs when dissimilar patterns of activation converge on a single point of intersection, such that increasing activity in the colour pathway and reducing activity

in the word pathway enables the individual to name the colour of the word, rather than the word itself. In relation to dietary restraint, interference for colour-naming food words occurs because individuals experience preoccupying thoughts about food, which increases the resting activation level of input units representing food words and results in greater relative interference at the output stage when attempting to colour-name a salient word (Williams et al., 1997). Furthermore, preoccupying thoughts about food often result in the food-related input units being practiced more frequently, thus further increasing interference at the output stage (Williams et al., 1997).

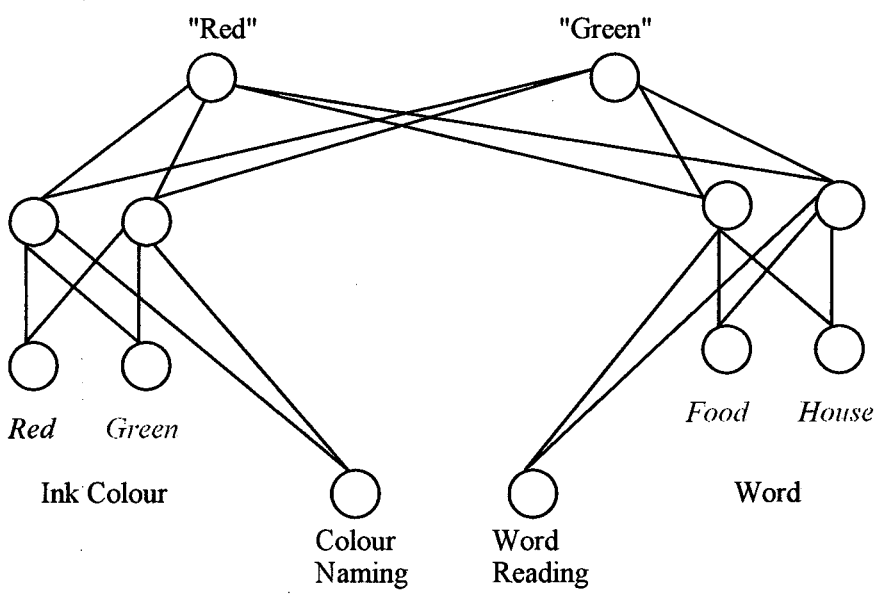

Figure 1. Diagram of Cohen et al's (1990, p.336) parallel-distributed processing model, showing connections between input units, intermediate units and response units. Task demands connect to intermediate units and modulate processing by adjusting the resting activation level and responsiveness of intermediate units.

However, another line of research has failed to demonstrate an attentional bias for eating-related stimuli among restrained eaters. For instance, Jansen, Huygens, and

Tenney (1998) found no evidence of Stroop interference in a sample of 13 high restrainers and 15 low restrainers for body shape and weight-related words. However, the researchers used a small sample size and did not assess response latencies to food words. Additionally, Sackville, Schotte, Touyz, Griffiths, and Beumont (1998) compared Stroop performance among 20 anorexic inpatients, 33 low restrainers and 20 high restrainers (as classified with the RS). The researchers found slower reaction times among the anorexic inpatients for high calorie food words, but no difference between the two restraint groups. Furthermore, no attentional bias was found among anorexic women for low calorie food words or for valenced emotion words, suggesting that Stroop procedures assess relevant areas of concern among individuals with eating disorders.

Overall, these studies indicate that it is unclear, on the basis of research to date, whether an attentional bias is a consistent facet of dietary restraint. This is perhaps surprising, since in general, slower response latencies on the Stroop task occur when words match the content of participants' current concerns (Jansen et al., 1998), and Wilson and Smith (1989) demonstrated that highly restrained eaters experience preoccupying thoughts about food and continuously worry about their body shape and weight, to the extent that they cannot be distinguished from eating disordered participants on ratings of body dissatisfaction. Attempts to explain this apparent contradiction have focused on inconsistencies between studies in the presentation of Stroop stimuli. For instance, food and shape concerns represent different aspects of eating psychopathology, yet the majority of research does not distinguish between them appropriately by presenting both word types together (Cooper & Fairburn, 1992). Furthermore, Jansen et al. (1998) confounded body- and weight-related words, hence individual biases for the two word types could not be revealed. Studies have

also been criticised for presenting stimulus words in blocks according to stimulus word category (e.g. Green & Rogers, 1993; Ogden & Greville, 1993; Sackville et al., 1998). Blocks of stimulus words have been found to increase response latency compared to random presentation, as the procedure is conducive to rumination effects (Lavy & van den Hout, 1993). Accordingly, reaction time is likely to result from a combination of attentional bias and a post-attentional summation or rumination effect (Lavy & van den Hout, 1993). Furthermore, word categories are often not matched for emotional valence (Perpiná, Leonard, Treasure, Bond, & Banos, 1998); participant samples are not consistently matched for age (e.g. Ben-Tovim & Walker, 1991) despite research demonstrating a relationship between age and Stroop interference (Seddon & Waller, 2000); and studies often comprise small sample sizes, thus reducing the ability to detect differences between samples and increasing the likelihood of type 2 error (Kazdin, 1994).

It should be noted that studies investigating an attentional bias among restrained eaters have focused exclusively on dietary restraint and have not considered the impact of disinhibition; and it is currently unclear how this combination of dietary restraint and disinhibition impacts on cognitive processing. It may be that participants with high restraint and high disinhibition show increased response latencies in response to food- and body-related words on the Stroop task, compared to individuals with high restraint and low disinhibition. This would support preload studies demonstrating that the behavioural effects of dietary restraint are primarily due to a tendency towards disinhibition, rather than restraint per se.

Despite these inconsistencies in the research, preoccupying thoughts about food among restrained eaters appear, in certain circumstances, to result in behavioural disinhibition and deplete cognitive resources otherwise available for non-dieting tasks

(Jones & Rogers, 2003). Although further research is required to address methodological criticisms and further differentiate between the effects of restraint and disinhibition, the paradoxical effects of preoccupying thoughts are thought to parallel the rebound effect in the thought suppression literature (O'Connell et al., 2005; Soetens & Braet, 2006). Accordingly, researchers have explored the role of thought suppression within the context of dietary restraint to explain the paradoxical behavioural and cognitive effects associated with dietary restraint.

Thought Suppression and Dietary Restraint

A common strategy to deal with intrusive thoughts and preoccupations is to try and suppress them (Wegner, 1994). However, given the ironic effects believed to be associated with thought suppression, this presumed safety behaviour may actually fuel an exacerbation of food-related thoughts (Ward et al., 1996). Furthermore, Wenzlaff and Wegner (1998, 2000) demonstrated that individuals who are highly motivated to control their cravings (e.g. alcohol, smoking, drinking, food) are often the very ones for whom suppression attempts backfire, both in thoughts and behaviour. Such a strong motivation is characteristic of restrained eaters, given their intention not to eat particular foods. Accordingly, dietary restrainers may be particularly susceptible to a rebound of food-related thoughts (Bonifazi & Crowther, 1996) and cognitive strategies such as thought suppression may actually heighten the restrained eater's vulnerability to binge on 'forbidden' foods (Herman & Mack, 1975).

Research investigating the effects of suppressing personally intrusive thoughts provides a useful framework for conceptualising the effects of suppressing thoughts about food (Dejonckheere, Braet, & Soetens, 2003). Accordingly, O'Connell et al. (2005) applied a modified version of the white bear paradigm (Wegner et al., 1987) to

investigate the suppression of food and eating-related thoughts among restrained and unrestrained eaters. During the first stage of the experiment, half the participants received a high calorie milkshake preload. Following this, all participants were randomly assigned to either a suppression or non-suppression group where they were required to either suppress their thoughts about food and eating, or verbalise all thoughts that came to mind. During the final stage, all participants were instructed to express their thoughts. Results revealed that instructions to suppress resulted in an immediate enhancement in the number of target thoughts among restrained eaters, although no rebound effect was found following the suppression period. Additionally, Dejonckheere et al. (2003) investigated the effects of thought suppression and dietary restraint on subliminally and supraliminally presented food words. Female undergraduate students (N=33) were initially required to think aloud about food for 5 minutes, whilst either suppressing or expressing their thoughts about sweets. Following this, all participants completed a modified Stroop task which consisted of sweet-related words and neutral words presented either supraliminally or subliminally on a computer screen. Results revealed that participants in the suppression condition showed an attentional bias for subliminally presented sweet-related words. No difference was found between the suppression groups for supraliminally presented words and there was no effect of dietary restraint on Stroop reaction time. However, the study comprised a small sample size which may not have been sufficient to detect differences in response time between the two restraint groups.

It should be noted that the majority of studies investigating thought suppression among restrained eaters have not considered the role of individual differences in thought suppression attempts. To address this issue, Oliver and Huon (2001) divided 77 females into high and low disinhibitors according to their scores on the TFEQ.

Participants were instructed to monitor their thoughts for 5 minutes, then either suppress or express their thoughts about food and eating for a further 5 minutes. The number of food-related thoughts was monitored using a button press device. Results indicated that disinhibition was not associated with a rebound of food-related thoughts, although high disinhibitors experienced increased anxiety and distress in relation to their thoughts about food compared to low disinhibitors. Furthermore, high disinhibitors were more likely to use punishment and worry strategies, which correlated positively with ratings of distress, anxiety and perceived thought frequency. The researchers suggested that 'punishment' and 'worry' strategies may enhance the rebound effect among disinhibited eaters. However, further research is required to investigate whether the rebound effect is mediated by thought control strategies among inhibited and disinhibited restrainers.

Research findings to date indicate that when dietary restraint and disinhibition are studied independently, suppression of food- and eating-related stimuli does not result in a rebound of unwanted thoughts. This is somewhat surprising, since a rebound effect following thought suppression has been shown for personally relevant cognitions (e.g. Klein, 2007; Wegner et al., 1993; Zeitlin et al., 1995), and restrained eaters are concerned with their weight and dietary intake (Vartanian, Herman, & Polivy, 2006) and frequently experience a preoccupation with food- and eating-related thoughts (McClelland, Kemps, & Tiggemann, 2005). Furthermore, suppression of emotional material results in a stronger rebound effect compared to neutral stimuli (Petrie, Booth, & Pennebaker, 1998) and high disinhibitors are reported to experience increased levels of anxiety and distress in relation to their food-related thoughts compared to low disinhibitors (Oliver & Huon, 2001). To explain this apparent contradiction, it is possible that an exclusive focus on dietary restraint (e.g. O'Connell

et al., 2005; Dejonckheere et al., 2003) or disinhibition (e.g. Oliver & Huon, 2001) may underestimate the effects of dietary restraint, disinhibition and thought suppression on cognitive processes (van Strien, 1999). Accordingly, suppression of food-related stimuli among disinhibited restrainers should result in a larger rebound effect compared to inhibited restrainers and unrestrained eaters. A study by Soetens, Braet, Dejonckheere, and Roets (2006) provides support for this view. 77 female undergraduates were divided into low restrainers, inhibited restrainers and disinhibited restrainers and randomly assigned to either a suppression or non-suppression condition. During the initial phase of the experiment, all participants were instructed to think about anything that came to mind. During the second phase, half the participants were instructed to not think about food and eating (suppression condition) whereas the other half were instructed to think about anything that came to mind (non-suppression condition). Following this, all participants were instructed, once again, to think about anything that came to mind. Participants recorded their target thoughts throughout the experiment by clicking a button each time they had a thought about food or eating. It was found that disinhibited restrainers reported using thought suppression techniques more frequently and were the only group to show a rebound of food- and eating-related thoughts, evidenced by a higher number of button clicks during the final experimental phase. However, limitations of the study should be considered. For example, the researchers used self-report measures to assess the rebound effect, which may have been confounded by response bias, and the study did not assess the effects of thought suppression, dietary restraint and disinhibition on task performance.

Summary

Overall, it can be seen that individuals with high dietary restraint experience a preoccupation with food-related thoughts, although the actual effect of these preoccupations on cognitive processing remains unclear. Explanations for the inconsistent results focus on methodological criticisms of the literature and the exclusive focus on either dietary restraint or disinhibition on cognitive processes. For instance, recent studies have suggested that a combination of high dietary restraint and high disinhibition results in a resurgence of food-related preoccupations following thought suppression which increases the likelihood of behavioural disinhibition when cognitive control is undermined. However, further research is required to determine the effects thought suppression, dietary restraint and disinhibition on automatic cognitive processes, and verify the role of individual differences in thought control strategies on behavioural and cognitive processes.

Clinical Implications

Recent applications of the thought suppression paradigm to individuals with obsessive-compulsive disorder (Tolin, Abramowitz, Przeworski, & Foa, 2002) and post-traumatic stress disorder (Vázquez, Hervás, & Pérez-Sales, in press) provide support that the negative consequences of thought suppression observed in the laboratory may apply equally well to clinical populations. In line with this, Weakland, Fisch, Watzlawick, and Bodin (1974) devised the Palo Alto model of brief therapy based on identifying and interrupting ironic processes that occur when repeated attempts to resolve a problem in fact maintain it or make it worse. The model proposes that ironic processes are ubiquitous and occur in a range of situations, such as when trying harder to fall asleep keeps an individual awake and when encouraging

a depressed partner to cheer up results in more despondency (Rohrbaugh & Shoham, 2001). Accordingly, a vicious cycle is formed whereby the harder one tries to solve the problem, the greater the problem becomes (Weakland et al., 1974). In the field of eating disorders and dietary restraint, the model emphasises the importance of identifying attempts to suppress thoughts about food, and either encourage the individual to concentrate on their food-related thoughts or engage in distraction techniques (Rohrbaugh & Shoham, 2001). However, further research is required to investigate the effectiveness of focusing on interrupting ironic processes within a therapeutic context (Rohrbaugh & Shoham, 2001).

Future research

Further research is required to investigate whether individual differences in the use of thought control strategies mediate the rebound effect and whether 'successful' and 'unsuccessful' attempts at restraint translate into differential effects on cognitive performance. Furthermore, the long-term impact of food and eating-related thought suppression among restrained eaters remains unclear. Accordingly, longitudinal research is required to investigate the behavioural consequences of dietary restraint and thought suppression on subsequent food intake.

Conclusion

Thought suppression is common strategy used among both clinical and non-clinical populations to keep unpleasant and unwanted thoughts out of awareness (Wenzlaff & Wegner, 2000). However, research has demonstrated that thought suppression can lead to a paradoxical increase in the very thoughts that one is trying to suppress (Wegner et al., 1987). The ironic process theory (Wegner, 1994) is

currently the most widely accepted account of the effects of thought suppression (Wenzlaff & Wegner, 2000), although various criticisms include its inability to predict the role of repeated suppression attempts or whether various thought control strategies can mediate the rebound effect (Wells & Davies, 1994).

More recently, researchers have explored the role of thought suppression within the context of dietary restraint. Restrained eaters are particularly susceptible to food-related preoccupations and frequently attempt to control their thoughts relating to food (Bonifazi & Crowther, 1996). Accordingly, highly restrained individuals are expected to be particularly susceptible to a rebound of food-related thoughts compared to unrestrained eaters. However, research has revealed inconsistent results and various limitations of the studies have been proposed. Furthermore, it is suggested that restrained eaters should be subdivided into inhibited restrainers and disinhibited restrainers based on a combination of restraint and disinhibition scores (Westenhoefer et al., 1991), as disinhibited restrainers may be particularly vulnerable to a rebound of food-related thoughts, whereas inhibited restrainers are considered to be more successful in their attempts at restraint.

An understanding of the role of thought suppression in the maintenance of dietary restraint and disinhibition will contribute to both literature bases by further explicating the cognitive mechanisms that enhance or attenuate the rebound effect. Further studies are required to investigate the differential effects of disinhibition and restraint on cognitive task performance and determine whether individual differences in the use of thought suppression techniques mediate the rebound effect.

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The Effects of Thought Suppression, Dietary Restraint and Disinhibition on Stroop Performance

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Abstract

The aim of the present study was to investigate the effects of thought suppression, dietary restraint and disinhibition on Stroop performance. Furthermore, the study looked at differences in how often participants use thought suppression as a strategy to cope with unwanted thoughts and in their use of specific thought suppression techniques. Ninety-six female undergraduates classified as low restrainers, inhibited restrainers and disinhibited restrainers were required to either suppress or not suppress thoughts about personally relevant material (food) or neutral stimuli (houses) prior to completing a modified Stroop task. Results revealed that, contrary to predictions, thought suppression *decreased* reaction time on the Stroop task. Furthermore, there was no effect of dietary restraint on Stroop performance. It was found that disinhibited restrainers reported a higher tendency to suppress their thoughts, experienced higher levels of anxiety and were less likely to use reappraisal strategies to control unwanted thought intrusions. It was concluded that Stroop performance does not vary as a function of dietary restraint and disinhibition and that further research is required to investigate individual differences in thought control techniques between the restraint groups.

Keywords: intrusive thoughts, thought suppression, dietary restraint, disinhibition, Stroop interference

Effects of Thought Suppression, Dietary Restraint and Disinhibition on Stroop Performance

Thought suppression is a mental control technique that involves strategic attempts to keep unwanted thoughts, ideas and images out of awareness (Wegner, 1994). However, whether attempting not to think about a traumatic event, or simply trying to avoid thoughts about 'forbidden' foods whilst on a diet, research has shown that thought suppression is a difficult task and frequently results in a paradoxical increase in the very thoughts that one is trying to suppress (Wegner, Schneider, Carter, & White, 1987). This phenomenon is termed the 'rebound' effect (Wegner et al., 1987).

