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Food and addiction among the ageing population

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ABSTRACT

Obesity among the elderly is a growing public health concern. Among the various factors that may contribute to the current rates of obesity is the rewarding aspect of highly palatable foods and beverages, which may lead to overconsumption and excess caloric intake. The present review describes recent research supporting the hypothesis that, for some individuals, the consumption these highly palatable foods and beverages may lead to the development of addictive-like behaviors. In particular, the authors consider the relevance of this hypothesis to the ageing population.

Contents

1. Introduction

Obesity in the elderly population is a developing public health concern (Arterburn et al., 2004; Zamboni and Mazzali, 2012), with data showing that approximately 35% of adults in the United States aged 65 and over were obese in 2007–2010 (Fakhouri et al., 2012). This includes more than eight million adults between the ages of 65–74 and nearly 5 million adults aged 75 and above. With the percentage of the U.S. adult population aged 65 and over expected to increase from 13% to 20.2% between 2010 and 2050 (Vincent and Velkoff, 2010) and the numerous medical comorbidities associated with obesity, including type II diabetes, cardiovascular disease, many forms of cancer, gallbladder disease, asthma, chronic back pain and osteoarthritis (Guh et al., 2009), it is important to consider the factors that may contribute to

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excess weight within this population. While the addictive potential of palatable foods has been studied in animal models and the food addiction hypothesis has been investigated in human research in recent years, this concept has received little attention with regard to the elderly population. The current article will summarize key points from the literature on overweight and obesity in the elderly, describe research findings that offer support for the concept of food addiction, and conclude with recommendations for future research to investigate food addiction in the elderly.

2. Physiologic changes, obesity and associated health effects among the elderly

Among other physiological changes, the ageing process involves shifts in body composition. As age increases, skeletal muscle mass declines (Janssen et al., 2000) and fat mass increases (Schutz et al., 2002). Additionally, body fat is redistributed, with, for example, increased intramuscular (Cree et al., 2004) and abdominal fat (Koh-Banerjee et al., 2004; Teh et al., 1996) and decreased subcutaneous fat (Hughes et al., 2004). Despite these changes, body weight can remain stable, which may mask alterations in body composition (Kuk et al., 2009). Other relevant physiological changes associated with ageing include decreased height (Wahlqvist and Flint, 1988) and decreased basal metabolic rate (Chau et al., 2008).

The most common measure used to assess adiposity in humans, the body mass index (BMI), is based on measurements of both height and weight. However, these guidelines do not take into account the physiological changes associated with aging, such as decreases in height, which could inflate BMI measurements (Sorkin et al., 1999). Additionally, BMI could underestimate adiposity because this measurement does not account for age-related increases in adipose tissue, despite body weight remaining the same (Zamboni et al., 2005). Consequently, researchers have investigated other approaches to measuring overweight and obesity in this population, including waist circumference (WC), which can be used to measure adiposity (Janssen et al., 2002; Pouliot et al., 1994). However, the parameters of abdominal obesity ($\geq$102 cm in men and $\geq$88 cm in women) need to be further investigated (Zamboni et al., 2005). Other forms of assessment include waste-to-hip ratio (Dobbelsteyn et al., 2001; Taylor et al., 1998) and sagittal abdominal diameter (Mukuddem-Petersen et al., 2006; Turcato et al., 2000).

