MEAL CHOICE MODELING IN A CAFÉ: THE ROLES OF RELATIONSHIP, AWARENESS, AND FAMILIARITY

by

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B.A. Hons., The University of Calgary, 2013

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES

(Psychology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

August 2017

Abstract

It is well established that the presence of other people affects how much people eat and the types of food they choose. Past research on food choice modeling has focused on snack foods and has primarily been conducted in controlled laboratory situations. The current research examines modeling of meal choice in a real-life context across two studies. Study 1 (N = 231 café patrons) tested whether meal choice modeling occurs, whether people are aware of being influenced, and whether knowing the model affects whether modeling occurs. The lunch orders of café patrons were surreptitiously tracked and participants were recruited after they paid for their lunch. Participants were asked whether they were influenced by the prior order, and what their relationship was to the person ahead of them in line. As hypothesized, participants modeled the lunch choice of the person ordering ahead of them in line above rates expected by chance. Contrary to predictions about the role of relationship, participants did not model at different rates following a stranger compared to a non-stranger. Hypotheses about modeling awareness were supported with a significant modeling effect observed even among participants who reported that their order was not influenced by the prior order. Study 2 (N = 69 students) tested familiarity to the café or social environment as a moderator. To increase variability in familiarity with the café, participants were students brought into the café for the study. Study 2 yielded inconclusive findings, possibly due to low statistical power. This research provided evidence of meal choice modeling occurring in real-life eating situations and outside of conscious awareness - demonstrating a powerful social influence on health behaviours.

Lay Summary

The presence of other people affects how much we eat and the types of food we choose. The current research examines modeling of meal choice. In Study 1 (N = 231), café lunch orders were surreptitiously tracked and participants were asked (1) whether they were influenced by the prior order and (2) what their relationship was to the person ahead of them in line. Participants generally modeled the previous lunch choice despite a common belief that their order was not influenced by the prior order. Unexpectedly, however, participants did not model at different rates following strangers compared to non-strangers. Study 2 (N = 69) tested whether familiarity to the café or social environment affected modeling. Study 2 yielded inconclusive findings, possibly due to low statistical power. This research demonstrated that social influences can have a significant effect on meal choice without our knowledge.

Preface

I am the primary author of the work presented in this thesis. I was responsible for designing the studies and for collecting, analyzing, and interpreting the data. Dr. Chen was the supervisory author on this project and contributed to concept formation, study design, data collection, provided guidance on data analysis and assisted with manuscript revisions.

This research was conducted with the permission of the University of British Columbia Office of Research Studies Behavioural Research Ethics Board, certification number H16-00275, "Vegetarian Influence Study".

Table of Contents

List of Tables

List of Figures

Acknowledgements

I would like to thank my advisor, Dr. Frances Chen, for her support, encouragement, guidance, and for modeling professionalism, kindness, and receptiveness to new ideas.

Thank you to my committee members, Drs. Anita DeLongis and Christiane Hoppmann, for their insightful comments and feedback on this project.

A big thank you to my lab mates for their support and advice, especially Patrick Klaiber for the conversations about statistics and reminding me to have fun all the while.

I would like to thank the many research assistants who helped with this project, including Olivia Pink, Kiana Kianpoor, Ava Hamzeh, Daria Juck, Jalila Devji, and Lina Braun. This research would not be possible without you and your café stalking skills.

Thank you to my family who both provide me with so much encouragement and help keep me grounded. In particular, I appreciate my mom who is my biggest champion and tells everyone she meets about her daughter in graduate school. Finally, a special thanks to my boyfriend, Patrick, for the unwavering support and for making the journey more enjoyable by being a part of it.

Introduction

If current obesity trends continue, by 2025 global obesity prevalence will reach 18% in men and exceed 21% in women (NCD Risk Factor Collaboration, 2016). There is increasing evidence that the obesity epidemic is driven by external influences on diet including portion sizes, variety of foods offered, number of people eating, and social norms about eating behaviour (Levitsky & Pacanowski, 2012). Social norms, in particular, are powerful for influencing what people choose to eat and how much to eat (Robinson, Thomas, Aveyard, & Higgs, 2014). A subtype of social eating norms, modeling, refers to the phenomenon whereby people mimic the food intake or choice of another person. The dominant theoretical framework for social modeling of eating posits that modeling occurs because people are using another person's eating behaviour as an indicator of the social norm (Herman, Roth, & Polivy, 2003). The effect of social modeling of eating is substantial, with one meta-analysis reporting a moderate to large effect size for intake modeling (Vartanian, Spanos, Herman, & Polivy, 2015) and a systematic review reporting a moderate effect size for intake modeling and consistent evidence for modeling of food choice (Robinson et al., 2014). Modeling significantly affects people's eating behaviour and thus represents an important area of research, both to increase understanding of this powerful influence on people's diet, as well as a basis for potential interventions to encourage healthy habits.

