Appetite 86 (2015) 3–18

Contents lists available at ScienceDirect

Appetite

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

Research report

Social modeling of eating: A review of when and why social influence affects food intake and choice

Tegan Cruwys [a,*], Kirsten E. Bevelander [b], Roel C.J. Hermans [c]

[a] School of Psychology, University of Queensland, St Lucia 4072, Australia
[b] Communication Science Department, Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands
[c] Developmental Psychopathology Department, Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands

ARTICLE INFO

Article history:
Received 30 May 2014
Received in revised form 23 August 2014
Accepted 26 August 2014
Available online 28 August 2014

Keywords:
Eating
Social influence
Normative influence
Social norms
Health behavior
Obesity

ABSTRACT

A major determinant of human eating behavior is social modeling, whereby people use others' eating as a guide for what and how much to eat. We review the experimental studies that have independently manipulated the eating behavior of a social referent (either through a live confederate or remotely) and measured either food choice or intake. Sixty-nine eligible experiments (with over 5800 participants) were identified that were published between 1974 and 2014. Speaking to the robustness of the modeling phenomenon, 64 of these studies have found a statistically significant modeling effect, despite substantial diversity in methodology, food type, social context and participant demographics. In reviewing the key findings from these studies, we conclude that there is limited evidence for a moderating effect of hunger, personality, age, weight or the presence of others (i.e., where the confederate is live vs. remote). There is inconclusive evidence for whether sex, attention, impulsivity and eating goals moderate modeling, and for whether modeling of food choice is as strong as modeling of food intake. Effects with substantial evidence were: modeling is increased when individuals desire to affiliate with the model, or perceive themselves to be similar to the model; modeling is attenuated (but still significant) for healthy-snack foods and meals such as breakfast and lunch, and modeling is at least partially mediated through behavioral mimicry, which occurs without conscious awareness. We discuss evidence suggesting that modeling is motivated by goals of both affiliation and uncertainty-reduction, and outline how these might be theoretically integrated. Finally, we argue for the importance of taking modeling beyond the laboratory and bringing it to bear on the important societal challenges of obesity and disordered eating.

Introduction

The consumption of food has implications beyond merely providing nutrients and energy needed to sustain life. Food and eating are also intertwined with our social lives. Most eating takes places in the presence of other people and is often perceived as an enjoyable part of our cultural experience (Rozin, 2005). Therefore, it should not be surprising that one's eating behavior is profoundly affected by social factors. In addition to processes such as social facilitation and impression management (also reviewed in this issue of *Appetite*), another social influence phenomenon is modeling of food intake, whereby people directly adapt their food intake to that of their eating companion. It was forty years ago that evidence first began to accumulate that modeling[1] is a primary determinant of eating behavior. Nisbett and Storms (1974) demonstrated that young males consistently ate more when their eating companion ate a large number of crackers and less when the other person ate minimally (compared to when eating alone). This so-called modeling effect caught the attention of other researchers and in subsequent years several other attempts were made to identify boundary conditions for the effect. This early modeling research was influenced by the externality hypothesis (Schachter, 1971), which stated that overweight people are more vulnerable to external food-related cues (such as the social environment) rather than internal cues (such as hunger or satiety). However, and in accordance with the work of Nisbett and Storms (1974), no differences were found between healthy and overweight people, or between restrained and unrestrained eaters, in their extent of modeling (Conger, Conger, Costanzo, Wright, & Matter, 1980; Polivy, Herman, Younger, & Erskine, 1979; Rosenthal & Marx, 1979; Rosenthal & McSweeney, 1979). Researchers therefore concluded that Schachter's externality hypothesis cannot distinguish between healthy-weight and overweight people

* Corresponding author.
E-mail address: t.cruwys@uq.edu.au (T. Cruwys).

[1] This review uses the term *modeling* to refer to social modeling, that is, behavioral conformity of eating, *not* statistical modeling.

http://dx.doi.org/10.1016/j.appet.2014.08.035
0195-6663/

in the case of modeling, because both groups are influenced by normative external cues (Herman & Polivy, 2008). Instead, these effects were found to have a strong and pervasive influence on both healthy-weight and overweight individuals' eating behaviors. Although the reproducibility of these effects was easily and repeatedly demonstrated, the question of *why* modeling occurs has proved more difficult to answer definitively. That is, what purpose does modeling serve, psychologically, that might explain why it is so strongly preserved and generalizable?

Over the decades of modeling research, a variety of explanations have been put forward to understand the effect. The most dominant interpretation, however, is that modeling of food intake is an example of a broader phenomenon of social influence and that general theories of normative behavior might help to understand why people adapt their food intake to that of others. Using a normative approach, Herman and his colleagues proposed that the principal regulatory influence on eating in social contexts is people's beliefs about what or how much is appropriate to eat (Herman & Polivy, 2005; Herman, Roth, & Polivy, 2003b). According to this model, people conform to others' eating because they see the amount eaten by others as an indicator of how much one can or should eat without eating excessively.

