ELSEVIER

Appetite 45 (2005) 235–241

Appetite

www.elsevier.com/locate/appet

Research Report

Dietary restraint and cognitive performance in children

Jeffrey M. Brunstrom*, Claire J. Davison, Gemma L. Mitchell

Department of Human Sciences, Loughborough University, UK

Received 14 January 2005; revised 28 June 2005; accepted 26 July 2005

Abstract

Adults who attempt to restrict their dietary intake also tend to perform worse on a range of cognitive tasks. However, the extent to which this finding generalises to children has remained unclear. Following studies involving adults, we asked 44 girls (mean age = 10.1 years) to complete a simple reaction-time task and the Tower of London task. This group was selected from a local community school in the East Midlands (UK). Dietary restraint was measured using a version of the Dutch Eating Behaviour Questionnaire that had been adapted for use by children. Our results indicate that children with high restraint scores have longer reaction times and they also tend to perform worse on the TOL task. Other aspects of our data also suggest the dietary restraint may be correlated negatively with a measure of academic ability. We discuss reasons why restraint and performance might be related causally and we conclude that this issue warrants further scrutiny.

Keywords: Dietary restraint; Dieting; Children; Developmental; Dieting; Cognitive performance; Reaction time; Preoccupation; Distraction; Tower of London

Introduction

Dietary restraint (including dieting to lose weight) is useful because it can help to prevent obesity. However, it is also associations with a number of unwanted consequences. These include depression (Rosen, Gross, & Vara, 1987), stress (Kagan & Squires, 1984), social anxiety (Rosen et al., 1987), a low self-esteem (Polivy, Herman, & Mcfarlane, 1994), and an increased risk of developing an eating disorder (Herman & Polivy, 1980; Hsu, 1997). Dieting is also associated with poorer performance on a range of cognitive measures (Green & Rogers, 1995, 1998; Wing, Vazquez, & Ryan, 1995). For example, compared with non-dieters, dieters appear to have a reduced ability to sustain attention (Rogers & Green, 1993), slower reaction times (Green & Rogers, 1995; Green, Rogers, & Elliman, 2000; Green, Rogers, Elliman, & Gatenby, 1994), and poorer problem-solving performance (Green et al., 2003; Green & Rogers, 1998).

Interestingly, these cognitive deficits appear to be mediated by psychological rather than physiological factors. This is because impairments exist in the absence of weight-loss (Green & Rogers, 1995) and because periods of enforced food deprivation fail to generate deficits in performance (Green, Elliman, & Rogers, 1995; Kretsch, Green, Fong, Elliman, & Johnson, 1997). Indeed, a recent study indicates that dieters may even experience a decrease in performance after eating a high-energy chocolate bar (Jones & Rogers, 2003). Based on this evidence, Green et al. (2003) have argued that performance is probably modulated by the demands that dietary restraint places on working memory capacity (Baddeley & Hitch, 1974). Consistent with this idea, dietary restraint is associated with a preoccupation with thoughts concerning food and weight (Laessle, Platte, Schweiger, & Pirke, 1996; Williams, Healy, Eade, Windle, Cowen and Green, 2002), which is also correlated with the severity of the impairment (Green & Rogers, 1998; Vreugdenburg, Bryan, & Kemps, 2003).

We should be especially concerned, because dieting behaviour is now evident in early school ages (Braet & Wydhooge, 2000; Hill & Bhatti, 1995; Hill, Draper, & Stack, 1994). Self-reported dietary restraint has been identified in children as young as 9 years old (Hill & Bhatti, 1995; Hill et al., 1994) and it is more common in girls than in boys (Thelen, Powell, Lawrence, & Kuhnert, 1992). A

* Corresponding author. Address: Department of Experimental Psychology, University of Bristol, 8 Woodland Road, Bristol, BS8 1TN England, UK.

E-mail address: jeff.brunstrom@bristol.ac.uk (J.M. Brunstrom).