Past research has predominantly examined social modeling of eating within controlled, laboratory settings. The strengths of experimental methods are random assignment and situational control but these factors often result in constrained conditions with decreased external validity. Due to these limiting factors, there have been recent calls for conceptual replications of psychology laboratory studies conducted outside of purely experimental settings (Bless & Burger, 2016). These concerns about experimental designs are particularly important for

modeling studies because the laboratory setting itself may increase the likelihood of modeling occurring through two different ways. First, demand characteristics may encourage participants to look for and adhere to a norm set by others because they think that behaviour is what the researcher is looking for (Robinson, 2015). Secondly, laboratory eating studies typically occur in an unfamiliar setting, increasing the likelihood that participants in these studies will feel an elevated sense of uncertainty and then look to others for a social norm to follow (Robinson, Blissett, & Higgs, 2013). It is therefore crucial to study modeling of eating behaviour in more naturalistic environments.

In addition to a need for research on eating behaviour in more naturalistic environments, substantial gaps in the literature exist with respect to our understanding of modeling of (1) food choice (vs intake) and (2) meals (vs snacks). The following sections provide a brief review of the literature in these areas and a rationale for the need for further research on modeling of meal choice. Next, we argue for the need for more research on two key moderators of food choice modeling: (1) relationship to the person providing the model, and (2) conscious awareness of modeling occurring.

The vast majority of social modeling of eating research has examined modeling of food *intake* (e.g. number of calories consumed), with far less research on food *choice*. Although it has been proposed that food choices may be driven more by preferences and may therefore be less susceptible to norm modeling than food intake (Pliner & Mann, 2004), existing research provides evidence of food choice modeling. For example, people will copy snack choices of fictional past participants whose choices are indicated by wrappers left in plain view (Burger et al., 2010; Prinsen, Ridder, & Vet, 2013; Salmon, Fennis, de Ridder, Denise T. D., Adriaanse, & Vet, 2014). There appear to be some limits on food choice modeling when there are multiple options

at a buffet (Burger et al., 2010; Robinson & Higgs, 2013, 2013) or if one of the food options is rated as unpalatable (Pliner & Mann, 2004). Due to the paucity of research on food choice modeling and the potential benefit of increasing healthy food choices, more research in this area is warranted.

An important area of food choice modeling that has yet to be examined is whether food choice modeling can occur for full meal choices. Robinson and Higgs (2013) examined food choice modeling for sides (e.g. carrots, tomatoes, cocktail sausages, pastries) at a lunch buffet but the main meal choice (a sandwich) was held constant. To our knowledge, no studies have examined whether meal choice modeling can occur in adults. Two studies have experimentally manipulated intake modeling of meals served in the lab, with mixed results. One study found that young women ate less breakfast when an eating companion ate nothing but they did not eat more breakfast when their eating companion ate a large amount of food (Hermans, Herman, Larsen, & Engels, 2010). Another study, however, reported a large effect size of intake modeling during dinner consumed with a confederate in the lab for both large amounts and small amounts (Hermans, Larsen, Herman, & Engels, 2012). Thus it remains unclear from the existing literature whether modeling occurs for meals.

Meal choice does appear to be susceptible to printed social norm messages (Mollen, Rimal, Ruiter, & Kok, 2013). Mollen and colleagues posted different social norm messages in a campus food court on different days and observed that students' orders of salads increased on the days when a prominent poster announced how commonly students ordered salad. Interestingly, only the descriptive norm posters (describing what other people do) but not the injunctive norm posters (describing what other people ought to do) were effective. Insofar as modeling represents a single person demonstrating a descriptive social norm (i.e. at least one person is choosing this

meal so perhaps it is the norm), then it seems likely that meal choice modeling will also occur. Further research into social influences on meal choice is warranted and potentially quite impactful because meals represent a the majority of people's total daily caloric intake (Garriguet, 2008).

