Appetite 116 (2017) 223–231

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

The bogus taste test: Validity as a measure of laboratory food intake

Eric Robinson [a, *], Ashleigh Haynes [a], Charlotte A. Hardman [a], Eva Kemps [b], Suzanne Higgs [c], Andrew Jones [a]

[a] Institute of Psychology, Health & Society, University of Liverpool, UK
[b] School of Psychology, Flinders University, Adelaide, Australia
[c] School of Psychology, University of Birmingham, Edgbaston, Birmingham, UK

ARTICLE INFO

Article history:
Received 27 February 2017
Received in revised form
27 April 2017
Accepted 1 May 2017
Available online 2 May 2017

Keywords:
Taste test
Food intake
Laboratory
Appetite
Eating behaviour

ABSTRACT

Because overconsumption of food contributes to ill health, understanding what affects how much people eat is of importance. The 'bogus' taste test is a measure widely used in eating behaviour research to identify factors that may have a causal effect on food intake. However, there has been no examination of the validity of the bogus taste test as a measure of food intake. We conducted a participant level analysis of 31 published laboratory studies that used the taste test to measure food intake. We assessed whether the taste test was sensitive to experimental manipulations hypothesized to increase or decrease food intake. We examined construct validity by testing whether participant sex, hunger and liking of taste test food were associated with the amount of food consumed in the taste test. In addition, we also examined whether BMI (body mass index), trait measures of dietary restraint and over-eating in response to palatable food cues were associated with food consumption. Results indicated that the taste test was sensitive to experimental manipulations hypothesized to increase or decrease food intake. Factors that were reliably associated with increased consumption during the taste test were being male, have a higher baseline hunger, liking of the taste test food and a greater tendency to overeat in response to palatable food cues, whereas trait dietary restraint and BMI were not. These results indicate that the bogus taste test is likely to be a valid measure of food intake and can be used to identify factors that have a causal effect on food intake.

Because of the damaging effects that poor diet and over-consumption of food have on health (Kopelman, 2007; Prentice, 2001), there is a need to understand the factors affecting how much people eat. Moreover, isolating the causal effect that biological, environmental and psychological factors have on food intake enables more nuanced theories of human eating behaviour. A variety of methods exist to measure eating behaviour. A large amount of epidemiological research has measured food and energy intake by using self-report methods, including food frequency questionnaires and dietary recalls. Although widely used and relatively inexpensive, the precision of such measures have long been questioned because of concerns over respondents' ability and motivation to provide highly accurate reports of their eating behaviour (Heitmann & Lissner, 1995; Macdiarmid & Blundell, 1998; Schoeller, 1990; Schoeller et al., 2013).

Laboratory measurement of food intake is another approach used to assess human eating behaviour. Unlike self-report measures, the controlled environment of the laboratory allows for objective examination of food intake. One laboratory approach is to examine food intake from test meals. In such studies participants are served a single or multi-item meal at breakfast, lunch and/or dinner, are told to eat until they are comfortably full, and the total amount of ad-libitum energy consumed is calculated (Blundell et al., 2010). The measurement of energy intake from test meals is common in research that examines the underlying physiology of human eating. For example, by assessing food intake at test meals across the day (or even for several days), it is feasible to examine whether pharmaceutical or nutritional interventions increase or decrease energy intake and/or affect food preference (Gibbons, Finlayson, Dalton, Caudwell, & Blundell, 2014; Hill, Rogers, & Blundell, 1995; Welch et al., 2011). This type of test meal design has been reported to be valid and reliable (Blundell et al., 2010; Gregersen et al., 2008; Martin et al., 2005). However, it has practical limitations. Test meal methods can be expensive and time

* Corresponding author. Institute of Psychology, Health & Society, University of Liverpool, L69 7ZA, UK.
E-mail address: eric.robinson@liv.ac.uk (E. Robinson).

http://dx.doi.org/10.1016/j.appet.2017.05.002

consuming for researchers and require specialist research facilities. Furthermore, methods used at present rarely attempt to disguise that the test meal is being used to measure participant food consumption, e.g. (Andrade, Kresge, Teixeira, Baptista, & Melanson, 2012; Yip, Wiessing, Budgett, & Poppitt, 2013). This could be problematic because transparency of the purpose of the test meal may affect the amount of food that participants eat due to self-presentation concerns (Robinson, Hardman, Halford, & Jones, 2015; Robinson, Kersbergen, Brunstrom, & Field, 2014) and this effect may be differential dependent on participant individual differences within or across samples (Robinson, Proctor, Oldham, & Masic, 2016). This line of reasoning is consistent with classic social psychology research on demand characteristics and 'observer' effects, whereby behaviour can be biased by awareness of the purpose of a study (Nichols & Maner, 2008; Orne, 1962). Indeed, for some time there has been concern that commonly used laboratory methods to study eating behaviour are too artificial, and therefore lack ecological validity (de Castro, 2000; Meiselman, 1992).