0195-6663/$ - see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.appet.2005.07.008

good predictor of attempts to lose weight is body-mass index (Schreiber et al., 1996). This may reflect an early onset of concerns about body image and self esteem (Conner, Martin, & Silverdale, 1996; Gralen, Levine, Smolak, & Murnen, 1990; Hill, Oliver, & Rogers, 1992; Lawrence & Thelen, 1995), possibly resulting from values inherited culturally from within the family (Davison, Markey, & Birch, 2000). Given this correspondence between adults and children, we sought to determine whether dietary restrained children exhibit the same kinds of cognitive impairment. This issue merits attention, because an impairment of this kind has the potential to impact on schooling and educational development.

Method

Participants

Forty-four girls were tested in this study. All were selected from three consecutive year groups in a state-funded primary (elementary) school in the East Midlands region of the UK. Their mean age was 10.1 years (range 8.6–11.4 years).

Cognitive measures

The simple reaction time (SRT) task and the Tower of London (TOL) task were both presented on a 133 MHz PC. The SRT and the TOL task were implemented on a DOS and a Windows '95 platform, respectively. Participants completed these tasks while sitting 0.5 m away from a VDU. Both the SRT task and the Tower of London task have been used previously to assess restraint-related cognitive impairments in adults (Green & Rogers, 1998; Green et al., 2000, 1994).

SRT task

The SRT task was based on a modified version of a procedure used previously by Brunstrom, and Witcomb (2004). On each trial, the participants focused on a blank VDU. A white circle appeared after a random interval in the range one to seven seconds. The circle remained on the screen until the participant pressed the spacebar on the keyboard. Depressing the spacebar also initiated the next trial. A measure of reaction time was derived from the latency between the onset of the circle and depression of the spacebar.

Standardised instructions were given to the participants. These included a practice block of eight trials. Participants were told to keep their writing hand resting on the space bar at all times. The main SRT task comprised a set of 20 trials.

TOL task

The TOL task was based on an original version by Shallice (1982) and the puzzles and procedure were similar to those used by Krikorian, Bartok, and Gay (1994). On each trial, the participants were presented with a 'starting position' in the centre of a VDU. This consisted of a set of virtual 'pegs' of three different lengths. The left, middle, and right pegs had a capacity to hold three, two, and one block, respectively. The participants were told to use the mouse to move the blocks around the screen so that the starting position matched a 'target' position. Only the top-most block on each peg could be moved and only one block could be moved at a time. The main session comprised 12 trials that became progressively more difficult. Specifically, trials one and two were two-move puzzles, three and four were three-move puzzles, five to eight were four-move puzzles, and nine to 12 were five-move puzzles. If the participant failed to complete a puzzle in the requisite number of moves, then the trial reset. The computer recorded the time period that elapsed during each attempt and the number of attempts that were required. Before starting the main 12-trial session, the participants were given two practice trials (one two-move and one three-move puzzle) to familiarise themselves with the task.

Academic assessment

Although not central to the aims of the study, we were also interested in the relationship between task performance, dietary restraint, and academic ability. Our opportunity to recruit assistance from teaching staff was limited and this is reflected in the kind of assessment that we were able make. For each child, their primary class teacher provided a simple rating of academic ability using the following scale, 3 is above average in the class, 2 is average in the class, 1 is below average in the class.

Dietary questions

Our primary aim was to determine whether cognitive impairments are associated with dietary restraint. Following previous studies (Green et al., 2003; Green & Rogers, 1998; Green et al., 1994), we decided to measure dietary restraint using the restraint scale of the Dutch Eating Behaviour Questionnaire (DEBQ, Van Strien et al., 1986). We adapted this scale to make it more readily understood by children. This involved changing the language while maintaining the spirit of the questions. Pilot testing confirmed that this objective had been achieved. We also included adapted versions of the other sub-scales of the DEBQ (emotional eating and external eating). As in previous studies (Green et al., 2003; Green & Rogers, 1998; Green et al., 1994,), these additional scales were incorporated to enable further characterisation of individuals with high and low scores on the restraint scale. They also offer an opportunity to consider whether dietary restraint is a 'pure' predictor of performance even after controlling for the shared variance between restraint and these others scales. After completing this questionnaire the participants were asked if they had