Whether modeling of meal choice occurs may also be influenced by who is modeling the choice; however, the literature in this area is also limited. According to the normative framework, people we have a close relationship with might be expected to provide the most reliable norms because we are more likely to have a shared group identity with them and therefore believe the same social norms are shared (Higgs, 2015). Similarly, Cruwys and colleagues (2015) have argued that affiliation (either perceived or sought) is a precursor for modeling to occur. That is, models, and the norm that they communicate, will only be considered a valid reference point if shared group membership or perceived similarity exists (Cruwys, Bevelander, & Hermans, 2015). According to these theoretical considerations, modeling should be higher amongst friends and family members than amongst strangers. Only a couple of studies have compared intake modeling in friends versus strangers but contrary to expectations, both studies reported a similar modeling effect between friends and strangers (Kaisari & Higgs, 2015; Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007). Further research on the role of relationship on modeling is warranted to assess whether modeling rates for food choices are moderated by level of relationship. Food choice modeling may be more likely to be moderated by relationship than intake because people may expect people who they know to have similar taste preferences to them. In addition, survey research on eating behaviours in social networks demonstrate self-reported similarity of food choices (Pachucki, Jacques, & Christakis, 2011), which may occur partly through modeling.

A second key moderator of food choice modeling worth investigating further is awareness of modeling. In modeling studies where researchers ask participants about their motivations, people usually report internal motivations like hunger and individual preferences (Roth, Herman, Polivy, & Pliner, 2001). Despite evidence of intake modeling in one such study, very few participants indicated that they were influenced by their partner's behavior; they instead identified taste and hunger as their primary determinants of intake (Vartanian, Herman, & Wansink, 2008). Consistent with self-reported denial of social influences, behavioural mimicry studies suggest that modeling may occur automatically and unconsciously (Koordeman, Kuntsche, Anschutz, van Baaren, & Engels, 2011). In one study, dyads of young females were observed during an evening meal and the synchrony of their bites were coded. Women were more likely to take a bite or sip immediately after their eating partner did, suggesting an unconscious mimicry of eating behaviour (Hermans, Lichtwarck-Aschoff et al., 2012). On the other hand, in another study, participants were able to accurately report being influenced by others when deciding how much to eat (Robinson & Field, 2015). In their study, only the participants who reported being influenced by the intake information of prior participants were significantly affected by the low or high intake norms. In order to create effective healthy eating interventions based on modeling principles, it is important to evaluate how much insight people have about their own modeling behaviour.

Overview and Hypotheses

The primary aim of this line of research is to examine whether social modeling of food choice occurs for meals in a naturalistic environment. Across these studies, we chose to define modeling of meal choice as modeling of a meat-based versus a vegetarian lunch option. We had both a logistical and an impact-based rationale for this choice. First, logistically, in the café in

which data collection occurred, these two choices were closely matched on a daily basis (e.g, on a given day, a shepherd's pie would be offered in either a meat or lentil-based variant), providing a relatively controlled and consistent context for testing social modeling. Second, in terms of impacts for health, vegetable-based options that our participants were presented with contained at least one type of vegetable, whereas many of the meat options substituted the vegetables for a type of meat. Increasing uptake of vegetarian options may represent one way to increase currently low rates of vegetable intake (Black & Billette, 2013) and potentially attenuate the increased cardiovascular disease risk associated with diets high in red and processed meat (Key et al., 1998; Micha, Wallace, & Mozaffarian, 2010).

Across two studies, an observational paradigm was used in which people were (surreptitiously) observed in a café and then answered questionnaires. It was predicted that social modeling of lunch choice would occur, and further that modeling rates would be higher for participants with a closer relationship to the person ordering ahead of them. Additionally, we hypothesized that modeling would occur outside of awareness, with even participants who report not being influenced showing evidence of modeling.

Study 1 Method

Field setting

The setting for this study was an on-campus café during lunch hours (11:30 to 1:30pm). The café was chosen for its lunch menu and café layout. The daily rotating hot lunch menu consisted of a meat or vegetable-based entrée and a meat or vegetable-based wrap. The layout of the café was set up with two adjacent areas (an entrée area and a wrap area) with people queuing up single-file for each area to order their food and watch as it was served in front of them. Thus, people ordering lunch could both hear the order ahead of them and see it being prepared.

