



# Personal relative deprivation increases self-selected portion sizes and food intake

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## ARTICLE INFO

### Article history:

Received 5 September 2017

Received in revised form

15 November 2017

Accepted 17 November 2017

Available online 21 November 2017

### Keywords:

Inequality

Obesity

Socioeconomic status

## ABSTRACT

Cues and experiences of the deprivation of financial/material resources have been associated with increased caloric intake and risk for overweight/obesity. Given that social comparisons may serve as a powerful reference for the adequacy of one's standing and resources, the present research tested whether subjective feelings of personal relative deprivation (PRD) or "losing out" to others stimulates calorie selection and intake. Study 1 demonstrated that self-reported chronic experiences of PRD positively predicted calories selected for a portion and consumed during an ad-libitum meal. Study 2 revealed that experimentally-induced PRD resulted in an increase in the amount of calories selected on a portion selection task and a stronger desire to consume the foods. Consequently, these findings demonstrate that chronic and acute subjective deprivation of non-food resources may contribute to socioeconomic gradients in obesity, and that perceived social inequality may have inherently obesogenic properties that promote excess calorie intake.

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## 1. Introduction

The prevalence of obesity has become a significant societal issue given its impact on both the individual (co-morbidities like cardiovascular disease and diabetes) (WHO, 2016) and community (health costs) (Dobbs et al., 2014). While shifts in consumption norms such as increasing portion sizes and availability of cheap calorie-dense foods have been implicated as features of an increasingly obesogenic environment, there is emerging data suggesting that societal-level inequality of resources and opportunities may also promote obesity, diabetes, and increased caloric intake patterns (Eibner & Evans, 2005; Elgar, Xie, Pfortner, White, & Pickett, 2016; Pickett & Wilkinson, 2015). Yet, it remains unclear whether inequality directly promotes obesogenic behaviours, or serves as an indirect proxy for obesogenic environments (e.g. poorer quality or access to healthier foods). The present study seeks to demonstrate how the experience of personal feelings of deprivation relative to others may directly promote the selection and

consumption of excess calories.

A growing body of evidence suggests a positive relationship between perceived resource scarcity and obesogenic eating behaviours (Hill, Prokosch, DelPriore, Griskevicius, & Kramer, 2016; Laran & Salerno, 2013). While non-human animals almost exclusively monitor and appraise the availability of food resources from the environment, human motivation for acquisition and consumption of caloric resources may also be shaped by perceived insecurities in critical non-food resources, such as money, material goods, and status, given that such resources provide access to food and are necessary for thriving (Briers, Pandelaere, Dewitte, & Warlop, 2006; Cheon & Hong, 2017). Accordingly, prior research has suggested that the perceived insufficiency of material resources and harshness of the broader environment may alter one's relationship with food in favour of more calorie-dense options. For instance, evolutionary perspectives, such as life-history theory and optimal foraging theory, has suggested that exposure to cues signalling environmental harshness and scarcity of resources results in an increase in preference and consumption of high-compared with low-calorie foods (Laran & Salerno, 2013; Swaffield & Roberts, 2015). Furthermore, insecurity and dissatisfaction with financial resources have been associated with desire for calorie-dense foods (Briers & Laporte, 2013). Recent reports also indicate

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that people who experienced low (compared to high) socioeconomic status (SES) during their childhood are more prone to eating in the absence of hunger (Hill et al., 2016), suggesting that experiences of chronic deprivation may alter or program one's future relationship with food to favour intake and storage of excess energy.

Low objective SES and economic insecurity have been critically linked with obesity (Nettle, Andrews, & Bateson, 2016; Sobal & Stunkard, 1989). But importantly, appraisal of inequality and scarcity of critical resources may not be best derived by an individual's absolute possession or access to such resources, but instead by social comparisons with the perceived abilities and fortunes of others (Dunning & Hayes, 1996; Festinger, 1954). Growing evidence indicates that an individual's perception of their own worth, and socioeconomic standing (subjective socioeconomic status; SSES) relative to others may be more heavily weighted and predictive of indicators of health and well-being compared with actual standing or objective indicators of SES like income, education and job statuses (Adler, Epel, Castellazzo, & Ickovics, 2000; Boyce, Brown, & Moore, 2010; Demakakos, Nazroo, Breeze, & Marmot, 2008). Supporting these findings and applying them to eating behaviour, a recent study has demonstrated that an experimentally-induced state of low subjective SES or social class may stimulate appetite and increase caloric intake from both snack and meal contexts (Cheon & Hong, 2017). In light of these findings, it appears that SES gradients of obesity may only be indirectly and partially driven by perceived scarcity and dissatisfaction with material resources and opportunities. Instead, subjective feelings of deprivation or "losing out" relative to others may be a key and more proximal factor driving increased appetite and caloric intake in response to perceived signals of scarcity, inequality, or competition for crucial resources in the environment.