Rebound Effects

Numerous studies have demonstrated the paradoxical nature of thought suppression attempts. In Wegner et al.'s (1987) seminal 'white bear' study, participants were randomly assigned to a suppression or expression group and instructed to either suppress their thoughts about a white bear, or verbalise their thoughts about a white bear for 5 minutes. Following this, those who were initially required to suppress their thoughts were instructed to express their thoughts, and vice versa. Results revealed that participants who initially suppressed their thoughts experienced a resurgence of target thoughts during the subsequent expression period, compared to those who initially expressed their thoughts. The researchers concluded that thought suppression leads to a subsequent resurgence in target thoughts. Various studies have replicated these results using a range of neutral suppression targets (e.g. Clark, Ball, & Pape, 1991; Lavy & van den Hout, 1990), suggesting that the rebound effect is fairly robust across a range of suppression material (Wenzlaff & Wegner,

2000). Furthermore, results have been extended to demonstrate that the rebound effect is further enhanced by the imposition of cognitive demands, such as time pressure or concurrent memory tasks (Wegner & Erber, 1992; Wegner, Erber, & Zanakos, 1993) and when the suppressed thoughts are relevant to current concerns (e.g. McNally & Ricciardi, 1996), although some controversy about this issue still remains (see Abramowitz, Tolin, & Street, 2001).

Studies based on the white bear paradigm have been criticised for using self-report data to measure the rebound effect, which may be confounded by demand characteristics, particularly if the target thoughts are personal, socially undesirable or embarrassing (Hermans, Pieters, & Eelen, 1998). Accordingly, Wenzlaff and Wegner (2000) emphasise the importance of using measures of automatic cognitive processes in addition to self-report data to provide a more objective measure of the rebound effect.

Effects of Thought Suppression on Stroop Performance

The Stroop task (Stroop, 1935) has been frequently used as a measure of attentional bias. The modified Stroop procedure involves colour naming emotional words, whilst attempting to ignore the meaning of the word itself. It is proposed that longer reaction times (RTs) to emotional words that are relevant to the specific disorder being studied (e.g. alcohol words for substance misuse samples and food words for eating disordered participants) indicate that the word's meaning is distracting and requires greater processing capacity (Dobson & Dozois, 2004).

Klein (2007) investigated the effects of suppressing neutral and personally relevant material in a sample of thirty-eight abstinent alcoholics and non-alcoholics. During the first stage of the experiment, participants were randomly assigned to either

a suppression or an expression group and required to suppress or concentrate on their thoughts about alcohol (personally relevant material) or houses (neutral material) for 5 minutes. Following this, all participants completed a modified Stroop task whilst rehearing an 8-digit number. Results revealed that suppression of thoughts about alcohol resulted in significantly longer RTs to alcohol-related words on the Stroop task, compared to RTs following the thought expression task. This effect was particularly enhanced for the abstinent alcoholic group, suggesting that suppression of personally relevant thoughts results in a larger rebound effect than suppression of personally irrelevant material. Furthermore, no rebound effect was observed following suppression of neutral stimuli for either the abstinent alcoholic or non-alcoholic groups.

Rebound effects have been explored in relation to a variety of clinical disorders, including depression (Wenzlaff & Bates, 1998), post-traumatic stress disorder (Shipherd & Beck, 1999) and obsessive-compulsive disorder (Janeck & Calamari, 1999; Salkovskis & Campbell, 1994). However, the role of thought suppression in eating related problems such as eating disorders and dietary restraint has been understudied and further research in this area is required (Herman & Polivy, 1993; Wenzlaff & Wegner, 2000).

Clinical Applications of Thought Suppression Research

Dietary Restraint

Dietary restraint is defined as an intention to restrict food intake by exerting conscious control over eating behaviour (Herman & Mack, 1975). The construct of dietary restraint plays an important role in weight reduction and weight maintenance (van Strien, 1999) and is common in Western society, with studies indicating that a

large proportion of women experience considerable dissatisfaction with their weight and body size (Rotenberg & Flood, 2000; Tiggemann, 2004). Numerous studies have demonstrated an association between dietary restriction and food preoccupations (e.g. Mann & Ward, 2001; Stewart & Samoluk, 1997) whereby a vicious circle can arise in which a focus on food and weight increases the risk of eating problems, and the eating problems in turn maintain and increase preoccupations with food (Cooper & Todd, 1997; Jones-Chesters, Monsell, & Cooper, 1998). Furthermore, cravings triggered by dietary restriction are an important precursor to overeating and binge eating (Polivy, Coleman, & Herman, 2005) and can also lead to impaired cognitive performance on a range of memory and RT tasks (e.g. Green & Rogers, 1993; Kemps & Tiggemann, 2005).

Recent studies suggest that some individuals with high dietary restraint are more prone to experience difficulties with food preoccupations and overeating than others (Ogden, 2003; van Strien, 1999). Furthermore, Westenhoefer (1991) suggests that restrained eaters can be subcategorised into those who are successful at their attempts at restraint and have a low tendency towards disinhibition (inhibited restrainers) and those who are relatively unsuccessful at restraint and have a high tendency towards disinhibition (disinhibited restrainers). Disinhibited restrainers are proposed to be particularly vulnerable to experiencing food preoccupations (Oliver & Huon, 2001), which leads to increased consumption when cognitive control is undermined, compared to low restraint and inhibited restraint groups (Westenhoefer Broeckmann, Műnch, & Pudel, 1994).

The obsessional nature of food-related preoccupations can be highly distressing and often results in feelings of guilt and shame (MacDiarmid & Hetherington, 1995). Accordingly, individuals frequently attempt to suppress their thoughts about food

(Ward, Bulik, & Johnston, 1996). However, whilst thought suppression may foster a temporary avoidance of 'forbidden' foods, it is ultimately an unsuccessful strategy which may exacerbate food-related preoccupations and result in a paradoxical resurgence of the suppressed thoughts (Wegner, 1994).

Thought Suppression and Dietary Restraint

Restrained eaters are thought to be particularly susceptible to a resurgence of food-related thoughts following thought suppression because food and weight-related issues are relevant to current concerns and individuals continually assert cognitive control, which results in a paradoxical increase in thoughts about food and eating when thought control is relinquished (Bonifazi & Crowther, 1996). However, research investigating food-related thought suppression has revealed inconsistent results. For instance, Dejonckheere, Braet, and Soetens (2003) demonstrated an attentional bias towards subliminally presented food words in a Stroop task following thought suppression, and Johnston, Bulik, and Anstiss (1999) found that suppression of chocolate-related thoughts resulted in an enhanced eagerness to obtain chocolate rewards, which potentially reflects an increased craving for chocolate following thought suppression. In contrast, other studies have found no evidence of food- and weight-related rebound effects among restrained eaters (Harnden, McNally, & Jimerson, 1997) or high disinhibitors (Oliver & Huon, 2001). However, it is possible that results underestimate the effects of thought suppression and dietary restraint, since studies have predominantly investigated the effects of dietary restraint or disinhibition on the rebound effect, which may confound successful dieting with disinhibited eating (van Strien, 1999). Accordingly, Soetens, Braet, Dejonckheere, and Roets (2006) investigated the effects of thought suppression among 77 female

undergraduates divided into three groups of low restrainers, inhibited restrainers and disinhibited restrainers. During the initial phase of the experiment, participants were instructed to think about anything that came to mind. Following this, half the participants were instructed to suppress their thoughts about food and eating, whereas the other half were instructed to think about anything that came to mind. Finally, all participants were instructed, once again, to think about anything that came to mind. It was found that disinhibited restrainers were the only group to show a resurgence of food- and eating-related thoughts following the suppression task. However, limitations of the study should be considered since the researchers used self-report measures to assess the rebound effect, which may have been confounded by response bias, particularly if the suppression material is considered to be personal or socially undesirable (Hermans et al., 1998); and the study did not assess the impact of thought suppression on task performance.

Thought suppression studies have also been criticised for failing to consider individual differences in thought suppression attempts, whereby studies using the Stroop task have focused primarily on the content of cognitions, rather than the internal cognitive mechanisms (i.e. metacognitions) that control and regulate thinking itself (Wells, 2000). Metacognitions are proposed to mediate the relationship between beliefs and self-regulation, and therefore it is possible that different metacognitive control strategies (e.g. thought re-appraisal, worry) have differential effects on suppression attempts; and whilst some strategies may be counterproductive, others may be quite successful (Wells & Davies, 1994). Accordingly, Soetens, Braet, and Moens (2008) conducted a questionnaire-based study with 105 overweight and normal-weight adolescents to determine the relationship between frequency of thought suppression failures and the type of thought control strategies used among a

sample of low restrainers, inhibited restrainers and disinhibited restrainers. The researchers found that disinhibited restrainers reported a higher number of thought intrusions during the suppression period (i.e. more frequent thought suppression failures), compared to low restrainers and inhibited restrainers, regardless of current weight status. Furthermore, participants who experienced thought suppression failures more frequently in everyday life were more likely to engage in distraction, worry and punishment techniques to achieve thought control. In line with this, Oliver and Huon (2001) reported that disinhibited eaters are more likely to use punishment strategies, which correlated with an increase in thought intrusions, as well as higher scores on measures of anxiety and depression. The researchers postulated that punishment techniques are unsuccessful thought control strategies, which produce failures in suppression attempts and lead to increased distress and a rebound of unwanted thoughts. However, results cannot be used to infer cause and effect, since it is also possible that anxiety and depression may increase the likelihood of suppression failures. Furthermore, no studies to date have investigated whether low restrainers, inhibited restrainers and disinhibited restrainers differ in their use of thought control strategies or whether this impacts on task performance. Thus, the role of individual differences in metacognitive thought control strategies has been understudied in research on restrained eating, and it is currently unclear how the combination of dietary restraint and disinhibition impacts on cognitive processing.

Aims

The present study aims to extend the scope of previous research by examining the effects of thought suppression, dietary restraint and disinhibition on Stroop performance. More precisely, the consequences of suppressing food words (personally relevant material) and house words (neutral material) on the frequency of such cognitions will be examined in a sample of low restrained, inhibited restrained and disinhibited restrained participants.

Method

All research was conducted within the parameters established by Southampton University's Psychology Department Ethics Committee (approval received 25/04/2007, see Appendix C) and in accordance with the British Psychological Society's Ethical Guidelines (1993).

Design

A 3 x 2 x 5 x 2 mixed factorial (Restraint group x Suppression task x Word type x Task topic) was adopted, whereby the restraint and suppression variables were between group factors and word type and task topic were within group factors. The first independent variable (restraint group) comprised three levels: (1) low restrainers, (2) inhibited restrainers, (3) disinhibited restrainers. The second independent variable (suppression task) comprised two levels: suppression versus non-suppression. The third independent variable (word type) consisted of five levels: (1) food-related words, (2) house-related words, (3) positive-emotional words, (4) negative-emotional words, (5) neutral words. The fourth independent variable (task topic) comprised two levels, (1) food condition, (2) house condition. The dependent variable was RT on the Stroop task.

Research Hypotheses

Stroop Data

The first four hypotheses aimed to investigate the extent to which RTs on a Stroop task are affected by thought suppression, dietary restraint and disinhibition. It was predicted that (1a) disinhibited restrainers would display significantly longer Stroop RTs following suppression of food-related thoughts than following

suppression of house-related thoughts; (1b) there would be no such difference for the low restrainers or inhibited restrainers, (2) thought suppression would significantly increase RTs on a Stroop task compared to a non-suppression task, (3a) disinhibited restrainers would display significantly longer RTs to food words following suppression of food-related thoughts compared to low restrainers and inhibited restrainer, (3b) there would be no difference in RTs to food words following suppression of food-related thoughts between low restrainers and inhibited restrainers, (4) there would be no difference between low restrainers, inhibited restrainers and disinhibited restrainers in the time taken to colour-name house words on a Stroop task regardless of suppression condition.

Questionnaire Data

The final two hypotheses related to the questionnaire data. It was predicted that (5) disinhibited restrainers would use thought suppression more frequently than low restrainers and inhibited restrainers, as measured by the WBSI (Wegner & Zanakos, 1994), (6) disinhibited restrainers would use more maladaptive thought control strategies compared to low restrainers and inhibited restrainers, as measured by the TCQ (Wells & Davies, 1994).

Controlling Potentially Confounding Variables

Consideration of confounding variables was necessary to maintain validity of the data. Presentation order of the food and house task topics was counterbalanced such that half the participants completed the food condition first and half the participants completed the house condition first. This aimed to reduce the possibility of practice effects. Furthermore, the number of mentions of the target thoughts ('food'

and 'house') was held constant to control for priming effects (Salkovskis & Campbell, 1994). Each experimental phase began with two buffer trials, and a further ten words were administered as practice items to ensure that participants fully understood the requirements of the task. No cues were present in the room. Measures of depression and anxiety were included to ensure that results were due to suppression and restraint rather than reflecting varying levels of anxiety and depression.

Participants

Participants included undergraduates from Southampton University who participated in return for course credits and were recruited through an online booking system and poster advertisements (see Appendix D).

231 participants were initially screened using an online questionnaire, which took approximately 10 minutes to complete. The screening questionnaire consisted of the Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1988), and questions about gender, age and participants' current and previous history of eating disorders or substance misuse. Female respondents with the highest and lowest scores on the restraint and disinhibition subscales of the TFEQ and who had no prior substance misuse or diagnosis of an eating disorder were chosen to take part.

The final sample consisted of ninety-six female participants[1]. Participants varied in age from 18 to 28 years, with a mean of 19.11 years (SD = 1.58). The mean BMI (Body Mass Index: weight/height x height) was 22.4 (SD = 3.27). Supplementary t-tests conducted between the screening sample and the final study sample did not yield any demographic differences in terms of age or TFEQ scores. However, the two

[1] To provide sufficient power to detect a medium difference between three independent groups (α = .05), whilst controlling for experimental manipulations (2 within group factors), it was estimated that a sample size of 52 participants per group was needed (Cohen, 1992).

groups did differ in terms of gender, whereby the screening sample comprised 6.49% male respondents and the final sample comprised only female participants.

In line with Stunkard and Messick (1985), participants were classified as low restrained or high restrained according to the median split on the restraint scale of the Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1988). Accordingly, participants who scored between 0-10 on the restraint scale were classified as 'low restrainers' and those scoring between 11-21 were classed as 'high restrainers'. Similarly, participants were classified as 'inhibited' or 'disinhibited' using a median split on the disinhibition scale of the TFEQ, whereby participants scoring between 0-8 were classified as 'inhibited' and those scoring between 9-16 were classed as 'disinhibited'. To determine whether individuals with high dietary restraint have different RTs on the Stroop task according to whether they are successful at restraint (inhibited restrainers) or unsuccessful at restraint (disinhibited restrainers), three groups were formed according to Westenhoefer's (1991) suggestions. This resulted in 32 low restrainers (low restraint, low disinhibition), 32 inhibited restrainers (high restraint, low disinhibition) and 32 disinhibited restrainers (high restraint, high disinhibition)[2]. The mean age of the three groups were 19.19 (SD = 2.15), 19.13 (SD = .98) and 18.91 (SD = 1.03) respectively. The mean age did not differ between the groups (F (2, 93) = .316, p =.729). The mean BMI of the three groups were 26.76 (SD = 30.07), 22.35 (SD = 2.81) and 23.49 (SD = 4.07) respectively. The mean BMI did not differ between the groups (F (2, 93) = .541, p =.584).

[2] In line with previous studies investigating dietary restraint and disinhibition (e.g. Soetens, Braet, Dejonckheere, & Roets, 2006), a forth group of low restraint, high disinhibited participants was not included in the sample. This was because the study was primarily concerned with exploring the effects of inhibited and disinhibited restraint on cognitive performance according to Westenhoefer's (1991) two-factorial classification of dietary restraint. Furthermore, an additional group would require a larger sample size which was beyond the time limitations afforded to the present study. Additionally, the possibility of including a non-restraint control group was considered (i.e. participants scoring '0' on the TFEQ restraint scale). However, again, this would have required a larger sample size and at this stage, it was considered more important to distinguish between the three *inhibition* groups, rather than to confirm differences between a low restraint and non-restraint group.

Exclusion Criteria

Males were excluded from the study because females are considered to be more susceptible to eating disturbances than men (Haller, 1992). Additionally, Moreira, de Almeida, and Sampaio (2005) identified different dietary intake and dietary regulatory patterns in male and female restrained eaters. Furthermore, focusing on female participants would allow for comparison of the present study to previous research on dietary restraint and thought suppression, which traditionally has included only female participants (e.g. Oliver & Huon, 2001; Soetens et al., 2006; Harnden, et al., 1996; Boon, Vogelzang, & Jansen, 2000).

Participants were excluded if they had been diagnosed with an eating disorder within the last three years, or if they had a current or previous history of substance misuse. This was in line with research demonstrating that eating disorders and substance misuse increase Stroop RT (e.g. Davidson & Wright, 2002; Drobes, Elibero, & Evans, 2006).

Materials

Measures

Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985, 1988)

The TFEQ, also known as the Eating Inventory, is a 51-item self-report questionnaire that measures three dimensions of eating behaviour: 'cognitive restraint' (21 items), 'disinhibition' (16 items) and 'hunger' (14 items). It has good criterion-related validity and internal consistency (Cronbach's alpha > .85; Gorman & Allison, 1995; Stunkard & Messick, 1988) and it is a widely used measure of eating

behaviours among studies of dietary restraint and disinhibition (e.g. Oliver & Huon, 2000; Ouwens, van Strien, & van der Staak, 2003; Soetens et al., 2006).

White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994)

The WBSI was administered as a measure of thought control and is designed to assess the chronic tendency to suppress unwanted intrusive thoughts. It consists of 15 statements with response items on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Responses are then summed to reveal a total score ranging between 15 and 75. Higher scores indicate a greater tendency to engage in thought suppression strategies. The WBSI has good reliability (Chronbach $\alpha = .89$) and adequate predictive and convergent validity, correlating with measures of obsessional thinking, sensitisation, anxiety and depression (Blumberg, 2000; Rassin & Diepstraten, 2003; Smári & Hölmsteinsson, 2001).