Participants

A total of 269 people who visited the café and ordered from the same area (wrap or entrée) as the person ahead of them agreed to participate in this field study. Approximately[1] 48% of people that were approached agreed to participate in the study, and people were not permitted to participate more than once. The low participation rate might indicate that only people who are already susceptible to social influences agreed to participate, resulting in a biased sample. This bias seems unlikely, however, because most of the people who declined participation did so because they had already participated previously, suggesting that the decliners were not less susceptible to social influence because most of them were actually past participants.

Because we were interested in whether people were influenced in choosing meat or vegetarian, we chose to consider only people making their orders in the same area (i.e. wrap area or entrée area) as the person ahead of them in line. Due to the presumably low likelihood of social modeling of meat options occurring for vegetarians or vegans, 38 participants were excluded from analyses for being vegetarian, vegan or not reporting their dietary preferences (20 vegetarians, 10 vegans, and 8 no answer). The final sample consisted of 231 participants (49% female). After participating in the café part of the study, participants were reimbursed with a small chocolate bar or a granola bar.

Procedure and Materials

Over a nine-month period, a research assistant surreptitiously tracked the lunch time orders of people at the café and a separate research assistant approached people who had purchased one of the hot food lunch items to invite them to participate in a short survey. After consent, participants answered questions about (1) what they ordered, (2) whether they were

[1] Participation rate is approximate because participation rate was only tracked for the second half of the study. Future research should also record reasons given for declined participation.

vegetarian/vegan, (3) their relationship to the person who placed the prior order (type of relationship and frequency of contact), (4) whether they discussed their order with that person, and (5) whether their order was influenced by the prior order.

After answering the short in-café survey, a subset of participants (n = 38) also filled out an online questionnaire later in the day. The link to the online survey was provided to participants after they were debriefed in the café. The online questionnaire assessed demographic variables such as age and ethnicity (see Table 2). Several questions were also included to conduct exploratory analyses on individual difference variables that might affect propensity to model and whether modeling is associated with meal enjoyment. *General flexibility of eating behaviour* was assessed by asking participants to rate, on a 7-point scale, the extent to which they disagreed or agreed with 5 statements (e.g. "I tend to eat the same foods for lunch everyday"). To test whether modeling was associated with *enjoyment of the meal,* participants were asked to rate, on a 7-point scale, the extent to which they disagreed or agreed with 3 statements (e.g. "I enjoyed the food I ate"). Finally, to evaluate whether modeling was related to *vegetarianism motivations,* participants were asked "how motivated are you to eat less meat than you currently do?" (1 = *not at all* – 5 = *extremely motivated).* Participants who responded at least 2 or higher on the scale were asked to rate the extent to which they disagreed or agreed with seven common motivations for a vegetarian diet (adapted from Rozin, Markwith, & Stoess, 1997). Participants who completed the online component of the study were entered into a draw for cash or a campus food services gift card. The study protocol was approved by the institutional ethics board.

Study 1 Results and Discussion

We examined whether participants ordered the same lunch option (meat or vegetarian) as the prior order. There was a significant relationship between the prior orders and the participants' orders (χ^2 (1, N = 231) = 27.75, $p < .001$, $\varphi = .35$, Odds Ratio (OR) = 5.16, 95% CI for the odds ratio [2.72 – 9.78]). The relationship was in the hypothesized direction, meaning participants tended to model the prior order, with 74% of participants ordering the same type of dish as the prior order. If chance alone were operating, then modeling rates of 61% would be expected from the baseline ordering rates (described below). The results are consistent with our hypothesis that modeling for choice of a lunch meal would occur in a naturalistic setting.