Although the literature seems to approach consensus on the utility of this normative model, there has not been a systematic review of modeling studies. The lack of a comprehensive review impedes our ability to ascertain from the extant modeling literature: (a) when and why social modeling shapes eating behavior, and (b) how to translate this knowledge to inform applied practice aimed at increasing healthy eating behavior. Therefore, our overarching aim is to review the literature on how people's food choice and intake is affected by modeling and, on the basis of these findings, propose new research directions that might help us to gain insight into the robustness or underlying mechanisms of modeling. We start by reviewing typical methodological approaches to the study of modeling, before summarizing the key findings from our systematic review of 69 modeling experiments. We then discuss theoretical and practical implications of these findings.

Modeling: methodological approaches

In past research, several strategies have been used to investigate modeling effects on eating. Both observational as well as correlational studies have found that people adapt their intake to that of their eating companion, and that those who are eating together converge upon an eating norm (e.g., Salvy, Romero, Paluch, & Epstein, 2007c; Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008b). This occurs such that the variance among participants in their food intake is reduced when eating together. However, both statistical and theoretical concerns arise when interpreting research where participants model one another. Firstly, because food intake is non-independent between participants, an appropriate statistical method of analysis would be multi-level modeling (Luke, 2004) – although often this is not performed. Furthermore, without random assignment, it is difficult to rule out the possibility that non-social factors, such as pre-existing similarity or eating attitudes, are responsible for conformity effects between eating companions. Finally, in a scenario in which both co-eaters are free to choose the type or amount of food to consume, it is difficult to determine which person is modeling and which person is being modeled. In part because of these concerns, an experimental design in which the intake and/or choice of one co-eater (i.e., the confederate) is predetermined by the experimenter has arguably become the gold-standard for research on the modeling of food intake. This paradigm enables researchers to investigate modeling behavior without any potential confounds related to selection or non-social processes. In some studies, participants are provided with a non-food related cover story for the experiment (e.g., Bevelander, Anschütz, Creemers, Kleinjan, & Engels, 2013a; Cruwys et al., 2012; Hermans, Salvy, Larsen, & Engels, 2012c). In these experiments, participants believe that food is incidental to the research question. In other studies, participants are told that they are participating in a taste-test study and are asked to complete questionnaires related to their experience of the food items (e.g., Goldman, Herman, & Polivy, 1991; Vartanian, Sokol, Herman, & Polivy, 2013). In these studies, participants are aware of the centrality of the food to the experiment; however, the researchers' interest in social influence and the amount of food consumed remains opaque.

The sheer robustness of modeling has allowed researchers to also develop a more "light-touch" technique for communicating social norms to participants, known as the remote-confederate paradigm (cf., Roth, Herman, Polivy, & Pliner, 2001). In studies utilizing this design, the confederate providing the norm for food choice or intake is not physically present. Rather, participants are provided normative information (while concealing the aim of the study with a cover story) by exposing them to either written information about the amount consumed by previous participants (e.g., in the form of a list on a table, which was supposedly used to determine how much food needed to be ordered by the experimenters) or by exposure to a remote model selecting or eating food on a video or computer screen (Bevelander et al., 2013a; Bevelander, Anschütz, & Engels, 2012b; Hermans et al., 2012c; Romero, Epstein, & Salvy, 2009). Given that both live and remote confederate designs have been found to induce modeling effects on eating (cf. Feeney, Polivy, Pliner, & Sullivan, 2011) and are able to infer strong cause and effect relationships, we summarize findings of studies in which the eating norm is induced by either type of confederate.

Inclusion criteria

To find relevant English-language empirical research on modeling effects on food choice and food intake, a literature search of PubMed and Google Scholar was conducted using the following key words: 'modeling'; 'matching'; 'social influence'; 'normative influence'; 'eating'; 'food choice'; 'food intake'. These key words were used in combinations of two to include one theoretical keyword (i.e., modeling, matching, social influence, normative influence) and one behavioral keyword (i.e., eating, food choice, food intake). The reference lists and citations of eligible publications were also reviewed to identify pertinent literature. A criterion for inclusion in the review was that the study had an experimental design in which either food choice or food intake was experimentally manipulated by a social referent (using either a live or remote confederate). Studies in which participant dyads or groups were examined in a free eating paradigm without a confederate were therefore not included (e.g., Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007b; Salvy, Kieffer, & Epstein, 2008a). Furthermore, we included only those studies with a dependent variable that was amount of food consumed or food choice (measured in a concrete behavioral fashion; not intentions only). Table 1 shows a complete list of all the modeling studies that were included in this review. Where possible, however, we also discuss studies in our review that did not meet our inclusion criteria, but which provided additional insight into the dynamic process of modeling. Sixty-nine studies (in 49 articles) were identified that met these selection criteria, reporting on over 5800 experimental participants. Of these, the majority (58) measured food intake, or whether participants ate at all, as the dependent variable of interest, whereas only 11 investigated participants' choice between at least two food alternatives. As can be seen in Table 1, studies conducted with live confederates (42) or with some form of remote confederate (27) are well represented.