Thought Control Questionnaire (TCQ; Wells & Davies, 1994)

The TCQ is a 30-item questionnaire to assess metacognitive strategies used to control unwanted and unpleasant thoughts (see Appendix E). It provides indices of five factor analytically derived dimensions of metacognitive thought control: distraction, social control, worry, punishment and re-appraisal. The TCQ has adequate reliability and good internal consistency (Cronbach's alpha > .79) (Corcoran & Fisher, 2000). The five-factor structure has been replicated in clinical samples (Reynolds & Wells, 1999) and non-clinical samples (Wells & Davies, 1994) using confirmatory factor analysis. Permission was received from the authors to include the TCQ within the present study (see Appendix F).

Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996)

The BDI-II is a 21-item questionnaire that assesses characteristic attitudes and symptoms of depression. The BDI demonstrates high internal consistency, with a mean Chronbach alpha coefficient of .86 (Beck, Steer, & Garbin, 1988) and high content validity (Richter, Werner, Heerlim, Kraus, & Sauer, 1998). Hermann (1997) noted that the BDI-II correlates well with other measures of depression (indicating good concurrent validity), including the depression scale of the Hospital Anxiety and Depression Scale (HADS) (r = .62 to .73) and the Hamilton Psychiatric Rating Scale for Depression (r = .73).

Beck Anxiety Inventory (BAI; Beck & Steer, 1990)

The BAI is a 21-item questionnaire that measures anxiety. It has high internal consistency (Chronbach $\alpha > .92$) and good test-retest reliability (Beck, Epstein, Brown, & Steer, 1988). In addition, it has adequate concurrent validity whereby it correlates well with other measures of anxiety such as the Burns Anxiety Inventory (r = .86) and the anxiety scale of the HADS (r = .83) (Beck & Steer, 1991; Fydrich, Dowdall, & Chambless, 1992).

Experimental Questionnaire-1 (EQ-1)[3]

In line with Oliver and Huon (2001), the EQ-1 was designed by the researcher for the purpose of the study to determine subjective hunger as well as desire and urge to eat prior to the experimental task (Appendix G).

[3] The experimenter-designed questionnaires were piloted with an independent sample of 10 participants (see Appendix H for an outline of the procedure, and Appendix I for the questionnaire administered). Results of the pilot study indicated that the questions and instructions were easy to understand and that the layout was clear.

Experimental Questionnaire-2 (EQ-2)[3]

In line with Klein (2007), the EQ-2 was designed by the researcher to determine whether participants followed instructions as administered (i.e. suppression or non-suppression of food and house words). This included questions about how hard participants tried to follow the instructions, how often they suppressed their thoughts and how much control they had over their thoughts. Additionally, subjective measures of thought frequency and thought duration were taken (see Appendices J and K for the food and house versions, respectively). Furthermore, participants in the non-suppression condition were asked how easy it was to let their thoughts flow freely during the non-suppression phase (see Appendices L and M for the food and house versions, respectively).

Post-Experimental Questionnaire (PEQ)[3]

The PEQ was designed by the researcher to collect data regarding age, gender, height and weight (Appendix N). This was followed by questions about how often participants think about food and eating (range: 1 'not at all' to 5 'all the time') and how difficult they find it to control thoughts relating to food (range: 1 = 'no difficulty' to 5 'extreme difficulty').

Experimental Task

Stroop Task

The Stroop task (Stroop, 1935) provides a measure of the effects of selective processing on performance, whereby increased RTs have been used to indicate attentional bias (Dobson & Dozois, 2004).

Two pilot studies were used to devise the word lists included in the Stroop task, using an independent sample of 25 female undergraduates (see Appendix O for an outline of pilot studies 2 and 3, and Appendices P and Q for the questionnaires used in pilot studies 2 and 3 respectively). The food words used were: food, cake, cheese, ice cream, pizza, pasta, chocolate, barbeque. The house words used were: stairs, walls, roof, door, bricks, chimney, windows. The Stroop task also consisted of 8 neutral words: rubber, cloth, ruler, hat, towel, dice, folder, pencil; 8 positive words: happy, love, bliss, joy, laughing, delight, triumph, thrilled; and 8 negative words: awful, distress, rage, cruel, horrible, anger, torment, nasty. Emotional words were included as a control condition to check whether the food words were salient due to their relatedness to food per se, or due to their emotional connotation (Gotlib & McCann, 1984). Stroop stimuli were matched according to word frequency, whereby words with high frequency of usage in the English language were selected, based on word lists in previous similar studies (e.g. Boon, Vogelzang, & Jansen, 2000; Cooper & Todd, 1997; Dejonckheere, Braet, & Soetens, 2003). The possibility of matching Stroop stimuli according to the number of syllables was considered, since the number of word syllables has been shown to influence Stroop RT (Cox, Pothos, & Bauer, 2002). However, in line with previous research (e.g. Klein, 2007), word lists were derived using pilot data from a representative sample of participants to generate stimuli with the highest ratings of temptation to eat and relatedness to houses. This will be considered further in the discussion.

Each of the 40 words included in the Stroop task were combined into one list and randomly presented four times in blue, red, yellow and green, for a total of 160 trials. The initial two words presented were buffer trials and excluded from all analyses.

The Stroop task was presented via a Millennium Power Professional computer and Vision Master Professional 450 colour monitor. Each trial began with a fixation cross (+) that was presented for 750ms in the middle of the screen. The inter-stimulus interval was 1000ms whereby a word was presented 1000ms after the offset of the fixation cross. Words appeared in lower case Times New Roman font, size 36. Each word remained on the screen until a vocal response was detected. RTs were recorded using Presentation 10.2 software (Neurobehavioural Systems Inc.) via a microphone placed on a stand, 20cm in front of the participant. The computer recorded response latencies in milliseconds, synchronous with the presentation of each word, and also recorded whether or not the response was correct. Stroop instructions had a Flesch Reading Ease Score of 84.1, which corresponds to the readability level of 'easy' ("Flesch Reading Ease", 2008).

Procedure

The experiment was conducted individually, with the participant sitting 60cm in front of the computer. The duration of the experimental session was approximately 60 minutes. Prior to testing, participants were asked to refrain from eating for 3 hours. This was done to prevent participants from eating immediately before the experiment and to promote similar hunger levels between the groups. Participants were informed that the purpose of the study was to investigate how mental tasks influence the ability to name colours. Verbal instructions for all the tasks were given following a standard script.

A diagram showing an outline of the procedure is shown in Appendix R. All participants read the information sheet (Appendix S) and signed a consent form (Appendix T) prior to the onset of the study. They were then randomly assigned to

either the suppression or non-suppression group and asked to complete the EQ-1. Once the experimenter was satisfied that the participants fully understood the requirements of the study and that all outstanding questions had been dealt with, the experiment began.

During the first stage of the experiment, the following instructions were read aloud to all participants: "Think about anything you want and let all your thoughts flow freely in and out of your mind. Every time you have a thought about food or eating, make a checkmark on this piece of paper. I am going to leave the room and return in 5 minutes. Any questions?" The experimenter then left the room for 5 minutes so that participants could follow the instructions without distraction. Following this, participants in the suppression condition were told: "For the next 5 minutes, I want you to do everything you can to NOT think about food and eating (task topic 1) or houses (task topic 2.) The aim is to try and keep yourself from having any food-related (task 1)/ house related (task 2) thoughts. However, if you do have any thoughts related to food and eating (task 1)/ houses (task 2), I want you to make a checkmark on this piece of paper. Any questions?" Participants in the non-suppression condition were told: "For the next 5 minutes, I want you to do the same again. Think about anything you want and let all your thoughts flow freely in and out of your mind. Every time you have a thought about food or eating, make a checkmark on this piece of paper. Any questions?" The experimenter then left the room and returned 5 minutes later. Following this, all participants were told: "The next stage looks at how well people can name the colours of words whilst doing another task at the same time. I am now going to give you an 8-digit number. You will be given 30 seconds to remember the number and you will need to keep it in mind whilst doing the colour-naming task. At the end of the task you will be asked to recall the number

so it is very important that you try to remember it". Participants then received an index card with a random 8-digit number typed in Times New Roman font, size 36, and given 30 seconds to commit it to memory. Following this, the index card was removed from sight.

Stroop instructions were then read aloud to participants and printed on the computer screen: "This task measures how long it takes you to respond to the colour of various words presented on the screen. A cross (+) will initially appear on the screen. Please look at it. It will be replaced by a word written in one of four colours – red, blue, green or yellow. Name the colour of the word as quickly as possible, whilst being careful not to make any mistakes". Participants then engaged in 10 practice trials and completed the first Stroop task. They then wrote down the 8-digit number and completed the EQ-2 and EQ-3. All participants then repeated the procedure (phase 2) whilst either suppressing or non-suppressing thoughts about food (task topic 1) or houses (task topic 2).

After completing the second Stroop task, participants filled out the remaining questionnaires in a randomised order (TFEQ, WBSI, TCQ, BDI-II, BAI, PEQ)[4]. Weight and height measurements were then taken and participants were debriefed thoroughly regarding the purpose of the study (Appendix U) and given information should they require further help with any of the issues raised by the research (appendix V).

The food and house task topics were counterbalanced such that half the participants completed the food task first and half the participants completed the house task first. This was considered necessary to control for potential practice

[4] Questionnaires were administered at the end of the session to reduce demand characteristics during completion of the subjective rating scales and experimental tasks. Moreover, this procedure also ensured that the researcher was blind to participants' restraint and disinhibition status during delivery of the experimental instructions. A similar procedure was used by Herman and Mack (1975); Klein (2007); and Soetens, Braet, Dejonckheere, and Roets (2006).

effects. The use of 5-minute thought-monitoring intervals and an 8-digit number as the cognitive load has been used in previous similar studies (e.g. Klein, 2007; Oliver & Huon, 2001; Wegner & Erber, 1992).

Data Analysis

Data were analysed using SPSS version 15.0 for windows. Stroop data were analysed using a 3 x 2 x 5 x 2 mixed analysis of variance (ANOVA) with restraint group (low restraint, inhibited restraint, disinhibited restraint) and suppression task (suppression, non-suppression) as between subject factors and word type (food, house, positive, neutral, negative) and task topic (food condition, house condition) as within subjects factors. The dependent variable was RT on the Stroop task. Significant results were followed by post hoc ANOVA and *t*-tests where appropriate.

Descriptive statistics and EQ-1 data were analysed using a one-way ANOVA. WBSI scores provided a measure of the frequency of thought suppression attempts in everyday life and were analysed using a 3 x 2 between subjects ANOVA, with restraint (low restraint vs. inhibited restraint vs. disinhibited restraint) and suppression condition (suppression vs. non-suppression) as the independent variables and scores on the WBSI as the dependent variable. The TCQ subscales were analysed using a multivariate analysis of variance (MANOVA) to assess strategies used to control unwanted and unpleasant thoughts.

Results

Descriptive statistics for the low restraint, inhibited restraint and disinhibited restraint groups are shown in Table 1.

Table 1.

Descriptive Statistics and ANOVA Results for Differences on Demographic and Questionnaire Data for the Three Restraint Groups

	Low Restraint (n= 32)		Inhibited Restraint (n= 32)		Disinhibited Restraint (n= 32)		
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	$F_{2,93}$
Age	19.19	2.15	19.13	.98	18.91	1.03	.31
BMI[a]	26.76	30.07	22.35	2.81	23.49	4.07	.54
TFEQ[b]-Restraint score	4.47	.531	13.25	.494	13.44	.394	110.74**
TFEQ[b]-Disinhibition score	5.16	.394	4.91	.405	11.63	.378	94.18**
TFEQ[b]-Hunger score	5.75	2.74	6.56	2.09	7.19	2.84	2.49
EQ-1[c] Desire for food	3.13	.976	2.72	1.27	3.16	.847	1.74
EQ-1[c] Urge to eat	2.75	1.19	2.34	1.31	3.03	1.20	2.50
EQ-1[c] Subjective hunger	3.41	.979	2.81	1.30	3.34	.865	2.99
BDI[d]	8.25	1.28	8.06	1.39	13.38	1.53	4.60*
BAI[e]	29.75	1.21	30.22	1.71	34.81	1.14	4.12*
Time since last meal (minutes)	620.31	59.92	499.69	57.10	444.47	48.54	2.64

[a]BMI = Body Mass Index. [b]TFEQ = Three Factor Eating Questionnaire. [c]EQ-1 = Experimental Questionnaire-1. [d]BDI = Beck Depression Inventory. [e]BAI = Beck Anxiety Inventory.

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

As can be seen in Table 1, the groups did not differ significantly in terms of age or BMI. However, for restraint scores, there was a main effect of group. Planned linear contrasts and analysis of means revealed that, as expected, restraint scores for the low dietary restrainers were significantly lower compared to the inhibited restrainers ($t(93) = 12.75, p<.001$) and disinhibited restrainers ($t(93) = 13.02, p<.001$). There was no significant difference in restraint scores between the inhibited and disinhibited restrainers ($t(93) = .272, p=.79$). Similarly, for disinhibition scores, there was a main effect of group. Planned linear contrasts and analysis of means revealed that, as expected, disinhibition scores for the disinhibited restrainers were significantly higher compared to the low restrainers ($t(93) = 11.654, p< .010$) and inhibited restrainers ($t(93) = 12.105, p< .001$). There was no significant difference in disinhibition scores between the low restrainers and inhibited restrainers ($t(93) = .450$, $p= .65$). This suggests that orthogonal grouping was achieved, whereby the combination of restraint and disinhibition scores was significantly different for the low restrainers, inhibited restrainers and disinhibited restrainers, indicating that the study appropriately differentiated between the three experimental groups. Analysis of TFEQ hunger scores revealed no significant difference between the three restraint groups.

The EQ-1 data revealed that from the outset of the experiment, there were no group differences in desire for food, urge to eat or subjective hunger. Furthermore, participants did not differ on time since last meal. However, for depression scores (BDI) there was a significant main effect of group. Planned linear contrasts and analysis of means revealed that, as expected, BDI scores for the disinhibited restrainers were significantly higher (relatively more depressed) than for the inhibited restrainers ($t(93) = 10.78, p<.01$) and low restrainers ($t(93) = 20.88, p<.01$).

Additionally, BDI scores were significantly lower (relatively less depressed) among the inhibited restrainers, compared to the low restrainers ($t(93) = 8.21, p<.01$). For anxiety scores (BAI) there also was a significant main effect of group. Planned linear contrasts and analysis of means revealed that, as expected, BAI scores for the disinhibited restrainers were significantly higher (relatively more anxious) than for the inhibited restrainers ($t(93) = 33.36, p<.01$) and low restrainers ($t(93) = 33.12, p<.01$). Additionally, BAI scores were significantly lower (relatively less anxious) for the inhibited restrainers, compared to the low restrainers ($t(93) = 30.76, p<.01$). Age, hunger, depression and anxiety have been shown to increase RT on the Stroop task in non-clinical samples (Markela-Lerenc, Kaiser, Fiedler, Weisbrod, & Mundt, 2006; Richards, French, Johnson, Naparstek, & Williams, 1992; Stewart & Samoluk, 1997; West & Alain, 2000). Accordingly, Pearson's correlations were conducted but revealed no significant correlation between RTs and age, TFEQ hunger score, subjective hunger, time since last meal, depression and anxiety respectively. Therefore, these potentially confounding variables were not included as covariates in subsequent analyses. More specifically, because of the lack of correlation between RTs and depression and anxiety, respectively, RTs did not need to be adjusted for the observed differences in depression and anxiety scores between restraint groups.

As in previous studies in which researchers used the modified Stroop procedure (e.g. Beck, Freeman, Shipherd, Hamblen, & Lackner, 2001; Higgs & Eskenazi, 2007), incorrect responses and RTs less than 300ms and greater than 1500ms were removed from the analysis. Furthermore, outliers of ±3 standard deviations were removed for each participant in each word condition, given the high likelihood that these were artefacts (Lattimore & Maxwell, 2004). The number of data points removed in this way amounted to less than 1% of the total.

Manipulation Check

In order to determine whether the three experimental groups followed instructions as administered, three separate 3 x 2 ANOVAs were conducted with restraint group (low restraint vs. inhibited restraint vs. disinhibited restraint) and suppression task (suppression vs. non-suppression) as the between subject factors and the three items on the EQ-2 that assessed the extent to which participants (1) tried to follow instructions, (2) suppressed their thoughts and (3) had control over their thoughts, as the dependent variables respectively. Additionally, two further 3 x 2 ANOVAs were conducted for each of the food and house conditions to determine group differences in the number of baseline thoughts before completing the Stroop tasks and the number thoughts during the thought suppression and non-suppression period.

Results for the *food* condition (Table 2) revealed a significant main effect of suppression task only for, 'how often did you suppress your thoughts?' ($F(1,90) = 6.63, p < .05$). Thus, for suppression ratings, as expected, the suppression group reported suppressing their thoughts significantly more frequently than the non-suppression group. This suggests that participants followed instructions as administered. In contrast to the expectation that the suppression group would experience food-related thoughts less frequently, spend less time engaging in food-related thoughts and report fewer food-related thoughts during the suppression period compared to participants in the non-suppression condition, the analyses revealed that the suppression and non-suppression groups did not differ on any of these variables. This indicates that the suppression manipulation did not adequately discriminate between the suppression and non-suppression groups. It is possible that either the suppression group were not able to successfully suppress their thoughts or that the

non-suppression group continued suppressing their thoughts, despite instructions not to suppress. This is considered further in the discussion.

Additionally, results revealed a significant main effect of restraint group for, 'how frequently did you experience food-related thoughts?' ($F(2,90) = 3.75, p < .05$). Scheffe post-hoc tests revealed a significant difference between the inhibited and disinhibited restrainers ($p < .05$), whereby disinhibited restrainers reported significantly more food-related thoughts regardless of suppression task. Additionally, a significant main effect of restraint group was found for, 'what percentage of time did you engage in food-related thoughts?' ($F(2,90) = 4.12, p < .05$). Scheffe post-hoc tests revealed a significant difference between inhibited and low restrainers ($p < .05$), whereby low restrainers reported a higher percentage of time engaged in food-related thoughts. No other group variations were significantly different. These data suggest that disinhibited restrainers experienced more intrusive thoughts relating to food in general compared to inhibited restrainers, whereas low restrainers spent more time engaged in food-related thoughts compared to inhibited restrainers. These results are in line with previous research, which has shown that disinhibited restrainers experience more intrusive thoughts in general (Oliver & Huon, 2001).