In determining whether modeling rates were higher for meat-based or vegetarian dishes, the baseline ordering rates of each dish must be considered. To calculate a baseline ordering rate, all observed orders were combined and the resulting percentages of orders were 73% meat-based dishes and 27% vegetarian dishes. Following a prior meat-based order, the proportions of meat-based orders increased to 83%. Following a vegetarian order, the vegetarian orders increased to 51% (see Table 1). In order to account for the differing baseline rates, relative risk ratios (RRs) were calculated. A relative risk ratio of 1 indicates no difference in the likelihood of the outcome between the two groups, a ratio < 1 indicates that the outcome is less likely, and a ratio > 1 indicates that the outcome is more likely when exposed to a particular influence. Following a meat-based order, RR = 1.69, $p < .001$, 95% CI for the RR [1.31 – 2.20] and following a vegetarian order, RR = 3.05, $p < .001$, 95% CI for the RR [2.01 – 4.62]. The risk ratio results suggest that the modeling effect following a vegetarian order may be stronger compared to the effect following a meat-based order.

To test whether modeling rates differed depending on the relationship of the participant to the person placing the prior order, we compared the people who were strangers to the person ahead of them and people who knew the person ahead of them in line (see Table 2 for Study 1 demographics). Because there were very few participants who knew the person modeling the prior order, relationship categories (e.g. close friend, romantic partner) were collapsed into two categories: acquainted and strangers[2]. Contrary to our hypotheses, modeling rates were not significantly higher for acquainted people (81%) compared to strangers (72%; χ^2 (1, N =231) = 1.81, p = .179).

To test whether modeling of lunch choice occurred consciously or not, we analyzed how many participants reported being influenced by the prior order as well as differences between those who reported being influenced compared to those who reported *not* being influenced. A minority of participants (26%) reported being influenced, a majority (71%) of participants said their order was not influenced by the prior order, and 3% said *maybe.* Even for people who reported that they were *not* influenced, there was still a significant relationship between the prior order and the participant's order (χ^2 (1, n = 164) = 10.54, p = .001, φ = .25, OR = 3.19, 95% CI for the odds ratio [1.56 – 6.51]). The effect sizes were smaller, however, for participants who reported not being influenced and modeling rates were significantly different between people who reported being influenced (89%) and those who reported that they were not influenced (69%; χ^2(1, n =225) = 9.30, p < .001). Thus our hypotheses about awareness of lunch choice modeling were supported: although modeling rates were higher for participants who said they were influenced by the prior order, modeling also occurred for those who said they were not influenced.

[2] Descriptively, subgroup analyses revealed values in the hypothesized direction (modeling by group = 86% for close friends, 79% for acquaintances, and 72% for strangers – see Figure 1) but there were no significant differences in proportions depending on relationship (all ps > .12), potentially due to the small sample size of acquainted people.

We conducted additional exploratory analyses examining who was more likely to model and whether modeling resulted in greater or less enjoyment of the meal. Differences in modeling rates by gender were not statistically significant ($\chi^2(1, n = 214) = 1.82, p = .177$) with men modeling 79% of the time and women modeling 71% of the time. Similarly, there were no statistically significant differences of modeling rates depending on whether participants followed somebody of the same gender or not ($\chi^2(1, n = 214) = 1.60, p = .205$). Using the subsample of participants who completed the online study (see Table 2 for demographic information), we examined whether general flexibility of eating behaviour was associated with higher modeling and whether participants who modeled their lunch order reported greater or less enjoyment of that meal. An independent samples *t*-test revealed no significant difference between flexibility of food attitude scores between participants who modeled (M = 4.38, SD = 0.84) and those who did not ($M = 4.06$, $SD = 0.46$; $t(36) = 0.98$, $p = .336$). Lunch enjoyment was also not significantly different between those who modeled their lunch choice ($M = 5.81$, $SD = .85$) and those who did not ($M = 5.38$, $SD = 1.04$; $t(36) = 1.15$, $p = .259$). It is worth noting that the number of participants completing the online survey was relatively small, partly because the online component only started three months into data collection. Therefore, Study 2 was designed in part to allow us to focus on examining some of these effects that Study 1 may have been underpowered to detect.

Study 1 demonstrated that modeling for meal choice does occur in a naturalistic environment with possibly a stronger modeling effect for participants following a vegetarian order compared to a meat order. The role of relationship in propensity to model lunch choice was examined but remains largely unanswered due to the small number of participants who knew the

person ordering ahead of them. Study 1 also demonstrated that lunch choice modeling can occur outside of conscious awareness.