Sarcopenic obesity (SO) adds to the complexity of studying overweight and obesity in the elderly. Various definitions of sarcopenia have been proposed, but for the purpose of this article, we will use the operational definition proposed by the European Working Group on Sarcopenia in Older People (EWGOP): a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes (Cruz-Jentoft et al., 2010). According to the EWGOP, a diagnosis of sarcopenia is considered appropriate if an individual has low muscle mass and either low muscle strength or low physical performance (Cruz-Jentoft et al., 2010). Additionally, sarcopenia is associated with other states involving muscle wasting; one of which is sarcopenic obesity. Like sarcopenia, the definition of SO varies, however, here again the authors will employ the definition established by the EWGOP: the loss of lean body mass while fat mass is preserved or increased (Cruz-Jentoft et al., 2010). In addition to the various definitions in the literature, there does not appear to be a clear consensus regarding the cut-off points for or techniques to measure sarcopenia or SO. Thus, it is unknown whether the presence of SO is under- or overestimated in the literature. In fact, one study found rates of SO to be 16.7% and 5.7% among a sample of men and women, respectively, when SO was defined as appendicular skeletal muscle mass divided by height^2. However, when defined as appendicular skeletal muscle mass divided by weight, these rates increased to 35.1% and 48.1% in men and women, respectively (Lim et al., 2010).

Sarcopenic obesity has been associated with insulin resistance, physical disturbances, inflammation, increased risk of falls, decreased physical activity, and increased risk of metabolic syndrome (Stenholm et al., 2008; Zamboni et al., 2008; Lim et al., 2010). Like SO, some of the proposed health consequences of overweight and obesity in the elderly relate to function and mobility. These include disability (Launer et al., 1994), osteoarthritis (Hochberg et al., 1995), and insulin resistance (Willey and Singh, 2003). It is worth noting that there is evidence showing that obese individuals with cardiovascular disease have a survival advantage relative to their leaner peers (Horwich et al., 2001; Lavie et al., 2003), a phenomenon labeled "the obesity paradox." One theory that has been proposed to explain this points to the errors associated with using BMI discussed earlier (Romero-Corral et al., 2007), however, a definitive consensus regarding the mechanisms underlying this paradox has yet to be reached.

3. The food addiction hypothesis

Obesity is an endpoint with multiple contributing factors. While the role of each of these variables is important to consider, the purpose of the present article is to discuss the evidence suggesting that palatable food consumption and its effect on neural reward systems might contribute to the current rates of overweight and obesity seen in the U.S. and worldwide, a topic that has been discussed extensively in recent years (Corsica and Pelchat, 2010; Corwin and Grigson, 2009; DiLeone et al., 2012; Epstein and Shaham, 2010; Gearhardt et al., 2014; Rogers and Smit, 2000; Smith and Robbins, 2013; Volkow et al., 2012; Ziauddeen et al., 2012), with a specific focus on how this might be germane to the ageing population. The United States Department of Agriculture (USDA) reports that between 1950–1959 and 2000, the consumption of caloric sweeteners increased by 39%, with the greatest increases in the form of corn sweeteners such as high fructose corn syrup (HFCS) (United States Department of Agriculture, n.d.). In fact, over this time, HFCS consumption rose by approximately 64%. Accordingly, the number of calories consumed daily from caloric sweeteners increased by 83 kcal in the U.S. between 1977 and 1996, an effect that was largely driven by soft drink and sugary fruit drink consumption (Popkin and Nielsen, 2003). This data is relevant, as studies have frequently shown associations between increased intake of sugar-sweetened beverages and increased body weight (Melanson et al., 2008). Additionally, a systematic review and meta-analyses found significant positive associations between intake of dietary sugars and body weight (Te Morenga et al., 2013). Among U.S. adults ages 60 and above in particular, the percentage of total calories from salty snacks, desserts, candy, soft drinks, fruit drinks, alcohol, French fries, hamburgers, cheeseburgers, pizza, and Mexican food increased significantly between 1977–1978 and 1994–1996. Further, during this time, the percentage of total calories consumed at restaurants and fast food establishments increased from 5.3% to 13.9% among members of this age group (Nielsen et al., 2002), which is pertinent as increased fast food consumption predicts greater mean population BMI (De Vogli et al., 2014).

Many are aware of the detrimental health effects associated with the excessive consumption of foods that are highly palatable but offer little nutritional value, which extend beyond the consequence of weight gain. However, rates of overweight and obesity remain high, suggesting that such eating patterns are impervious to change. This has led some to question whether certain foods, namely foods that are highly palatable, might affect the brain's reward system in ways that may engender dependence.