A different laboratory measure of food intake is the bogus taste test. The bogus taste test typically involves providing participants with one or more food items and unobtrusively measuring the amount of food consumed. In an attempt to disguise that food intake is being measured, participants are led to believe that the purpose of the task is to assess their taste perception of the food(s). Participants are provided with the food, a series of taste ratings to complete (e.g. how sweet is the food?) in a set time period (e.g. 10 min) and are normally informed that once they have completed the ratings they are free to eat as they please. The taste test therefore is relatively inexpensive and convenient to use, as well as acting as a 'disguised' and objective measurement of food intake that can be easily implemented in laboratory settings. The taste test has been employed to examine whether a range of environmental and psychological factors influence food intake, including but not exclusive to; social norms (Robinson, Sharps, Price, & Dallas, 2014), advertisement (Harris, Bargh, & Brownell, 2009), portion size (Spanos, Kenda, & Vartanian, 2015), alcohol intoxication (Christiansen, Rose, Randall-Smith, & Hardman, 2016), stress (Sproesser, Schupp, & Renner, 2013), memory for recent eating (Higgs, 2002), attentional bias (Werthmann et al., 2011), mindfulness (Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012), impulsivity (Guerrieri, Nederkoorn, & Jansen, 2008) and inhibitory control (Houben, 2011). Although the taste test has been employed by researchers for some time, e.g. (Conger, Conger, Costanzo, Wright, & Matter, 1980), unlike other measures of eating behaviour there has been no formal assessment of the validity of the taste test as a measure of food intake. For a recent examination of the bogus taste test in alcohol research see (Jones et al., 2016).

1. Variables associated with food intake

Here we examine the validity of the bogus taste test as a measure of food intake by making use of participant level data from 31 published studies that adopted the taste test. If the taste test is a valid measure of food intake then factors that have been shown to reliably predict how much food a person consumes using other paradigms would be expected to predict food intake in the taste test. For example, although not all studies show a statistically significant relationship between hunger and food intake, there is now consistent evidence that self-reported hunger measured prior to eating modestly predicts how much a person will subsequently eat during a meal (de Castro & Elmore, 1988; Horner, Byrne, & King, 2014; Sadoul, Schuring, Mela, & Peters, 2014). Likewise, studies have consistently shown that individuals prefer to eat less of foods they dislike and more of a food if they like its taste (Brunstrom & Shakeshaft, 2009; Drewnowski & Hann, 1999; de Graaf et al., 2005). There are also marked sex differences in food intake, whereby men have a higher energy need and tend to consume more food than women (Rolls, Fedoroff, & Guthrie, 1991). Thus, in the present analyses we predicted that hunger, food liking and being male (as opposed to female) would positively predict taste test food intake and that evidence for these associations would imply support for construct validity of the taste test.

We also examined whether trait dietary restraint and the tendency to over-eat in response to palatable food cues predict taste test food intake. Trait dietary restraint can be defined as the tendency to consciously attempt to restrict food intake in order to prevent weight gain. Based on this definition, we predicted that higher dietary restraint should be predictive of lower taste test food intake. However, we made this prediction tentatively because whether attempts to restrict food intake reliably translate to reduced food intake is questionable, with some research suggesting that dietary restraint can often 'backfire'. Rather than being predictive of lower energy consumption, restraint has in some studies been associated with over-eating (Herman & Mack, 1975; Johnson, Pratt, & Wardle, 2012; Stroebe, van Koningsbruggen, Papies, & Aarts, 2013; Wardle, Steptoe, Oliver, & Lipsey, 2000). In addition, there is observational data which suggest that dietary restraint does not predict restriction of objectively measured food intake in the real world (Stice, Sysko, Roberto, & Allison, 2010).

The tendency to over-eat in response to palatable food cues is a factor that may also predict taste test food intake. In the present research we made use of self-reported data on trait disinhibited eating and trait external eating to characterize 'over-eating in response to palatable food cues'. In particular, trait disinhibition has been implicated in greater food intake and weight gain in multiple studies (Bryant, King, & Blundell, 2008; French, Epstein, Jeffery, Blundell, & Wardle, 2012). However, there has been some debate over the accuracy and validity of self-reported trait measures of behaviour (Bongers & Jansen, 2016; Evers, de Ridder, & Adriaanse, 2009; Evers et al., 2011). Based on this we tentatively predicted that self-reported tendencies to over-eat in response to palatable food cues would be positively associated with taste test food intake.

We also know that participants with a higher body mass index (BMI) should on average have a greater energy need and therefore eat more than individuals with a lower BMI. In line with this, in multiple laboratory and epidemiology studies individuals of heavier body weight have demonstrated a greater total energy intake (Berteus Forslund, Torgerson, Sjostrom, & Lindroos, 2005; Sadoul et al., 2014; Trichopoulou, Gnardellis, Lagiou, Benetou, & Trichopoulos, 2000). de Castro, King, Duarte-Gardea, Gonzalez-Ayala, and Kooshian (2012) found evidence that a heavier BMI was associated with self-reported energy intake and this relationship was most pronounced when participants were eating outside of the home. Yet, there are studies which report no significant association between BMI and energy intake. For example, Bell and Rolls (2001) found no difference in laboratory measured energy intake between females with normal weight and obesity. Similarly, in addition, although Berg et al. (2009) found that obesity was related to larger self-reported meal size for main meals among a large sample of Swedish adults, there was no significant relationship between BMI and daily energy intake in this study. There are also complex relationships between dietary restraint, over-eating in response to food cues and BMI. Individuals of heavier BMI are more likely to be restrained eaters, but ironically, also more likely to score higher on measures of over-eating (French et al., 2012). In addition, laboratory taste tests typically involve the consumption of 'unhealthy' energy dense food. Because individuals of heavier body weight may be more likely to present their eating behaviour in a socially desirable way (Hebert, Clemow, Pbert, Ockene, & Ockene, 1995), or eat minimally when they are aware that their food intake is assessed