To determine the effect of the cognitive load manipulation, a 3 x 2 ANOVA was conducted, with restraint group (low restraint vs. inhibited restraint vs. disinhibited restraint) and suppression task (suppression vs. non-suppression) as the between subject factors and the number of errors recalling the 8-digit number as the dependent variable (See Table 2). No main or interaction effects were found, suggesting that in line with expectations, the groups did not differ on their ability to recall the random 8-digit number. Gilbert and Hixon (1991) note that a large number of errors during recall can indicate that participants were not trying to remember the number and

therefore the cognitive load may have been ineffective. This was however not the case in the current study, as correct recall was found for 62.5% of the low restraint group, 65.6% of the inhibited restraint group and 62.5% of the disinhibited restraint group. This is in line with previous similar studies (e.g. Fikretoglu, 2003) and suggests participants in all groups did try to remember the random 8-digit number as instructed. Furthermore, it suggests that the cognitive load manipulation was equally effective for each restraint group.

Table 2.

Descriptive Statistics for the EQ-2 Items and Number of Food Thoughts for Restraint Groups by Suppression Task (Food Condition)

	Low Restraint (n = 32)		Inhibited Restraint (n = 32)		Disinhibited Restraint (n = 32)	
Instruction	*M*	*SD*	*M*	*SD*	*M*	*SD*
Suppression Task						
EQ-2[a].1 How hard did you try to follow the instructions?	3.33	1.11	2.60	1.29	3.29	1.49
EQ-2.2 How often did you suppress your thoughts?	3.80	1.08	3.93	.884	3.94	.899
EQ-2.3 How much control over your thoughts did you have?	3.07	1.03	3.40	.986	3.06	1.14
EQ-2.4 How frequently did you experience food-related thoughts?	2.73	.884	2.73	1.49	3.18	1.13
EQ-2.5 What percentage of time did you engage in food-related thoughts?	35.33	24.74	32.00	29.56	40.59	25.11
Number of baseline thoughts about food (frequency count)	4.13	2.94	4.20	3.61	5.47	3.62
Number of food thoughts during the suppression period (frequency count)	3.67	2.38	3.67	6.67	6.06	4.65
Number of errors recalling the 8-digit number	1.44	2.42	1.67	2.71	1.53	2.27
Non-suppression Task						
EQ-2.1 How hard did you try to follow the instructions?	3.29	1.10	2.59	.939	3.00	1.25
EQ-2.2 How often did you suppress your thoughts?	3.65	.996	3.06	.966	3.33	1.34
EQ-2.3 How much control over your thoughts did you have	3.18	1.01	3.89	.795	3.33	1.04
EQ-2.4 How frequently did you experience food-related thoughts?	3.35	1.16	2.24	1.03	3.20	1.01
EQ-2.5 What percentage of time did you engage in food-related thoughts?	52.35	25.37	23.53	18.68	42.00	19.34
Number of baseline thoughts about food	7.12	8.52	4.35	4.72	5.07	2.76
Number of food thoughts during the non-suppression period	5.82	6.39	3.42	3.15	4.07	2.65
Number of errors recalling the 8-digit number	1.69	2.15	1.59	2.43	1.53	2.72

[a]EQ-2 = Experimental Questionnaire-2.

Similar results were found for the *house* condition (Table 3). More specifically, in contrast to expectations, no main effect for suppression task was found whilst restraint groups differed only on effort ratings in response to the question, 'how hard did you try to follow the instructions?' ($F(2,90) = 4.65, p<.05$). The results of Scheffe post-hoc tests revealed that the low restrained group differed significantly from the inhibited restrainers and the disinhibited restrainers, with low restrainers reporting that they tried harder compared to the inhibited and disinhibited restrainers. These results indicate that again the suppression manipulation may have failed to establish the desired effect. For the cognitive load manipulation, no main or interaction effects were found, suggesting that the groups did not differ on their ability to recall the random 8-digit number. Correct recall was found for 59.3% of the low restraint and inhibited restraint groups, and 62.5% of the disinhibited restraint group. This suggests that for the house condition, participants in all groups tried to remember the random 8-digit number as instructed and that the cognitive load manipulation was equally effective for each restraint group. No other significant effects were found.

To determine whether order effects occurred in the presentation of the food and house conditions, a one-way ANOVA was conducted with order as the independent variable and RT as the dependent variable. No significant main effects or interactions were found. Accordingly, presentation order was not significant and did not interact with any other variables; therefore order is not considered a confounding variable and hence will not be considered in further analyses.

Overall, it can be seen that in both the food and house conditions, participants in the suppression condition experienced a similar number of target thoughts compared to the non-suppression condition and spent a similar length of time engaged with the target thoughts. Therefore it may be possible that the suppression manipulation did

not sufficiently discriminate between the suppression and non-suppression groups. This will be taken into account when interpreting and discussing the results. Furthermore, some differences were found between the restraint groups in the food condition in terms of the number of thought intrusions and the percentage of time spent engaging in food-related thoughts. This may merely reflect the fact that disinhibited restrainers generally experience more intrusive thoughts, rather than a side effect of the manipulation. Finally, results concerning cognitive load suggest that the recall task acted adequately.

Table 3.

Descriptive Statistics for the EQ-2 Items and Number of House Thoughts for Restraint Groups by Suppression Task (House Condition)

	Low Restraint ($n = 32$)		Inhibited Restraint ($n = 32$)		Disinhibited Restraint ($n = 32$)	
Instruction	*M*	*SD*	*M*	*SD*	*M*	*SD*
Suppression Task						
How hard did you try to follow the instructions?	3.07	1.10	2.20	1.14	2.53	1.28
How often did you suppress your thoughts?	3.27	.961	3.40	1.18	3.53	.874
How much control over your thoughts did you have?	3.13	.834	3.27	1.16	3.47	1.00
How frequently did you experience food-related thoughts?	2.60	.632	2.60	.986	2.71	.849
What percentage of time did you engage in house-related thoughts?	23.33	15.05	24.00	23.23	27.65	18.55
Number of baseline thoughts about houses	4.13	3.98	2.87	2.10	4.35	2.80
Number of house thoughts during the suppression period	2.73	2.43	2.93	3.17	3.29	3.22
Number of errors recalling the 8-digit number	1.69	2.92	1.40	2.19	1.47	2.24
Non-suppression Task						
How hard did you try to follow the instructions?	3.35	1.16	2.65	1.22	2.40	.986
How often did you suppress your thoughts?	3.65	1.22	3.00	1.11	3.60	.910
How much control over your thoughts did you have	3.00	.935	3.71	.855	2.87	.743
How frequently did you experience house-related thoughts?	2.65	.931	2.24	.970	2.53	.834
What percentage of time did you engage in food-related thoughts?	31.76	20.68	24.12	15.33	30.00	21.04
Number of baseline thoughts about houses	3.71	3.53	3.47	2.26	2.87	2.23
Number of house thoughts during the non-suppression period	3.82	4.82	3.12	3.96	2.07	2.05
Number of errors recalling the 8-digit number	1.44	2.09	1.53	2.21	1.53	2.53

Addressing the Research Hypotheses

Stroop Data

The first four research hypotheses were initially addressed:

1(a) Disinhibited restrainers will display significantly longer Stroop RTs following suppression of food-related thoughts than following suppression of house-related thoughts; (b) There will be no such difference for the low restrainers or inhibited restrainers

2. Thought suppression will significantly increase RTs on a Stroop task compared to a non-suppression task

3(a) Disinhibited restrainers will display significantly longer RTs to food words following suppression of food-related thoughts compared to low restrainers and inhibited restrainer, and (b) there will be no difference in RTs to food words following suppression of food-related thoughts between low restrainers and inhibited restrainers

4. There will be no difference between low restrainers, inhibited restrainers and disinhibited restrainers in the time taken to colour-name house words on a Stroop task regardless of suppression condition

To address these hypotheses, a 3 x 2 x 5 x 2 mixed ANOVA was conducted, with restraint group (low restraint vs. inhibited restraint vs. disinhibited restraint) and suppression task (suppression vs. non-suppression) as the between subject factors and word type (food vs. house vs. positive vs. negative vs. neutral) and task topic (food condition vs. house condition) as the within subjects factors. The dependent variable was RT on the Stroop task. Descriptive statistics are presented in Table 4.

Table 4.

Descriptive Statistics for Stroop RTs in the Food and House Conditions by Restraint Group as a Function of Word Type

	Low Restraint (n = 32)		Inhibited Restraint (n = 32)		Disinhibited Restraint (n = 32)	
Word Type	*M*	*SD*	*M*	*SD*	*M*	*SD*
Food Condition						
Food	630.24	96.59	669.51	132.05	662.18	125.66
House	622.13	87.62	641.36	97.99	624.84	74.67
Neutral	620.56	86.28	642.37	106.29	624.08	72.14
Positive	628.28	88.35	639.08	97.07	621.62	67.35
Negative	601.14	83.08	643.67	102.29	613.79	86.84
Total	620.47	87.98	647.19	106.62	629.30	88.44
House Condition						
Food	601.30	90.43	646.84	103.20	679.97	121.34
House	584.62	84.50	650.92	131.84	609.57	103.89
Neutral	583.20	83.27	617.40	89.41	612.47	78.68
Positive	590.65	79.00	626.79	83.09	618.23	83.18
Negative	586.47	72.22	630.23	109.91	620.85	92.12
Total	589.25	81.3	634.44	104.33	626.21	96.73

Main effects

Task topic: Results yielded a significant main effect for task topic ($F(1, 90)$ = 12.75, $p < .01$) whereby analysis of means revealed longer RTs in the food condition compared to the house condition (see Table 4).

Word type: The main effect of word type was significant ($F(4,360) = 10.94$, $p<.001$).

Suppression: A main effect of suppression task was revealed ($F(1,90) = 13.16$, $p<.001$). However, in contrast with the prediction, mean RTs for all 5 word types

were *faster* following suppression, indicating that thought suppression decreased RTs on the Stroop tasks, irrespective of word type (see Table 5). However, this result should be interpreted with caution given the fact that the suppression manipulation may have failed.

Dietary Restraint: No main effect for restraint group was found, i.e. RTs on the Stroop task did not significantly differ between the low restrainers, inhibited restrainers and disinhibited restrainers ($F(2,90) = 1.47, p>.05$).

Table 5.

Descriptive Statistics for Stroop RTs in the Food and House Conditions by Restraint Group as a Function of Suppression Task and Word Type

		Low Restraint (n = 32)		Inhibited Restraint (n = 32)		Disinhibited Restraint (n = 32)	
		M	*SD*	*M*	*SD*	*M*	*SD*
Food Condition	Word type						
Suppression	Food	590.60	79.85	634.79	62.16	631.11	69.90
	House	578.46	70.37	605.75	57.87	597.72	63.82
	Neutral	571.96	56.90	611.37	69.64	601.74	60.04
	Positive	585.14	62.35	614.51	56.62	594.34	54.34
	Negative	566.68	63.76	604.42	58.63	597.89	69.11
Non-suppression	Food	665.22	98.61	711.58	156.27	697.39	163.94
	House	660.66	84.71	665.88	117.10	655.58	76.06
	Neutral	663.44	86.14	668.80	127.86	649.36	78.17
	Positive	666.34	91.85	658.37	116.61	652.53	68.84
	Negative	631.54	87.85	664.51	115.30	631.81	102.87
House Condition	Word type						
Suppression	Food	558.99	67.58	613.88	62.49	619.81	76.74
	House	545.91	73.41	608.27	66.86	604.28	81.32
	Neutral	544.08	58.12	592.81	83.42	584.58	69.59
	Positive	548.39	62.45	608.95	63.66	602.70	71.33
	Negative	554.50	56.85	592.40	67.31	591.49	73.57
Non-suppression	Food	638.63	93.21	670.29	125.23	650.45	84.41
	House	618.77	80.45	661.84	133.29	633.93	79.23
	Neutral	617.71	88.19	639.98	94.27	638.66	78.45
	Positive	627.92	74.36	637.85	97.15	626.71	90.69
	Negative	614.67	73.98	647.18	120.52	644.39	98.21

Interactions

Task topic x Group: A significant interaction was found for task topic x group ($F(2, 90) = 3.69, p < .05$). Analysis of means revealed longer RTs in the food condition compared to the house condition for all three restraint groups (see Table 4). Supplementary *t*-tests with Bonferroni corrections, using an alpha level of .01 revealed that this difference was only significant for the low restraint group ($t(159) = 7.71, p<.01$). This suggests that, contrary to expectations, low restrainers displayed significantly longer Stroop RTs in the food condition compared to the house condition, irrespective of suppression task.

Task topic x Word type: A significant interaction was found for task topic x word type ($F(4, 360) = 3.00, p<.05$). Analysis of means revealed that Stroop RTs to food words exceeded that of house words, neutral words, positive words and negative words in both the food and house conditions (see Table 4). A series of planned comparisons were conducted in order to further investigate the effect of word type on RT. Although multiple analyses using *t*-tests increase the likelihood of a Type 1 error, SPSS for Windows does not permit post-hoc or planned within group comparisons following repeated measures ANOVA (Dancey & Reidy, 2002). Consequently, Bonferroni corrections were applied before declaring a result as statistically significant. Using an alpha level of .005, supplementary *t*-tests revealed that, in the food condition, RTs only differentiated between food words and house words ($t(95) = 3.26, p<.005$), food words and neutral words ($t(95) = 3.22, p<.005$), food words and positive words ($t(95) = 3.16, p<.005$) and food words and negative words ($t(95) = 4.38, p<.001$). In the house condition, RTs only differentiated between food words and positive words ($t(95) = 3.34, p<.005$), food words and negative words ($t(95) = 3.46, p<.005$) and food words and neutral words ($t(95) = 4.65, p<.001$). These results

indicate hyperaccessibility to food words, evidenced by significantly longer RTs to food words compared to the other word types irrespective of task topic.

Questionnaire Data

The fifth research hypothesis predicted that 'disinhibited restrainers will use thought suppression more frequently compared to inhibited restrainers and low restrainers according to responses on the WBSI'. This was addressed using a 3 x 2 between subjects ANOVA, with restraint group and suppression task as the independent variables and scores on the WBSI as the dependent variable. Results showed a significant main effect of group ($F(2,90) = 3.16$, $p < .05$) with mean WBSI scores of 45.78 ($SD = 11.37$), 46.84 ($SD = 13.09$) and 52.66 ($SD = 12.75$) for the low restrainers, inhibited restrainers and disinhibited restrainers, respectively. Scheffe post-hoc analyses revealed a homogeneous subset, with no significant group differences in the one-to-one comparisons. In line with the guidelines for interpretation of WBSI scores (Muris, Merckelbach, & Horselenberg, 1996), it can however be seen that disinhibited restrainers scored in the 'high average' range whereas inhibited restrainers and low restrainers scored in the 'low average' range (average: scores between 42 – 54), indicating a possible clinical (but not statistically significant) difference between the groups whereby disinhibited restrainers use thought suppression more frequently compared to inhibited restrainers and low restrainers.

Finally, the sixth research hypothesis predicted that 'disinhibited restrainers will use more maladaptive thought control strategies according to responses on the TCQ'. This was addressed using a 3 x 2 between subjects ANOVA, with restraint group and

suppression condition as the independent variables and the total score on the TCQ as the dependent variable (See Table 6 for descriptive statistics). No significant main effects or interactions were found. Additionally, in line with Oliver and Huon (2001), a 3 x 2 multivariate analysis of variance (MANOVA), with restraint group and suppression task as the independent variables, was conducted for the five TCQ subscales. The main effect of group was just significant at the .05 level (λ=.81, $F(10,172) = 1.88$, p= .05). No significant main effect for suppression or interaction effect for restraint group x suppression condition was found (λ=.93; $F(5,86) = 1.24$; λ=.92, $F(10,172)$=.70, respectively). Univariate results indicated that the marginal effect of restraint was caused by differences between groups on the reappraisal subscale. Scheffe post-hoc tests revealed that disinhibited restrainers had significantly lower scores on the re-appraisal subscale compared to the low restraint group, whilst the inhibited restrainers scores did not differ from the low restraint or disinhibited restraint groups.

Table 6.

Descriptive statistics for TCQ-Total and Subscale Scores by Restraint Group

	Low Restraint (n= 32)		Inhibited Restraint (n= 32)		Disinhibited Restraint (n= 32)	
TCQ Scores	*M*	*SD*	*M*	*SD*	*M*	*SD*
Suppression Task						
Total score	61.56	7.81	62.60	5.87	58.65	9.12
Distraction subscale	48.80	2.37	14.40	2.13	14.59	3.37
Social control subscale	12.94	4.48	12.13	2.67	13.12	3.67
Worry subscale	9.44	2.22	11.20	3.12	9.71	2.85
Punishment subscale	9.94	1.91	11.07	3.47	9.65	3.18
Re-appraisal subscale	13.81	3.63	13.80	1.78	11.53	4.06
Non-suppression Task						
Total Score	65.06	5.96	61.53	8.22	62.47	10.76
Distraction subscale	16.38	2.78	14.76	3.51	15.07	3.13
Social control subscale	15.06	2.89	13.18	3.88	12.67	4.79
Worry subscale	10.63	2.60	10.47	3.00	12.33	4.73
Punishment subscale	8.94	1.57	10.06	3.29	10.80	3.36
Re-appraisal subscale	14.06	2.49	13.29	2.49	12.27	3.04

Note. Total score out of a maximum of 120. Total possible score on each subscale = 24 (6=never, 12=sometimes, 18=often, 24=almost always)

Post Experimental Data

Finally, data for the PEQ were analysed using a 3 x 2 between subjects ANOVA, with restraint group and suppression condition as the independent variables and PEQ item scores as the dependent variable (see Table 7 for descriptive statistics). Results revealed a significant main effect of restraint group for 2 questions: 'how often do you think about food and eating' and 'how difficult do you find it to control your thoughts relating to food?' ($F(2,90) = 7.31$, $p = .001$ and $F(2,90) = 9.39$, $p < .001$, respectively). For each question, Scheffe post-hoc tests revealed significant differences between the disinhibited restrainers and both the inhibited restrainers and low restrainers, suggesting that, in general, disinhibited restrainers: a) think about food more often compared to the other two restraint groups, and b) find it more difficult to control their thoughts relating to food compared to the other two restraint groups, irrespective of suppression task. No other significant main effects or interactions were found.