Study 2, therefore, was designed (1) to increase the sample size for the online component by combining all the café and online questions into one questionnaire and (2) to test a mechanism for food choice modeling. There is debate in the eating modeling literature about whether people model out of affiliative or appropriateness concerns (or both). Modeling for affiliative motivations can be broadly described as modeling in order to affiliate with or appear more likable to the model (Robinson, Tobias, Shaw, Freeman, & Higgs, 2011). In contrast, modeling for appropriateness concerns suggests that modeling occurs because people are uncertain of what to do so they look to others for social norm information about what constitutes appropriate behaviour in that situation. Within the Focus Theory of Normative Conduct, two types of social norm are identified: injunctive norms (how people ought to behave) and descriptive norms (how people actually behave; Reno, Cialdini, & Kallgren, 1993). Modeling of eating can be argued to be a type of descriptive norm following; with people viewing others' eating behaviour as an indication of a social norm. Indeed, the most widely accepted theory within the social modeling of eating literature is Herman and colleagues' normative account, whereby people model others' eating behaviour because it provides a guide for appropriate behaviour (an indication of a social norm) in a specific context (Herman et al., 2003; Herman & Polivy, 2005). If uncertainty reduction is the mechanism for food choice modeling, then people who are more unfamiliar with a certain environment should be more likely to model than people who are familiar with that environment. We hypothesized that, consistent with normative theory, people who are unfamiliar with the café will be more likely to model and people who are unfamiliar with the social environment will also be more likely to model.

In addition, for Study 2, we modified our baseline ordering rates calculation. Instead of combining all participant and prior orders together to calculate base ordering rates for meat and vegetarian orders, we tracked all the orders of café patrons with nobody in line ahead of them. The people with nobody in line ahead of them represent a more truly 'uninfluenced' baseline sample because there was no model to influence their behaviour.

Study 2 Method

Field Setting and Participants

The same café used in Study 1 was used for Study 2. In order to increase variability in participants' familiarity with the cafe, we recruited participants from the undergraduate research participation pool. Participants were 69 undergraduate students who took part in the study in exchange for extra credit in a psychology course (61% female, mean age =20.58, SD = 3.06). Sample size considerations will be examined in the discussion.

Procedure and Materials

Participants signed up online to participate in the study, checked in with the research assistant seated at a table at the café, received $2 to offset the cost of buying lunch, and then purchased their lunch. Participants checked in with the research assistant ostensibly for the research assistant to provide them with the partial reimbursement for their lunch; however, the true purpose was to request that they order a hot lunch item (snacks were also available at the café) and to alert the order tracker to who the participant was. The order tracker was seated separately from the research assistant and surreptitiously recorded orders without making eye contact or talking to the research assistant who interacted with the participants. Identical to Study 1, the order tracker recorded the orders of participants and the person who ordered ahead of them. In addition, however, for Study 2 the order tracker also recorded the lunch orders of all

people (participants and regular café patrons) who did not have anybody ordering in line ahead of them to serve as a baseline measure of what lunch choice people make with no modeling influence.

After participants paid for their lunch, they returned to the table with the research assistant that they had checked in with earlier and then filled in questionnaires while eating their lunch. Participants completed the same questionnaires from Study 1 but also reported additional demographic information and their familiarity with the café and social environment. To test whether *familiarity with the environment* affects propensity to model we evaluated familiarity in two different ways: (1) familiarity with the particular café (e.g. "before today, had you ever bought lunch at the Loop café?") and (2) familiarity with the broader social environment, assessed through how many years the student had spent at the university.

Study 2 Results and Discussion

As in Study 1, we examined whether participants ordered the same lunch option (meat or vegetarian) as the prior order. There was not a significant relationship between the prior orders and the participants' orders (χ^2 (1, N = 69) = 0.19, p =.664, φ = -.05, OR = 0.77, 95% CI for the odds ratio [.24 – 2.51]). The modeling rates were no different from chance, with 57% of participants ordering the same type of dish as the prior order. If chance alone were operating, then modeling rates of 58% would be expected from the baseline ordering rates. For baseline ordering rates for Study 2, the percentages of orders where café patrons had nobody in line ahead of them were calculated (70% meat-based dishes and 30% vegetarian dishes). Descriptively, the proportions are actually in the opposite direction of what we would have expected with the proportions of meat-based orders decreasing to 67% following another meat-based order and vegetarian orders decreasing to 28% following another vegetarian order. Relative risk ratios also

indicated no significant effect of modeling for both meat and vegetarian orders. Following a meat-based order, RR = 0.92, p = .650, 95% CI for the RR [0.65 – 1.30] and following a vegetarian order, RR = 0.83, p = .671, 95% CI for the RR [0.36 – 1.93]. The modeling results suggest that there was no meal choice modelling.