The relationship between deprivation and health outcomes have traditionally been examined at the aggregate level and use measures like income (Gini coefficient; Yitzhaki, 1979) to quantify levels of inequality (as a proxy for deprivation) across the population (Adjaye-Gbewonyo & Kawachi, 2012; Smith, Pettigrew, Pippin, & Bialosiewicz, 2012). While this provides for a useful and convenient appreciation of the relationship between inequality and obesity, it is unrepresentative of, and does not allow for individual-level examination of a relationship between actual feelings of deprivation and obesity. Personal relative deprivation (PRD) has been generally defined as subjective feelings of dissatisfaction, resentment and wanting, resulting from negative (typically upward) social comparisons and the belief that one is deprived of a desired outcome (Crosby, 1976; Smith et al., 2012). Of relevance, heightened feelings of PRD have been shown to result in a greater drive to compensate for this perceived discontent - promoting behaviour consistent with resource seeking (i.e. gambling and increased materialism) (Callan, Shead, & Olson, 2011; Mishra & Novakowski, 2016; Zhang, Tian, Lei, Yu, & Liu, 2015). Interestingly, this increased inclination for resource seeking does not appear to be domain restricted, given the evidence that demonstrates an overlapping and interchangeable relationship between material and food resource domains (Briers et al., 2006; Kim, Shimojo, & O'Doherty, 2010; Nelson & Morrison, 2005; Xu, Schwarz, & Wyer, 2015).

Considering the above, we propose that PRD or unfavourable upward social comparisons may be an especially powerful modulator of appetite and potentially drive the relationship between resource insecurity and stimulated appetite (and subsequent eating behaviour). However, despite prior cross-sectional and correlational studies on the link between relative deprivation and obesity risks (Eibner & Evans, 2005; Elgar et al., 2016), there is a notable lack empirical/experimental research directly examining the causal influence of the subjective state of PRD on actual eating behaviours that risk obesity (i.e., selection and consumption of greater

calories). Accordingly, there has only been one recent study that has examined the links between poverty, relative financial inequality and caloric consumption behaviour (Bratanova, Loughnan, Klein, Claassen, & Wood, 2016). Yet this research was not designed as a direct examination of the effect of the subjective experience of relative deprivation on eating behaviours given that it experimentally manipulated poverty concerns (signalling absolute deprivation or scarcity of resources) rather than relative personal deprivation, which operates independently of actual resource scarcity or poverty. Furthermore, while the authors also observed increased caloric consumption as a result of an experimental manipulation of inequality, this effect was driven by anxiety associated with an anticipated interaction with someone who was richer or poorer, rather than subjective experience of deprivation. Therefore, establishing a direct relationship between PRD and increased caloric intake would provide additional information of the proximal psychological mechanisms through which obesogenic food preferences and eating behaviours manifest from environmental and psychosocial factors such as perceived harshness/scarcity of the environment (Laran & Salerno, 2013; Swaffield & Roberts, 2015), low subjective SES (Cheon & Hong, 2017; Hill et al., 2016), and social inequality and disadvantage (Elgar et al., 2016; Wilkinson & Pickett, 2006). Specifically, that the underlying mechanism may not simply be the perceived insufficiency of SES resources *per se*, but a profound state of subjective deprivation that insufficient SES resources creates.

These findings would also provide additional support for the notion that among humans, psychological and physiological systems that monitor and regulate motivation towards food-based and critical non-food resources (e.g., money, status) may functionally overlap (Briers & Laporte, 2013; Cheon & Hong, 2017; Xu et al., 2015). Practically, these insights could also inform potentially novel psychologically-based interventions for mitigating socioeconomic and inequality-based disparities in obesity.

To fulfil these objectives, we conducted two studies to examine the role of PRD on eating behaviour. Rather than measuring only hypothetical food preferences or relatively superficial eating situations (e.g., amount of candies consumed) as some prior studies linking appetite with resource scarcity have, we investigated the impact of PRD on more ecologically-valid eating behaviours in meal contexts involving concerns of fullness and satiety. We hypothesize that i) self-reported chronic tendencies and ii) an experimentally induced condition of subjective PRD will be associated with the selection and consumption of higher-calorie portion sizes.

## 2. Study 1 methods

The purpose of study 1 was to investigate the relationship between self-reported PRD and, food-related decisions (selection of portions) and behaviour (actual consumption of food). We expected that participants who reported higher levels of PRD would (i) select larger food portion sizes in a computer-based food portion selection task (PST), (ii) self-serve themselves larger portions of food in the *ad-libitum* lunch meal provided, and (iii) consume larger portions of food in the *ad-libitum* lunch meal.

### 2.1. Participants

Ninety-two participants (age,  $24 \pm 2$  years; 54 men; BMI,  $21.4 \pm 3.0$  kg/m<sup>2</sup>) were recruited from a Singaporean university. Participants were each compensated \$5 and a self-served *ad-libitum* lunch (which was consumed during the experiment) for completing the study. The research was approved by the university's institutional review board (IRB) and written consent obtained from all participants.

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