Table 7.

Descriptive statistics for PEQ Data by Restraint Groups

	Low Restraint (n= 32)		Inhibited Restraint (n= 32)		Disinhibited Restraint (n= 32)	
PEQ Questions	M	*SD*	*M*	*SD*	*M*	*SD*
Suppression Task						
How often do you think about food and eating?	3.06	.77	3.07	.88	3.41	.71
How difficult do you find it to control thoughts relating to food and eating?	2.31	.95	2.47	.83	3.24	1.09
Non-suppression Task						
How often do you think about food and eating?	3.00	.63	2.82	1.07	3.87	.52
How difficult do you find it to control thoughts relating to food and eating?	2.31	.87	2.47	1.13	3.40	1.06

Discussion

The purpose of the study was to examine the extent to which thought suppression, dietary restraint and disinhibition affect RTs on a Stroop task. The study also aimed to examine whether disinhibited restrainers differ from low restrainers and inhibited restrainers respectively, in how often they use thought suppression as a coping strategy to deal with unwanted thoughts and in their use of thought control techniques.

Summary of Findings

Stroop Data

It was hypothesised that (1a) disinhibited restrainers would display significantly longer Stroop RTs following suppression of food-related thoughts than following suppression of house-related thoughts, and (1b) there would be no difference for the low restrainers and inhibited restrainers. Results revealed a task topic x restraint group interaction, but contrary to predictions this reflected the fact that the low restrainers – not disinhibited restrainers - displayed significantly longer Stroop RTs in the food condition, compared to the house condition, irrespective of suppression instructions. Furthermore, results showed a word type x task topic interaction, revealing that instructions to suppress or not suppress thoughts about food led to slower RTs to food words compared to the other word types, whereas instructions to suppress or not suppress thoughts about houses lead to slower RTs to *food* words only, compared to positive, negative and neutral words. No difference in RTs were found between food and house words. Contrary to predictions, no effect of dietary restraint was observed. It is suggested that longer Stroop RTs occur in response to emotion words, or words that match current concerns, since attention towards these word types is automatic and

implicit (McKenna & Sharma, 1995). Accordingly, it is possible that food stimuli have high emotional value and are of current concern to all participants in this study, regardless of dietary restraint. Alternatively, it is possible that the attentional bias towards food-related words in the present study reflected the emotional valence of the words, since both positive and negative emotion words have been shown to increase Stroop RT (MacLeod, 1991). However, this may be unlikely since RTs to food words were longer compared to positive and negative words, suggesting that findings may not simply reflect valence. It is also notable that in the house condition, suppression of house words did not produce longer RTs to house words, compared to the other word types. This may be explained by the fact that the suppression manipulation did not adequately discriminate between the suppression and non-suppression groups and thus any conclusions regarding the impact of target thoughts (i.e. houses) on RT are limited and should be interpreted with caution.

It was further predicted that (2) thought suppression would significantly increase RTs on a Stroop task compared to a non-suppression task. However, contrary to predictions, results revealed that Stroop RTs were *faster* following suppression of food- and house-related words. This may suggest that thought suppression helps to diminish the subsequent occurrence of suppressed thoughts, although again, conclusions regarding the effects of thought suppression should be interpreted with caution since the suppression manipulation did not adequately discriminate between the suppression and non-suppression groups. To explain the limitations of the suppression manipulation, one may suggest that suppressors in this study did not expend a lot of effort in their suppression attempts. However, suppressors reported an average of 4.53 thoughts during the 5-minute suppression interval, which is similar to the rate of thought intrusions reported by suppressors in previous similar studies (e.g.

Klein, 2007; Wegner & Erber, 1992). Alternatively, as observed by Purdon (2001), it is possible that participants did not follow the non-suppression instructions precisely, since participants reported moderate attempts at thought control, despite instructions not to suppress. Therefore, it is likely that the non-suppression group did not serve as an adequate control group. These data provide evidence that instructions to not suppress unwanted thoughts are unlikely to override natural inclinations of thought control. This highlights the extent to which personally relevant thoughts about food are actively resisted, even in non-clinical samples, and suggests that an experimental manipulation involving instructions to suppress or not suppress may lack ecological validity. In real life, individuals are unlikely to resist engaging in thought suppression, as it is a common strategy to protect oneself from unwanted thoughts (Wegner, 1992). Therefore, the non-suppression instructions may require participants to act against their inclinations and thus they may continue to engage in spontaneous suppression attempts (Purdon, 2001).

It was also predicted that (3a) disinhibited restrainers would display significantly longer RTs to food words following suppression of food-related thoughts compared to low restrainers and inhibited restrainers, and (3b) there would be no difference in RTs to food words following suppression of food-related thoughts between low restrainers and inhibited restrainers. Results revealed no effect of restraint group on Stroop RT, suggesting that there is no difference in the rebound effect following thought suppression between low restrainers, inhibited restrainers and disinhibited restrainers.

Finally, it was predicted that (4) there would be no difference between low restrainers, inhibited restrainers and disinhibited restrainers in the time taken to colour-name house words on a Stroop task regardless of suppression condition. This

was supported by the data, suggesting that disinhibited restrainers do not show an attentional bias towards personally irrelevant stimuli compared to low restrainers and inhibited restrainers.

Questionnaire Data

It was hypothesised that (5) disinhibited restrainers would use thought suppression more frequently than low restrainers and inhibited restrainers, as measured by the WBSI (Wegner & Zanakos, 1994). Results revealed a main effect of restraint group, which reflected a particularly high score (i.e. more frequent suppression attempts) among the disinhibited restrainers. However, Scheffe post hoc tests failed to identify significant differences between the restraint groups. Furthermore, in line with the guidelines for interpretation of WBSI scores (Muris et al., 1996), disinhibited restrainers scored in the 'high average' range for thought suppression frequency, whereas low restrainers and inhibited restrainers scored in the 'low average' range. This suggests that disinhibited restrainers use thought suppression quite frequently as a strategy to cope with unwanted thoughts whereas low restrainers and inhibited restrainers use thought suppression strategies less often, as expected.

Finally, it was predicted that (6) disinhibited restrainers would use more maladaptive thought control strategies compared to low restrainers and inhibited restrainers, as measured by the TCQ (Wells & Davies, 1994). Contrary to predictions, results did not reveal a difference between the three restraint groups on use of punishment and worry strategies, suggesting that disinhibited restrainers do not use more maladaptive strategies to cope with unwanted thoughts. However, it was found that disinhibited restrainers had significantly lower scores on the reappraisal subscale,

indicating that disinhibited restrainers are less likely than low restrainers to use adaptive thought control strategies.

Findings in Relation to Previous Research

Dietary Restraint

The present study did not find a main effect of restraint group on Stroop RT within the food or house conditions. In contrast, previous studies have suggested that high dietary restraint is associated with an attentional bias towards eating-related stimuli, whereby high dietary restrainers demonstrate slower colour naming of food- and body-related words on the Stroop task compared to low dietary restrainers (Francis, Stewart, & Hounsell, 1997; Green & Rogers, 1993; Ogden & Greville, 1993). It is suggested that attention towards words related to current concerns is automatic and implicit, and therefore results in longer RTs on the Stroop task (McKenna & Sharma, 1995). The current findings however, do not corroborate these results, since no difference was found between low restrainers, inhibited restrainers and disinhibited restrainers on Stroop RT. Several methodological differences may account for these discrepant results. For instance, previous studies used two groups of high restrained and low restrained participants and did not consider the role of disinhibition on task performance. Furthermore, Green and Rogers (1993) and Ogden and Greville (1993) presented homogenous sets of food- and body-related words on the Stroop task. However, it was not tested to which extent either the food-related or the body-related target stimuli contributed to the effect. Moreover, homogenous word categories have been shown to increase Stroop RTs as participants may ruminate about the meanings and implications of the words during the task (Overduin, Jansen, & Louwerse, 1995). In the present study, heterogeneous word categories were used

that included random presentation of words from target and non-target categories, which presumably diminished the rumination effect. Accordingly, it is possible that blocked presentation of target stimuli on the Stroop task assesses emotional ruination rather than attentional bias. Several studies have also found no difference between high restrainers and low restrainers on Stroop RT to food words (e.g. Mahamedi & Heatherton, 1993; Overduin et al., 1995). It is possible that this common lack of significant findings may be accounted for by criticisms relating to the validity of the Stroop task to measure attentional bias towards food words (Faunce, 2002). For instance, colour-naming delays may be a result of attention directed towards or away from emotionally relevant stimuli (Willliams, Mathews, & MacLeod, 1996) or due to slowed disengagement with food-related stimuli (Smeets, Roefs, van Furth, & Jansen, 2008). An interesting idea for future research could be to replicate the present study using a more direct measure of attentional processes, such as the dot probe task (MacLeod, Mathews, & Tata, 1986).

The findings do not corroborate with a study by Soetens et al., (2006), who found that disinhibited restrainers experienced a rebound of food-related thoughts following thought suppression, whereas low restrainers and inhibited restrainers did not report an increase in food-related thoughts. However, the study used self-report measures to assess the rebound effect and did not investigate the impact of dietary restraint and disinhibition on task performance. Accordingly, the present study suggests that any differences between the restraint groups do not translate into differences on task performance.

Previous research has shown that activation of eating-related concerns, such as giving a caloric preload or presenting fattening food, increases Stroop interference among restrained eaters (e.g. Green, Elliman, Rogers, & Welch, 1997; Mahamedi &

Heatherton, 1993). It is therefore possible that activation of relevant concerns is necessary to observe a Stroop effect between the three restraint groups included in this study, rather than using only self-report measures of restraint and disinhibition. Future research could determine whether priming strategies prior to the Stroop task increases RTs among disinhibited restrainers by investigating the effects of disinhibited eating on Stroop performance. It is also possible that non-clinical concerns about food have to be genuinely sub-clinical in order to observe a Stroop effect between the three restraint groups. For instance, Cooper and Fairburn (1992) found that participants who were currently dieting and had a history of eating disorder symptoms showed Stroop interference for food- and body-related words, whereas no Stroop interference was found among dieters without a history of eating disorder symptoms.

When comparing RTs *between* the food and house task topics, one interesting finding concerned the fact that only low restrainers displayed significantly longer RTs in the food condition compared to the house condition. Surprisingly, this effect did not occur for the inhibited restraint or disinhibited restraint groups. This may suggest that instructions to suppress or not suppress thoughts about food may have cued low restraint participants to think about the target more than they would have normally, thus increasing Stroop RT in the food condition (Wenzlaff & Wegner, 2000). In contrast, inhibited restrainers and disinhibited restrainers may have been more successful at suppressing the cueing effects of food instructions due to increased practice at suppressing food and eating-related thoughts in everyday life (Fikretoglu, 2003). Further research is required to investigate the effects of practice on attenuating the rebound effect.

Thought Suppression

The finding that RTs on the Stroop task were faster following thought suppression indicates that participants in the present study were successful at their suppression attempts such that thought suppression helped to diminish the subsequent occurrence of target thoughts. This is contrary to research demonstrating a rebound in target thoughts following thought suppression (e.g. Klein, 2007; Wegner et al., 1993; Wegner et al., 1987; Zeitlin, Netten, and Hodder, 1995). However, although this result was not predicted, it is consistent with an earlier study by Kelly and Kahn (1994), which used participants' own intrusive thoughts as targets for suppression. Participants were instructed to either suppress or express their thoughts, then concentrate on their thoughts during a subsequent expression condition. Results revealed a 'reverse rebound' effect, whereby instructions to suppress decreased the occurrence of the target thoughts. Furthermore, Fikretoglu (2003) instructed 44 female undergraduates to suppress thoughts about a traumatic film whilst rehearsing a 10-digit number; then think about anything that came to mind. The researchers found that thought suppression led to a decrease in film-related thought frequency. Finally, Cougle, Smits, Lee, Powers, & Telch (2005) instructed 138 undergraduates with high social anxiety traits to either suppress or not suppress their thoughts about presenting a controversial speech. This was followed by a thought monitoring period whereby all participants were instructed to think about anything that came to mind. The researchers found a significant difference in the direction opposite to the rebound effect whereby thought suppression under conditions of heightened anxiety resulted in fewer thought intrusions compared to the non-suppression condition.

Thought Suppression Techniques

Previous studies have demonstrated that disinhibited restrainers use thought suppression more frequently than low restrainers and inhibited restrainers, and that thought control strategies are associated with increased ratings of anxiety and depression (Oliver & Huon, 2001; Soetens et al., 2006; Soetens et al., 2008). In support, the present study found that disinhibited restrainers scored in the 'high average' range for thought suppression frequency, whereas low restrainers and inhibited restrainers scored in the 'low average' range (Muris et al., 1996). Furthermore, it was found that disinhibited restrainers reported higher levels of anxiety and a higher number of thought intrusions, compared to low restrainers and inhibited restrainers. However, these results cannot be used to infer cause and effect.

Recent studies (Blumberg, 2000; Rassin, 2003) have shown that the WBSI comprises two factors: thought suppression tendencies and intrusive thoughts, and that the WBSI total scores may be best interpreted as a measure of failure of thought suppression (Rassin, 2003). Accordingly, the relatively high WBSI scores among the disinhibited restrainers in the present study presents concerns for clinicians, because intrusive thoughts can be quite distressing (Jones & Rogers, 2003). Furthermore, when the intrusions involve food thoughts, they may act as a constant reminder of eating, thus further undermining attempts at self-control (Soetens et al., 2008).

The present study also administered the TCQ to investigate metacognitions involved in thought control. Oliver and Huon (2001) demonstrated that high disinhibitors are more likely to engage in worry and punishment techniques to achieve thought control, compared to low disinhibitors. However, the present study found that when the roles of both dietary restraint and disinhibition are considered, there are no group differences in the use of worry and punishment techniques. In contrast, it was

found that disinhibited restrainers are less likely to use cognitive reappraisal strategies in response to unwanted thought intrusions. This supports research demonstrating that anorexic inpatients are less successful at using re-appraisal strategies compared to restrained eaters and non-dieters (Woolrich, Cooper, & Turner, 2008). Cognitive reappraisal is a metacognitive strategy which involves reinterpreting the meaning of an event to change the trajectory of an emotional response (Gross, 2001). For example, this may include challenging the thought's validity, analysing the thought rationally or thinking about a particular thought or situation in a different way (Wells & Davies, 1994). Cognitive reappraisal therefore appears to be a healthy control strategy, since it is associated with a reduction in ratings of anxiety, distress and depression (Dennis, 2007; Ochsner & Gross, 2005). The Self-Regulatory Executive Function (S-REF) model (Wells & Matthews, 1994, 1996) proposes that metacognitions such as excessive worry about food may help to maintain psychological and emotional disorders. For instance, in eating disorders and dietary restraint, cognitive biases maintain a focus on eating, weight and shape issues (Shafran, Fairburn, Robinson, & Lask, 2004) and there is some research to suggest that metacognitive appraisals may be enhanced among anorexic patients, whereby anorexics are more worried by their depressive thoughts and negative self-beliefs than restrained eaters and non-dieters (Turner & Cooper, 2002). The present study suggests that disinhibited restrainers may be less likely to engage in adaptive metacognitive activity than inhibited and low restrainers. Further studies are required to replicate the present results and determine the role of metacognitions in dietary restraint and disinhibition. Accordingly, an interesting extension would be to see if encouraging reappraisal techniques in response to food-related thoughts reduces an individual's tendency towards disinhibition. This is particularly important because

disinhibition of eating has been associated with an increased risk of obesity and binge eating (d'Amore, Massignan, Montera, Moles, De Lorenzo, & Scucchi, 2001). However, it should be noted that questions on the WBSI and TCQ do not assess thought control strategies in relation to food-related thoughts specifically, nor which specific strategies were used during the study. Therefore, future researchers could consider devising a questionnaire that is specifically aimed at investigating control of food-related thoughts and ask participants to complete the TCQ in relation to the types of thought control strategies they used during the experiment.

Strengths and Limitations of the Study

The present study addressed specific methodological problems inherent in previous research by controlling for the influence of physical hunger on the Stroop task, controlling for valence effects by including positive and negative emotion words and by focussing specifically on food words rather than confounding food-, body- and weight-related stimuli. Another strength is that the study measured RTs to individual words rather than stimulus word blocks to allow for greater temporal precision (Jones-Chesters et al., 1998) and used a voice response method, which reduces error in comparison to the keypress response (Repovš, 2004). Furthermore, a fundamental strength of the study was the subcategorisation of restrained eaters into 'inhibited restraint' and 'disinhibited restraint' according to scores on the restraint and disinhibition subscales of the TFEQ (Stunkard & Messick, 1985). In contrast, previous studies have primarily focussed on either restraint (e.g. Green & Rogers, 1993; Dejonckheere et al., 2003; Stewart & Samoluk, 1997) or disinhibition (e.g. Oliver & Huon, 2001), or administered the Restraint Scale (Herman & Mack, 1975) to assess dietary restraint which confounds dietary restriction, weight fluctuation and

disinhibited eating (van Strien, 1999). Furthermore, the present study extends previous research by using the TCQ to investigate the role of metacognitions in thought suppression attempts. Previous research has been criticised for focusing primarily on the content of thought suppression stimuli (e.g. food words versus neutral words assessed using the Stroop task) and not considering the impact of individual thought control strategies on the rebound effect (Wells, 2000).

Several methodological limitations merit comment. This study had low statistical power, which increases the likelihood of a type-2 error (Dancey & Reidy, 2002). The original sample size targets were not achieved due to time restraints, whereby it was only possible to recruit three equal samples of 32 participants from the screening sample which fulfilled the study criteria. Low statistical power has been common in studies focusing on thought suppression and dietary restraint (Wenzlaff & Wegner, 2000) and further research based on larger participant samples is required. Additionally, the study did not match Stroop stimuli in the food, house, positive, neutral and negative word conditions according to the number of syllables. Since the number of syllables has been shown to influence Stroop RT (Cox et al., 2002), future studies should aim to control this variable across the groups. Another limitation is that the sample only included female participants and therefore it is unclear whether the observed pattern of findings can be generalised to males. Although the selection of a female-only sample ensured that the study was consistent with previous research on thought suppression and dietary restraint (e.g. Boon et al., 2000; Cooper & Todd, 1997; Green & Rogers, 1993), generalisation of results is a particular concern, since several studies have found gender differences in thought suppression attempts and frequency of unwanted thought intrusions (e.g. Robichaud, Dugas, & Conway, 2003; Rutledge, 1998). This issue should be addressed in future studies to determine the

extent to which males and females differ in their processing and organisation of food-related stimuli.

One concern regarding the present experimental design involves the limited external validity of the research. Participants in the present study suppressed thoughts in response to specific instructions from an experimenter. Although there is some support for the idea that spontaneous suppression produces similar effects to those observed in instructed suppression (Wenzlaff & Wegner, 2000), the use of an instructed suppression task limits the generalisation of findings to everyday suppression efforts. Moreover, performance during experimental tasks may be perceived as irrelevant (Engelkamp & Zimmer, 1997) and thus participants are likely to have reduced motivation to engage in thought suppression techniques, relative to the suppression of unwanted, intrusive cognitions in everyday life. Therefore, an interesting extension would entail an evaluation of the impact of thought suppression, dietary restraint and disinhibition on more ecologically valid tasks over a longer period of time, or by using computer tasks that are made as ecologically valid as possible, such as by using relevant pictorial stimuli on the Stroop task rather than single-word stimuli. This would ensure experimental conditions which are more analogous to everyday life.

The present study investigated suppression of verbally based thoughts, but does not differentiate between the effects of suppressing imagery versus thought-based mentation. This is a potential confound, since some words within the Stroop stimuli may be more likely to elicit verbal-linguistic thought (e.g. triumph, horrible) whereas other words may be more likely to elicit imagery (e.g. cake, chimney, towel) (Stöber, 1998). Accordingly, it is possible that the rebound effect is enhanced following suppression of stimuli that is rich in imagery, compared to suppression of verbally

based thoughts (Behar, Vescio, & Borkovec, 2005). Future studies could address this by distinguishing between thought- and imagery-based mentation to determine the role of imagery on the rebound effect.

As with other thought suppression studies that use event marking (e.g. Purdon, 2001; Soetens et al., 2006), participants were instructed to make a checkmark every time they had a target thought, but were given no further instructions on how to determine what an individual thought unit comprised. Therefore, individuals may have used different criteria for what constitutes a separate target thought occurrence, thereby increasing error in recording thought frequency and limiting the possibility of detecting group differences at a significant level. For instance, whilst one participant may make one checkmark for an intrusive thought that occurs multiple times, another participant may make a checkmark every time that thought resurfaces. Further ambiguity arises because participants are left to decide whether an unwanted target thought is a new thought or a continuation of a previous instance of that thought which has not left consciousness. Although these problems with measuring thought frequency would be expected to function similarly among the suppression and non-suppression groups because participants were randomised, future research could measure stream-of-consciousness by instructing participants to verbalise their thoughts during the suppression and non-suppression phase and using independent coders to rate the frequency and duration of target thought intrusions.

Clinical Implications

The present study found that despite instructions not to suppress, participants continued to engage in moderate suppression efforts. This suggests that therapists may need to restructure beliefs about the consequences of food-related thoughts before

individuals can feel that it is 'safe' to disengage control efforts. This is consistent with studies in the obsessive-compulsive disorder literature, which demonstrate that participants are more willing to engage in treatment if the degree of threat imposed by the obsessional thought is reduced first through cognitive restructuring (Salkovskis, 1989).

Results from this study suggest that individuals scoring high on measures of dietary restraint and disinhibition are more likely to report experiencing food-related preoccupations, as well as feelings of depression and anxiety (Soetens et al., 2008). Furthermore, in clinical populations of eating disorders, dietary restraint and disinhibition have been linked to an increase in bulimic symptoms (Duchmann, Williamson, & Stricker, 1989) and obesity (Provencher, Drapeau, Tremblay, Després, & Lemieux, 2003). This suggests that individuals with high restraint and high disinhibition should be dissuaded from dietary restriction and encouraged to accept their weight as it is. Furthermore, it may be useful to consider individuals' thought control tendencies when treating eating problems, such that preoccupying thoughts about food could be reframed as a symptom of an individuals' eating difficulty, whilst serving as a reminder to use coping techniques such as cognitive reappraisal, relaxation or mindfulness interventions (Kristeller, Baer, & Quillian, 2006). Additionally, if future studies of dietary restraint and disinhibition show an effect of thought suppression on behavioural and cognitive processes, then approaches such as mindfulness may be integrated into existing treatment approaches with the goal of further reducing relapse.

Conclusion

Results of this study suggest that an attentional bias towards food-related words is not unique to restrained eaters, since food preoccupations were apparent for all participants in the study. However, low restrainers appeared to be particularly vulnerable to the effects of food cues on Stroop task performance, whereas inhibited restrainers and disinhibited restrainers did not demonstrate an impact of food-related instructions on task performance. This may be due to the effects of practice on the rebound of thought intrusions. Furthermore, participants appeared to be successful in their attempts at thought suppression, since Stroop RTs were faster following suppression, compared to a non-suppression task, thus supporting previous research demonstrating a reverse rebound effect. However, results should be interpreted with caution since the suppression manipulation did not adequately discriminate between the suppression and non-suppression groups.

Soetens et al., (2006) demonstrated that disinhibited restrainers experience a rebound of food-related thoughts following thought suppression, whereas this effect is not seen among low restrainers and inhibited restrainers. However, the researchers used self-report measures to assess the rebound effect and did not investigate the impact of dietary restraint and disinhibition on task performance. Accordingly, the present study extended previous findings by demonstrating that any differences between the restraint groups may not translate into differences on task performance.

Furthermore, results revealed that disinhibited restrainers experience a higher number of thought intrusions, are at a higher risk of experiencing failures in their thought control attempts and report higher scores on measures of anxiety, compared to low restrainers and inhibited restrainers. This is concerning given that disinhibited restrainers are a group at risk of obesity and binge eating (Duchmann et al., 1989;

Provencher et al., 2003), which may be further enhanced following unsuccessful suppression attempts. Furthermore, it was found that disinhibited restrainers were less likely to use healthy thought control strategies compared to low restrainers and inhibited restrainers, when confronted with unwanted thoughts. Accordingly, clinicians should be aware of an individual's tendency to engage in thought control and which techniques are used to achieve this. Future studies could investigate whether encouraging reappraisal strategies helps to reduce disinhibition and bingeing among restrained eaters.

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List of Appendices

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Appendix A

Clinical Psychology Review: Guidelines for Authors

Clinical Psychology Review

Guide for Authors

SUBMISSION REQUIREMENTS: Authors should submit their articles electronically via the Elsevier Editorial System (EES) page of this journal (http://ees.elsevier.com/cpr). The system automatically converts source files to a single Adobe Acrobat PDF version of the article, which is used in the peer-review process. Please note that even though manuscript source files are converted to PDF at submission for the review process, these source files are needed for further processing after acceptance. All correspondence, including notification of the Editor's decision and requests for revision, takes place by e-mail and via the Author's homepage, removing the need for a hard-copy paper trail. Questions about the appropriateness of a manuscript should be directed (prior to submission) to the Editorial Office, details at URL above. Papers should not exceed 50 pages (including references).

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Corresponding author. Clearly indicate who is willing to handle correspondence at all stages of refereeing and publication, also post-publication. Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.

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Appendix B

Appetite: Guidelines for Authors

Appetite

Guide for Authors

Appetite publishes the entire range of research relating to eating and drinking.

Submissions for publication should be relevant to the consumption of or attitudes to ingestible substances, or to the influences on or the consequences of such choices and appetites. Nevertheless, other matters are not excluded if they are important in a particular study.

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Full papers
Reports of new empirical findings should present the investigation as succinctly as feasible with clarity with the main text divided into Introduction, Methods, Results and Discussion.

Reviews may be of any length consistent with succinct presentation, subdivided as

appropriate to the subject matter.

PREPRATION OF MANUSCRIPTS

General layout

Manuscripts should be typewritten in double-spacing throughout (including abstract, keywords, headings, footnotes, references, tables and legends) with wide (3-cm) margins. Number all the pages of the manuscript consecutively. Ensure that each new paragraph is clearly indicated either by an indented first line or a preceding blank line (not both). Present each Table and the set of legends for Figures on separate pages at the end of the manuscript. If possible, consult a recent issue of the journal to become familiar with layout and conventions.

Typography. Text should be justified to the left without hyphenated line breaks, except for compound words. Punctuation should be consistent. One space only should be inserted between words and between numerical values and units, and after punctuation except a full stop (point) where there should be two spaces. The initial letter is put in upper case only after a stop, question mark or paragraph break, not after a colon or semi-colon. Do not use the lower-case letter "l" (el) for "1" (one) or the capital letter "O" for "0" (zero). (They have different typesetting values.) Please make a handwritten note in the margin of any special characters used, e.g. Greek, maths.

Title page

Title. Concise and informative, starting with a substantive term (not "the", "effect" etc.). Titles are often used in information retrieval systems. Avoid abbreviations and formulae where possible.

Co-authors' names and affiliations. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' full postal addresses (where the work was done) below the names, including the post code and country's name; if available, the e-mail address of each author may be added. Indicate each author's affiliation with a lowercase superscript letter immediately after the family name and in front of the appropriate address. Corresponding author. The email address of the corresponding author, with preferred full name in brackets, will be published at the foot of the paper. Below that footnote, in single spacing and marked "not for publication", the telephone and fax numbers (with country and area codes) of the corresponding author must be provided for use if needed during production, in addition the complete postal address if different from the affiliation as an author.

Present/permanent address. If an author has moved since the work described in the paper was done (or was visiting at the time), a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the address of affiliation in the main heading. Superscript Arabic numerals are used for such footnotes (but not for the corresponding author's email contact).

Abstract and keywords

The key features of the work (not its background, nor that it is discussed) should be stated on the second page of the manuscript in a summary of no more than 200 words

for an empirical report or review and 100 words for a short communication. The abstract of an empirical report normally gives the study's main aim, the primary method(s), the most important findings and conclusions from the investigation, but not with subheadings. References, abbreviations or P values should not be used.

This abstract must be followed by a maximum of 10 keywords, which reflect the entries the author(s) would like to see in an index.

Main text

The main text of a full paper should begin with a brief statement of the point of the paper for those interested in the general area of the journal. The remainder of the paper should be for readers professionally familiar with the topic. This means that an empirical report should introduce and discuss only those publications directly relevant to what the investigation discovered. (A short evaluative review of the broader research literature would be welcome as a separate submission.)

The main Introduction, Methods, Results and Discussion sections of an empirical report should have appropriate subsections using just one level of subheading; any second level of subheading must be within a paragraph. Footnotes should be minimised; all essential details should be included in the appropriate place in the main text of Methods. The content and layout of questions and answers should be described without redundancy in the text of Method, with more detail essential to the findings being given in Tables in the Results section; questionnaires and interview protocols (in Figure form) are not published. Reference to a publication should be made by the name of its author, followed by the year of its publication between parentheses, thus: Miller (1990) found that ..., or ... as studied previously (Miller, 1990). Unpublished material should be cited in the form (Jones, Note1).

When a Table or a Figure is cited, normally it should be in brackets at the end of the description of a finding; the Table or Figure itself is described in its heading or caption. The number of each Table or Figure should be indicated in the main text at the end of the paragraph where it is first cited in support of a specific statement of the observation or other content.

Descriptive and inferential statistics should only be cited in support of verbal statements in the Results section of what was reliably observed; description of data-analytical procedures should be confined to the Methods section. Probability values and power statistics should be given with statistic values and round-bracketed degrees of freedom, e.g. $F(1, 34) \equiv 123, p \square 0.001$ (preferably between commas or a stop, rather than square brackets), but where feasible such information should be included in Tables rather than in the main text.

Spelling must be consistent with either British usage (*The Shorter Oxford English Dictionary*) or American usage (*Webster's New Collegiate Dictionary*). However, spelling in the list of references must be literal to each original publication. Details of style not specified here may be determined by reference to the *Publication Manual* of the American Psychological Association or the *Style Manual for Biological Journals*. To avoid unnecessary errors you are strongly advised to use the 'spellchecker' function of your wordprocessor; however, its effects must be checked for changes to the intended wording.

Abbreviations where used, must be standard. The *Systeme Internationale* (SI) should be used for all units; where metric units are used (e.g. kcal), the SI equivalent (e.g. MJ) must also be given.

References

Text: Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Fifth Edition, ISBN 1-55798-790-4, copies of which may be ordered from ⊟http://www.apa.org/books/4200061.html or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA. Or APA, 3 Henrietta Street, London, WC3E 8LU, UK. Details concerning this referencing style can also be found at ⊟http://humanities.byu.edu/linguistics/Henrichsen/APA/APA01.html

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References should be given in the following form (with issue number in parentheses after volume number only when pagination is not across issues throughout the volume:

Hedderley, D. I., & Meiselman, H. L. (1995). Modelling meal acceptability in a free choice environment. *Food Quality and Preference*, 6, 15-26.

Booth, D.A. (1994). *Psychology of nutrition*. London UK & Bristol, PA: Taylor & Francis.

Driver, J., & Bayliss, G. C. (1998). Attention and visual object segmentation. In R. Parasuraman (Ed.), *The attentive brain* (pp. 299-325). Cambridge, MA: MIT Press.

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All cited material which is unpublished or limited in circulation should be listed after the References, with numbering (arabic) in order of citation in the text (as note 1 etc), giving as much information as possible about where to request a copy of the item.

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Tables should not duplicate data presented elsewhere in the manuscript (e.g. in graphs or text). Each column and row of a Table should be distinctively labelled, including units for quantities. Each set of data should be placed in its own labelled column or row (not in brackets with another datum), e.g. N (where Ns vary among cells), Mean, SD, F, P, kcal, MJ. No character (except zero before a decimal point) should be repeated in every cell of a column or row of a Table. Numerical values should normally be rounded to no more than two digits before or after the decimal point or three digits around it. Information about particular cells that cannot be included in the Table heading or column and row labels may be given in a footnote using a superscript letter, or asterisk(s) in the case of P-values only.

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Numbered legends should be typed together on a separate page, collated into the manuscript in front of the Figures (one to a page, with Figure number only). The contents of the Figure should be described in that caption in terminology used in the citing section of the paper. The key to any symbol, line or box should be included in the legend, unless given within the body of the Figure.

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As well as a copy at the end of the main manuscript, original drawings, photographic prints or laser-printed copy must be submitted for each line or half-tone illustration. Each Figure should be clearly numbered (not captioned), away from the body of the graphics. Each box, axis, line or column in a Figure should be distinctively labelled, including units for quantities. Any label or key not in the Figure legend should be placed within the body of the Figure, not adding to the area of the graphics. White space within the width of the Figure and at the top and bottom should be at the minimum consistent with clarity. Data points should be as large as feasible. Columns should be no wider than necessary and stippled or grey filling should be avoided.

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Appendix C

Ethics Committee Approval

Ethics Application

Sent: 27 April 2007 12:29
To: béiotice c. (cks105)

Dear Claire

Re: **Effect of thought suppression on stroop performance among restrained eaters**

The above titled application was approved by the School of Psychology Ethics Committee on 25 April 2007.

Should you require any further information, please do not hesitate in contacting me. Please quote reference CLIN/04/51.

Best wishes,

Kathryn

Miss Kathryn Smith
Secretary to the Ethics Committee
School of Psychology
University of Southampton
Highfield
Southampton SO17 1BJ
Tel: 023 8059 3995 Fax: 023 8059 2606
Email: kms@soton.ac.uk

Appendix D

Recruitment Poster

Colour Naming Experiment!

Females are required to take part in an experiment on **COLOUR NAMING!**

1. Complete an online questionnaire **(2 credits)**
2. Name the colour of various words printed in different colours, as fast as you can! **(4 credits)**

The experiment lasts approx 60 minutes and in total you will get

6 CREDITS!!

For stage 2, participants are required to refrain from eating for 3 hours before the experiment.

Simply log onto:
http://www.psychology.soton.ac.uk/psychosurvey/condition_start.php?conditionID=36

OR contact Claire at: cks105@soton.ac.uk

Start date: 01/08/2007 **End date:** 01/02/2008

COLOUR NAMING EXPERIMENT:
http://www.psychology.soton.ac.uk/psychosurvey/condition_start.php?conditionID=36
OR e-mail: **cks105@soton.ac.uk**

COLOUR NAMING EXPERIMENT: http://www.psychology.soton.ac.uk/psychosurvey/condition_start.php?conditionID=36 OR e-mail: **cks105@soton.ac.uk**
COLOUR NAMING EXPERIMENT: http://www.psychology.soton.ac.uk/psychosurvey/condition_start.php?conditionID=36 OR e-mail: **cks105@soton.ac.uk**
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Appendix E

Thought Control Questionnaire

Thought Control Questionnaire (TCQ)

Most people experience unpleasant and/ or unwanted thoughts (in verbal and/ or picture form), which can be difficult to control. We are interested in the techniques that you **generally** use to control such thoughts.

Below are a number of things that people to do control these thoughts. Please read each statement carefully and indicate how often you use each technique by **circling** the appropriate number. There are no right or wrong answers. Do not spend too much time thinking about each one.

When I experience an unpleasant/ unwanted thought:

		Never	Sometimes	Often	Almost always
1	I call to mind positive images instead	1	2	3	4
2	I tell myself not to be so stupid	1	2	3	4
3	I focus on the thought	1	2	3	4
4	I replace the thought with a more trivial bad thought	1	2	3	4
5	I don't talk about the thought to anyone	1	2	3	4
6	I punish myself for thinking the thought	1	2	3	4
7	I dwell on other worries	1	2	3	4
8	I keep the thought to myself	1	2	3	4
9	I occupy myself with work instead	1	2	3	4
10	I challenge the thought's validity	1	2	3	4
11	I get angry at myself for having the thought	1	2	3	4
12	I avoid discussing the thought	1	2	3	4
13	I shout at myself for having the thought	1	2	3	4
14	I analyse the thought rationally	1	2	3	4
15	I slap or pinch myself to stop the thought	1	2	3	4
16	I think pleasant thoughts instead	1	2	3	4
17	I find out how my friends deal with these thoughts	1	2	3	4
18	I worry about more minor things instead	1	2	3	4
19	I do something that I enjoy	1	2	3	4
20	I try to reinterpret the thought	1	2	3	4
21	I think about something else	1	2	3	4
22	I think more about the more minor problems I have	1	2	3	4
23	I try a different way of thinking about it	1	2	3	4
24	I think about past worries instead	1	2	3	4
25	I ask my friends if they have similar thoughts	1	2	3	4
26	I focus on different negative thoughts	1	2	3	4
27	I question the reasons for having the thought	1	2	3	4
28	I tell myself that something bad will happen if I think the thought	1	2	3	4
29	I talk to a friend about the thought	1	2	3	4
30	I keep myself busy	1	2	3	4

Scoring Guidelines:

Question	Score	Subscale
1		D
2		P
3		R
4		W
5	R	S
6		P
7		W
8	R	S
9		D
10		R
11		P
12	R	S
13		P
14		R
15		P
16		D
17		S
18		W
19		D
20		R
21		D
22		W
23		R
24		W
25		S
26		W
27		R
28		P
29		S
30		D

Distraction = ____ Social Control = ____ Worry = ____

Punishment = ____ Re-appraisal = ____

Total Score (30 items) = ____

Appendix F

Permission to Use the TCQ

RE: Thought Control Questionnaire
Adrian.wells@manchester.ac.uk

Sent: 13 May 2007 13:46
To: béiotice c.k. (cks105)

Dear Miss Béiotice,

Following your recent e-mail regarding the use of the TCQ, I would be happy to grant you permission to use it in your research.

Good luck,

Adrian Wells

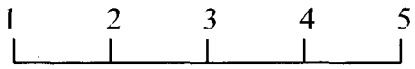
Appendix G

Experimental Questionnaire-1 (EQ-1)

Experimental Questionnaire-1 (EQ-1)

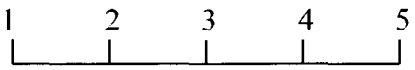
Please answer the following questions in relation to how you are feeling right now, as you are filling out the questionnaire:

1) How strong is your desire for food right now?



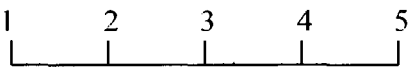
(1 = I have no desire for food at all; 5 = I have a very strong desire for food)

2) How strong is your urge to eat right now?



(1 = I have no urge to eat at all; 5 = I have a very strong urge to eat)

3) How hungry do you feel right now?



(1 = I am not hungry at all; 5 = I am extremely hungry)

Appendix H

Outline of Pilot Study 1

Pilot Study 1

The first pilot study aimed to ascertain whether the six questionnaires devised by the researcher were easy to understand and whether the layout was clear. The set of six questionnaires included the five pre-Experimental Questionnaires: EQ-1, EQ-2 (suppression of food words), EQ-2 (suppression of house words), EQ-2 (non-suppression of food words) and EQ-2 (non-suppression of house words), and one post experimental questionnaire (PEQ).

Ten female participants took part in the study. Participants varied in age from 19 to 23 years, with a mean of 20.1 years (SD = .98) and were selected through opportunity sampling. For each questionnaire, participants were required to rate on a 5-point Likert scale: (1) how easy the questions were to understand (range: 1 'very difficult to understand' to 5 'very easy to understand'); (2) how easy the instructions were to follow (range: 1 'very difficult to follow' to 5 'very easy to follow'); and (3) how clear the layout was (range: 1 'not clear at all' to 5 'very clear'). These items were followed by an open-ended question asking for any further comments or suggestions (see Appendix 7 for the questionnaire administered for pilot study 1). Ratings ranged from 3-5 for each of the items (see Table A1 for means and standard deviations of ratings for each questionnaire) and no comments or suggestions were given; hence all questionnaires were included in the main study.

Table A1.

Descriptive Statistics for Pilot Study 1

	How easy were the questions to understand? $N = 10$		How easy was it to follow instructions? $N = 10$		How clear was the layout? $N = 10$	
	M	*SD*	*M*	*SD*	*M*	*SD*
EQ-1[a]	4.40	.52	4.10	.32	4.40	.52
EQ-2[b] suppression of food words	4.00	.82	4.00	.47	3.90	.32
EQ-2[b] suppression of house words	3.90	.32	3.80	.42	4.00	.47
EQ-2[b] non-suppression of food words	3.80	.42	4.00	.47	3.90	.32
EQ-2[b] non-suppression of house words	3.80	.42	3.90	.32	3.90	.32
PEQ[c]	4.10	.57	4.20	.63.	4.00	.67

[a] Experimental Questionnaire-1; [b] Experimental Questionnaire 2; [c] Post Experimental Questionnaire

Appendix I

Questionnaire for Pilot Study 1

Questionnaire for Pilot Study 1

You are being asked to take part in a pilot study to determine whether several questionnaires designed by the researcher are easy to understand and whether the layout of the questionnaires is clear.

All information collected for this pilot study will be kept strictly confidential and results will not include your name or any other identifying characteristics. You may withdraw your consent and discontinue participation at any time without penalty or loss of benefit to yourself. The study is being conducted as part of the University of Southampton, Doctoral Programme in Clinical Psychology and the School of Psychology Research Ethics Committee has reviewed the study. If you have any questions or would like to request a project summary, please contact: Claire Béiotice, School of Psychology, University of Southampton, SO17 1BJ, E-mail: cks105@soton.ac.uk.

Six questionnaires have been designed by the researcher and will be included in the main study. These questionnaires (attached) are called: EQ-1, EQ-2 (suppression of food words), EQ-2 (suppression of house words), EQ-2 (non-suppression of food words), EQ-2 (non-suppression of house words) and PEQ.

Please answer the following questions for each questionnaire:

Name of Questionnaire _____

(a) How easy were the questions to understand?

1 2 3 4 5

(1 = very difficult to understand; 5 = very easy to understand)

(b) How easy was it to follow the instructions?

1 2 3 4 5

(1 = very difficult to follow; 5 = very easy to follow)

(c) How clear was the layout of the questionnaire?

1 2 3 4 5

(1 = not at all clear; 5 = very clear)

(d) Any comments/ suggestions that may be helpful

.....

.....

.....

Appendix J

Experimental Questionnaire-2 (EQ-2) – Food Version, Suppression Condition

Experimental Questionnaire-2 (EQ-2)
Suppression of Food Words

Please answer the following questions in relation to the task you have most recently completed:

1) How hard did you try to follow instructions?

1 2 3 4 5

(1 = I did not try at all; 5 = I tried very hard)

2) How often did you suppress your thoughts about food?

1 2 3 4 5

(1 = I did not suppress my thoughts at all; 5 = I suppressed my thoughts all the time)

3) How much control over your thoughts did you have when asked to suppress your thoughts about food?

1 2 3 4 5

(1 = I felt I had no control; 5 = I had full control)

4) How frequently did you experience food-related thoughts when asked to suppress your thoughts about food?

1 2 3 4 5

(1 =I had no food-related thoughts at all; 5 = I experienced food-related thoughts all the time)

5) Approximately what percentage (%) of time did you engage in food-related thoughts when asked to suppress your thoughts about food?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix K

EQ-2 (House Version, Suppression Condition)

Experimental Questionnaire-2 (EQ-2)
Suppression of House Words

Please answer the following questions in relation to the task you have most recently completed:

1) How hard did you try to follow instructions?

1 2 3 4 5

(1 = I did not try at all; 5 = I tried very hard

2) How often did you suppress your thoughts about houses?

1 2 3 4 5

(1 = I did not suppress my thoughts at all; 5 = I suppressed my thoughts all the time)

3) How much control over your thoughts did you have when asked to suppress your thoughts about houses?

1 2 3 4 5

(1 = I felt I had no control; 5 = I had full control)

4) How frequently did you experience house-related thoughts when asked to suppress your thoughts about houses?

1 2 3 4 5

(1 =I had no house-related thoughts at all; 5 = I experienced house-related thoughts all the time)

5) Approximately what percentage (%) of time did you engage in house-related thoughts when asked to suppress your thoughts about houses?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix L

EQ-2 (Food Version, Non-suppression Condition)

Experimental Questionnaire-2 (EQ-2)
Non-Suppression of Food Words

Please answer the following questions in relation to the task you have most recently completed:

1) How hard did you try to follow instructions?

1 2 3 4 5

(1 = I did not try at all; 5 = I tried very hard)

2) How often did you suppress your thoughts about food?

1 2 3 4 5

(1 = I did not suppress my thoughts at all; 5 = I suppressed my thoughts all the time)

3) How much control over your thoughts did you have when asked to let your thoughts flow freely through your mind?

1 2 3 4 5

(1 = I felt I had no control at all; 5 = I had full control)

4) How frequently did you experience food-related thoughts when asked to let your thoughts flow freely through your mind?

1 2 3 4 5

(1 = I had no food-related thoughts at all; 5 = I had food-related thoughts all the time)

5) Approximately what percentage (%) of time did you engage in food-related thoughts when asked to let your thoughts flow freely through your mind?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix M

EQ-2 (House Version, Non-suppression Condition)

Experimental Questionnaire-2 (EQ-2)
Non-Suppression of House Words

Please answer the following questions in relation to the task you have most recently completed:

1) How hard did you try to follow the instructions?

1 2 3 4 5

(1 = I did not try at all; 5 = I tried very hard)

2) How often did you suppress your thoughts about houses?

1 2 3 4 5

(1 = I did not suppress my thoughts at all; 5 = I suppressed my thoughts all the time)

3) How much control over your thoughts did you have when asked to let your thoughts flow freely through your mind?

1 2 3 4 5

(1 = I felt I had no control at all; 5 = I had full control)

4) How frequently did you experience house-related thoughts when asked to let your thoughts flow freely through your mind?

1 2 3 4 5

(1 = I had no house-related thoughts at all; 5 = I had house-related thoughts all the time)

5) Approximately what percentage (%) of time did you engage in house-related thoughts when asked to let your thoughts flow freely through your mind?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix N

Post-Experimental Questionnaire (PEQ)

Post-Experimental Questionnaire (PEQ)

Please complete the following questions:

1) Age: _____

2) Height: _____ Meters

3) Weight: _____ Kilograms

4) Approximately how long has it been since your last meal?

___ hours ____ minutes

Please answer the following questions in relation to how you think or feel in general*:*

1) How often do you think about food and eating?

1 2 3 4 5

(1 = Not at all, 5 = All the time)

2) How difficult do you find it to control thoughts relating to food and eating?

1 2 3 4 5

(1 = No difficulty controlling these thoughts at all, 5 = Extreme difficulty controlling these thoughts)

Appendix O

Outline of Pilot Studies 2 and 3

Pilot Studies 2 and 3

Two further pilot studies were conducted to devise the word lists included in the Stroop tasks.

Pilot Study 2

The second pilot study aimed to select 7 food-related words and 7 house-related words. The sample included 25 female participants. Participants varied in age from 20 to 29 years, with a mean of 24.8 years ($SD = 2.31$) and were selected through opportunity sampling. To devise a list of food words, participants were presented with 40 words derived from previous similar studies (e.g. Boon, Vogelzang, & Jansen, 2000; Cooper & Todd, 1997; Dejonckheere, Braet, & Soetens, 2003; Green & Rogers, 1993; Rofey, Corcoran, & Tran, 2004) and were required to rate each word on a 5-point Likert scale according to how much each word tempts them to eat, ranging from 1 (no temptation to eat) to 5 (very strong temptation to eat). To ensure that the experiment appropriately differentiated between food words and house words, participants were also asked to rate whether each of the food words were related to the word 'house' (1= not related at all; 5= very strongly related). The seven highest ranking words for 'temptation to eat' were selected. These seven words also met the criteria for not being related to the word house.

A similar procedure was used to generate the house words, whereby participants were presented with a list of house-related words and were required to rate each word on a 5-point Likert scale according to how much each word is related to the word 'house', ranging from 1 (not related at all) to 5 (very strongly related).

Participants were also instructed to rate whether the house words were related to the word 'food' (1= not related at all; 5= very strongly related). The seven highest ranking words identified to be related to the word 'house' were selected. The words 'bedroom' and 'kitchen' were then removed from this list because it was also identified as being related to the word 'food', and the next highest ranking word was selected for inclusion in the study.

Pilot Study 3

A third pilot study was conducted to devise 8 positive words, 8 neutral words and 8 negative words to be included in the food and house Stroop tasks. 25 female participants took part in the study, varying in age from 18 to 28 years with a mean of 22.8 years (SD = 1.84). The purpose of the study was to ensure that the experiment appropriately differentiated between positive, neutral and negative words. To devise a list of emotion words, participants were presented with 96 words (32 positive, 32 neutral, 32 negative) derived from previous similar studies (e.g. Beck, Freeman, Shipherd, Hamblen, & Lackner, 2001; Dejonckheere et al., 2003; Green & Rogers, 1993; Lattimore & Maxwell, 2004; Wegner, Erber, & Zanakos, 1993) and were required to rate each word on a 5-point Likert scale according to how emotional they found each word, ranging from 1 (very positive) to 5 (very negative). Words with the highest frequency of very positive, neutral and very negative ratings were included in the study. Mean ratings for the three word groups were: 1.38 (SD = .744) for the positive words; 3.00 (SD = .535) for the neutral words; and 4.88 (SD = .354) for the negative words. A one-way ANOVA with planned linear contrasts was conducted to determine whether the ratings were significantly different between the three word groups. This revealed that, as expected, ratings for the positive words were

significantly higher compared to the neutral words ($t(21) = -5.73, p<.001$) and negative words ($t(21) = -12.35, p<.001$) and that ratings for the neutral words were significantly higher compared to the negative words ($t(21) = -6.61, p<.001$). This suggests that the study appropriately differentiated between the three emotion word groups.

Appendix P

Questionnaire for Pilot Study 2

Pilot Study 2 Questionnaire

You are being asked to take part in a pilot study to determine which words should be included in the main experimental task. The purpose of the main study is to investigate the effect of dietary restraint and thought suppression on Stroop performance.

All information collected for this pilot study will be kept strictly confidential and results will not include your name or any other identifying characteristics. You may withdraw your consent and discontinue participation at any time without penalty or loss of benefit to yourself. The study is being conducted as part of the University of Southampton, Doctoral Programme in Clinical Psychology and the School of Psychology Research Ethics Committee has reviewed the study. If you have any questions or would like to request a project summary, please contact: Claire Béiotice, School of Psychology, University of Southampton, SO17 1BJ, E-mail: cks105@soton.ac.uk.

Gender:

Age:

Below is a list of 40 words. Please indicate *how much each word tempts you to eat*:

		Does not tempt me to eat at all	**Slight influence on tempting me to eat**	**Moderate influence on tempting me to eat**	**Strong influence on tempting me to eat**	**Very strong influence on tempting me to eat**
1	Crisps					
2	Bedroom					
3	Toast					
4	Door					
5	Burgers					
6	Stairs					
7	Bed					
8	Pizza					
9	Dessert					
10	Cream					
11	Cheese					
12	Windows					
13	Path					
14	Ice-cream					
15	Bricks					
16	Tiles					
17	Bread					
18	Chocolate					
19	Chair					
20	DIY					
21	Butter					
22	Garden					

		Does not tempt me to eat at all	Slight influence on tempting me to eat	Moderate influence on tempting me to eat	Strong influence on tempting me to eat	Very strong influence on tempting me to eat
23	Sweets					
24	Kitchen					
25	Chimney					
26	Chips					
27	Table					
28	Treacle					
29	Walls					
30	Bathroom					
31	Pasta					
32	Barbeque					
33	Basement					
34	Garage					
35	Icing					
36	Cakes					
37	Sugar					
38	Roof					
39	Gateaux					
40	Sandwiches					

Below is a list of 40 words. Please indicate *how much you think each word is related to the word 'house':*

		Not related at all	**Slightly related to the word 'house'**	**Moderately related to the word 'house'**	**Strongly related to the word 'house'**	**Very strongly related to the word 'house'**
1	Crisps					
2	Bedroom					
3	Toast					
4	Door					
5	Burgers					
6	Stairs					
7	Bed					
8	Pizza					
9	Dessert					
10	Cream					
11	Cheese					
12	Windows					
13	Path					
14	Ice-cream					
15	Bricks					
16	Tiles					
17	Bread					
18	Chocolate					
19	Chair					
20	DIY					
21	Butter					
22	Garden					
23	Sweets					
24	Kitchen					
25	Chimney					
26	Chips					
27	Table					
28	Treacle					
29	Walls					
30	Bathroom					
31	Pasta					
32	Barbeque					
33	Basement					
34	Garage					
35	Icing					
36	Cakes					
37	Sugar					
38	Roof					
39	Gateaux					
40	Sandwiches					

Appendix Q

Questionnaire for Pilot Study 3

Pilot Study 3 Questionnaire

You are being asked to take part in a pilot study to determine which words should be included in the main experimental task. The purpose of the main study is to investigate the effect of dietary restraint and thought suppression on Stroop performance.

All information collected for this pilot study will be kept strictly confidential and results will not include your name or any other identifying characteristics. You may withdraw your consent and discontinue participation at any time without penalty or loss of benefit to yourself. The study is being conducted as part of the University of Southampton, Doctoral Programme in Clinical Psychology and the School of Psychology Research Ethics Committee has reviewed the study. If you have any questions or would like to request a project summary, please contact: Claire Béiotice, School of Psychology, University of Southampton, SO17 1BJ, E-mail: cks105@soton.ac.uk.

Gender:

Age:

Below is a list of 98 words. For each word, please indicate *how emotional you think the word is.*

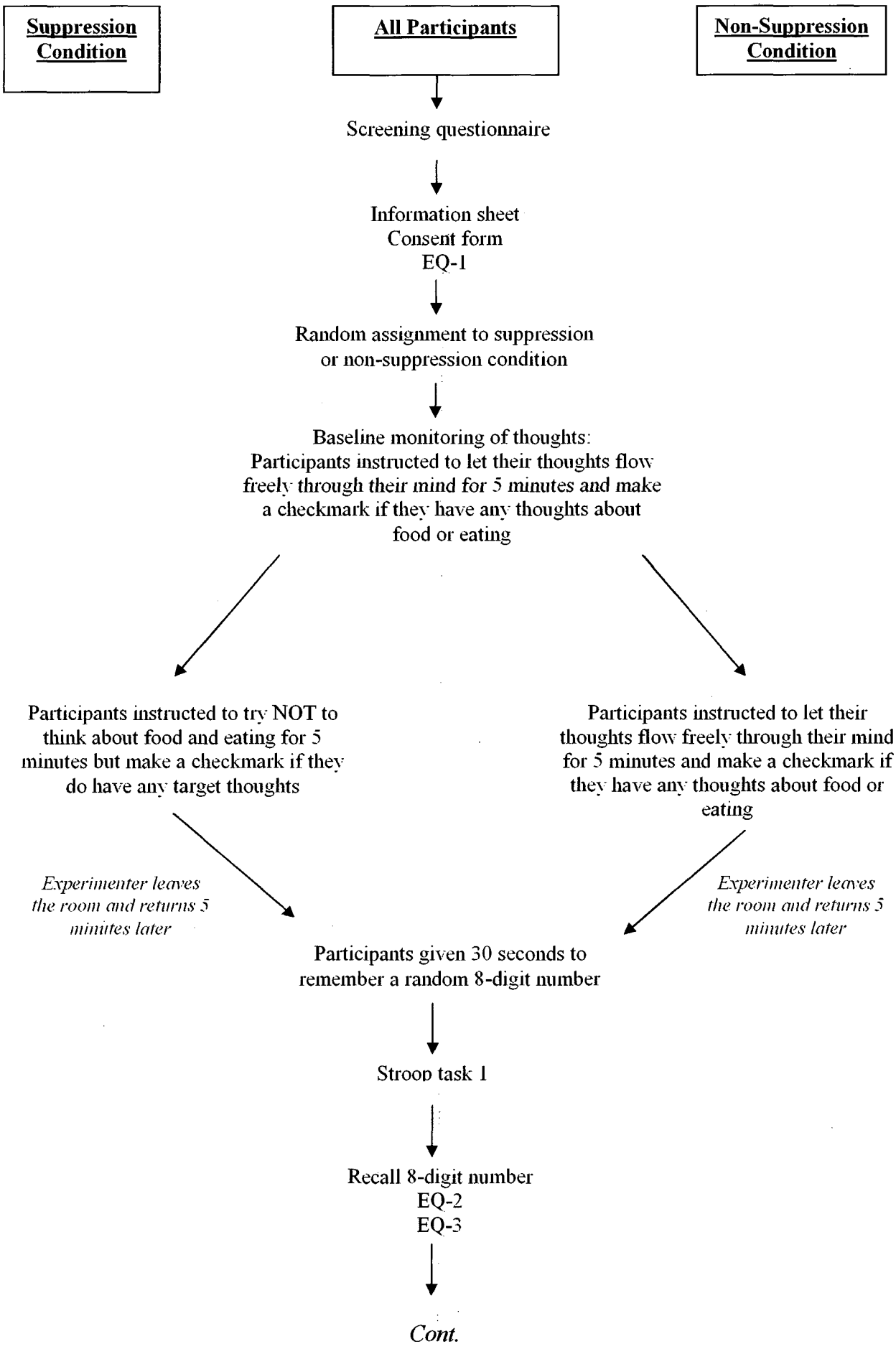
		Very Positive	**Positive**	**Neutral**	**Negative**	**Very Negative**
1	Plate					
2	Upset					
3	Merry					
4	Umbrella					
5	Bliss					
6	Zip					
7	Glass					
8	Irritate					
9	Folder					
10	Bag					
11	Bad					
12	Giggle					
13	Lavish					
14	Nasty					
15	Moan					
16	Cushion					
17	Worry					
18	Chair					
19	Book					
20	Rage					
21	Luxury					
22	Triumph					

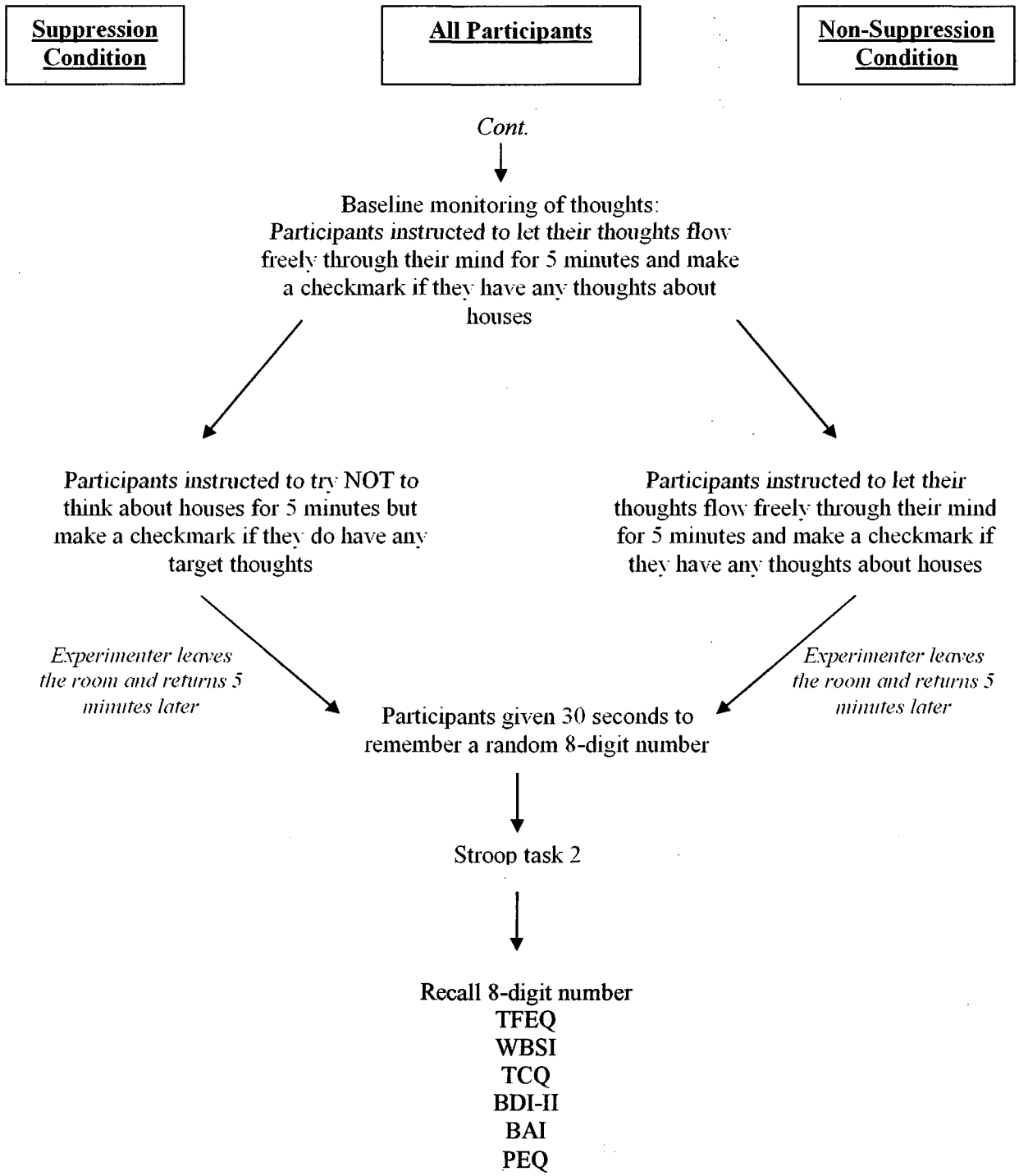
		Very Positive	Positive	Neutral	Negative	Very Negative
23	Paper					
24	Free					
25	Night					
26	Justice					
27	Offend					
28	Box					
29	Napkin					
30	Love					
31	Tearful					
32	Light					
33	Idol					
34	Skip					
35	Content					
36	Dice					
37	Poor					
38	Ball					
39	Radio					
40	Torment					
41	Work					
42	Polite					
43	Thrilled					
44	Balloon					
45	Rubber					
46	Slum					
47	Charm					
48	Phone					
49	Candle					
50	Excited					
51	Ring					
52	Lighter					
53	Nag					
54	Scissors					
55	Fear					
56	Devotion					
57	Nice					
58	Fire					
59	Complain					
60	Key					
61	Anger					
62	Hat					
63	Joy					
64	Cloud					
65	Distress					
66	Wallet					
67	Joke					
68	Shoe					
69	Pencil					
70	Cloth					
71	Tense					
72	Screen					
73	Sewing					

		Very Positive	Positive	Neutral	Negative	Very Negative
74	Laughing					
75	Cabinet					
76	Horrible					
77	Dishwasher					
78	Page					
79	Awful					
80	Table					
81	Annoy					
82	Fan					
83	Pleasant					
84	Glove					
85	Metal					
86	Cruel					
87	Movie					
88	Sky					
89	Delight					
90	Boredom					
91	Playful					
92	Gloomy					
93	Ruler					
94	Towels					
95	Happiness					
96	Sadness					

Appendix R

Diagram of Procedure


Suppression Condition
All Participants
Non-Suppression Condition
Screening questionnaire
Information sheet
Consent form
EQ-1
Random assignment to suppression or non-suppression condition
Baseline monitoring of thoughts: Participants instructed to let their thoughts flow freely through their mind for 5 minutes and make a checkmark if they have any thoughts about food or eating
Participants instructed to try NOT to think about food and eating for 5 minutes but make a checkmark if they do have any target thoughts
Participants instructed to let their thoughts flow freely through their mind for 5 minutes and make a checkmark if they have any thoughts about food or eating
Experimenter leaves the room and returns 5 minutes later
Experimenter leaves the room and returns 5 minutes later
Participants given 30 seconds to remember a random 8-digit number
Stroop task 1
Recall 8-digit number
EQ-2
EQ-3
Cont.


Suppression Condition
All Participants
Non-Suppression Condition
Cont.
Baseline monitoring of thoughts:
Participants instructed to let their thoughts flow freely through their mind for 5 minutes and make a checkmark if they have any thoughts about houses
Participants instructed to try NOT to think about houses for 5 minutes but make a checkmark if they do have any target thoughts
Participants instructed to let their thoughts flow freely through their mind for 5 minutes and make a checkmark if they have any thoughts about houses
Experimenter leaves the room and returns 5 minutes later
Experimenter leaves the room and returns 5 minutes later
Participants given 30 seconds to remember a random 8-digit number
Stroop task 2
Recall 8-digit number
TFEQ
WBSI
TCQ
BDI-II
BAI
PEQ

Appendix S

Information Sheet

University of Southampton

School of Psychology

Doctoral Programme in Clinical Psychology

University of Southampton
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Tel +44 (0)23 8059 5321
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A Study of Cognitions and Colour Naming

You are being asked to take part in a research study. Before you decide whether you would like to take part, please read this information sheet to help you understand what the study will involve and why the research is being done.

What is the purpose of the study?
The purpose of the study is to investigate how cognitive tasks influence the ability to name colours.

Why have I been chosen?
You have been selected to take part following your response to the online screening questionnaire. I am selecting participants who gave a range of different response patterns to the questions, and therefore your inclusion in this study is not evidence of 'abnormal' responding and the questionnaire is not, in itself, a sufficient basis to make any diagnosis.

Do I have to take part?
No, it is up to you to decide whether you would like to take part.

What does the study involve?
The study will involve a period of monitoring your thoughts, followed by a computer task. This will involve looking at words printed in various colours on the computer screen. Your task will be to name the colour of each word as quickly as possible. You will be given 10 practice trials, followed by the main task. After this, you will be given a set of questionnaires to complete and your height and weight will be measured. The study will take approximately 50 minutes to complete. All participants are required to refrain from eating for 3 hours before the experiment.

Will my results be kept confidential?
Yes, all information collected for the study will be kept strictly confidential and results will not include your name or any other identifying characteristics. Personal information will not be released to or viewed by anyone other than the researchers involved in this project.

What will happen to the results of the study?
A report of the study will be written. A summary of the results will be made available on request.

Who is organising and funding the research?
I am a clinical psychology trainee at the University of Southampton, Doctoral Programme in Clinical Psychology. The research is being conducted as part of my training and the University of Southampton will act as a sponsor.

Who has reviewed the study?
The School of Psychology Research Ethics Committee, University of Southampton. If you have any questions or would like to request a project summary, please contact: Claire Béiotice, School of Psychology, University of Southampton, SO17 1BJ, E-mail: cks105@soton.ac.uk

Appendix T

Consent Form

University of Southampton

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Tel +44 (0)23 8059 5321
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Consent Form

A Study of Cognitions and Colour Naming

Researcher: Claire Béiotice, Trainee Clinical Psychologist

Please circle yes/ no to indicate your response to the following statements:

1. I have read and understood the information sheet explaining the purpose of this study	YES NO
2. I understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself	YES NO
3. I understand that data collected as part of this research project will be treated confidentially, and that published results of this research project will maintain my confidentiality. In signing this consent letter, I am not waiving my legal claims, rights, or remedies	YES NO
4. I give consent to refrain from eating for 3 hour before this study	YES NO
5. I consent to have my height and weight measured at the end of the experiment	YES NO
6. I give consent to participate in the above study	YES NO

Signature _____ Date _____

Name _____

I understand that if I have questions about my rights as a participant in this research, or if I feel that I have been placed at risk, I can contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Phone: (023) 8059 3995.

Appendix U

Debriefing Statement

University of Southampton

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Debriefing Statement: Effect of Thought Suppression, Dietary Restraint and Disinhibition on Stroop Performance

What was the purpose of the study?
The study aimed to examine the role of dietary restraint and disinhibition on cognitive performance following a thought suppression task. It is expected that when people suppress thoughts about food, they will be slower at colour-naming food words on the cognitive task, compared to when they do not suppress thoughts about food. Additionally, it is expected that people who have difficulty restraining the amount of food they eat will be slower at colour-naming words, compared to people who can easily restrain the amount they eat.

Participants were only partially informed about the aim of the study, whereby the researcher was looking at the relationship between eating patterns, thought suppression and performance on the Stroop task. This was deemed necessary to reduce the confound of response bias, since participants may alter performance to conform with the research hypotheses.

What are the clinical implications?
Your data will help our understanding of the cognitive mechanisms involved in thought suppression and also the factors involved in the development and maintenance of dietary restraint. This will help us to understand why dieting attempts frequently fail and do not result in weight loss, since suppression of thoughts is assumed to be an ineffective strategy for long-term thought control.

What will happen to the results of the study?
All information collected for the study will be kept strictly confidential and results will not include your name or any other identifying characteristics. If you have any further questions, or would like to request a project summary, please contact: Claire Béiotice, School of Psychology, University of Southampton, SO17 1BJ. E-mail: cks105@soton.ac.uk.

Useful resources
For more information about thought suppression and dietary restraint, the following references may be helpful:

Soetens, B., Braet, C., Dejonckheere, P., Roets, A. (2006). When suppression backfires: The ironic effects of suppressing eating-related thoughts. Journal of Health Psychology. 11, 655-668

Wegner, D. M. & Zanakos, S. (1994). Chronic thought suppression. Journal of Personality, 62, 615 – 640

Thank you for taking part in this study

Signature: Date:
Name:

If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Phone: (023) 8059 3995.

Appendix V

Access to Further Information

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A Study on the Effects of Thought Suppression and Dietary Restraint

Thank you for taking part in this study.

From time to time, everyone feels sad, angry or worried, especially when things are not going very well. For some people these feelings seem to come and go, but for others, the feelings may last for quite a long time. These feelings can affect how people feel about themselves, the way they think about things and they can also affect our ability to cope with things in everyday life.

This may not apply to you, but if it does, you may find it helpful to get some advice and support.

Where to go for help

If you feel you need some help and support, or if you just want someone to talk to, please contact any of these people who will be able to help you:

- Your GP
- The Samaritans: 08457 90 90 90
- The Eating Disorders Association: 0845 634 1414
- Depression Alliance: 08457 660163

Researchers: Claire Béiotice, Dr Catherine Brignell.
School of Psychology, Doctoral Programme in Clinical Psychology, University of Southampton, Highfield, Southampton, SO17 IBJ. 02380 595321