We examined the role of familiarity on modeling rates in two different ways, using familiarity with the specific café and familiarity with the university environment more broadly. Descriptively, participants who had never been to the café before modeled more often than participants who had been there before (60% compared to 53%), but this difference was not statistically significant ($\chi^2(1, N = 69) = 0.34$, p = .555, 95% CI for the difference [-17.87 – 31.03]. To test whether familiarity with the social environment affected modeling rates, we compared first year university students to later year students. First year participants modeled at almost identical rates to later-year students (58% compared to 57%). Contrary to our hypotheses, increased familiarity (in either domain) was not related to less modeling.

It was not possible to test whether modeling rates differed depending on the relationship of the participant to the person placing the prior order because in our sample only two participants knew the person in line ahead of them. Despite not finding evidence for a modeling effect, the proportions of people reporting that they were influenced by the prior order were similar in Study 2 to Study 1. A minority of participants (19%) reported being influenced, a majority (72%) of participants said their order was not influenced by the prior order, and 9% said *maybe.*

As in Study 1, we conducted additional exploratory analyses examining who was more likely to model and whether modeling resulted in greater or less enjoyment of the meal. Surprisingly, differences in modeling rates by gender were statistically significant ($\chi^2(1, N = 69)$

= 5.50, p = .019) with men modeling 74% of the time and women modeling 45% of the time. The very wide confidence interval for the difference in male and female modeling proportions (CI: [2.95 – 50.25] suggests that this effect should be interpreted with caution. There were no statistically significant differences of modeling rates depending on whether participants followed somebody of the same gender or not ($\chi^2(1, n = 55) = 1.72$, p = .190). We examined whether general flexibility of eating behaviour was associated with higher modeling and whether participants who modeled their lunch order reported greater or less enjoyment of that meal. An independent samples t-test revealed no significant differences between flexibility of food attitude scores between participants who modeled and those who did not ($t(67) = 1.35$, p = .183). Lunch enjoyment was also not significantly different between those who modeled their lunch choice and those who did not ($t(67) = .64$, p = .526).

General Discussion

Study 1 results provide evidence of meal choice modeling in a natural environment. Patrons of the café consistently copied the meal choice of the person ahead of them in line, suggesting that people were using the order of the person ahead of them in line to help determine which lunch option to choose. This study extends past research on food choice modeling by providing the first empirical evidence of modeling for entire meal selections in a real-life setting. It has been argued that modeling may be less likely to occur in meal-eating contexts because people may have stronger scripts or routines during meals that guide their eating behavior compared to snack situations (Cruwys et al., 2015; Hermans et al., 2010). However, the effect size of meal choice modeling in our study (OR = 5.16, 95% CI for the OR [2.72 – 9.78]) was comparable, to snack choice modeling effect sizes in a previous study with another dichotomous outcome (OR = 2.64, 95% CI for the OR [1.09-6.43]; Prinsen et al., 2013).

The present results show modeling occurred for both the vegetarian and meat-based lunch options. Descriptively, the effect for the vegetarian option was stronger. This result is consistent with the normative framework set forth by Herman and colleagues proposing that social influences on eating behaviour occur mainly because people are motivated by a desire to avoid eating excessively to guard against negative stereotypical judgments about people who 'overindulge' or eat too much (Herman & Polivy, 2005). This framework was initially proposed for intake modeling but it has been since applied to food choice modeling research (Cruwys et al., 2015; Prinsen et al., 2013). The stronger result for vegetarian modeling fits with the avoid-overindulgence argument if the vegetarian option was perceived to be less indulgent than the meat option. The vegetarian option may have been perceived as less indulgent than the meat-based option because it included vegetables, was 1$ cheaper than the meat-based option, and because meat eating is associated with luxury and status (Ruby, 2012). Since no data was collected about which option was viewed as more indulgent, it is not possible to test this hypothesis.

Another possible explanation for an increased modeling effect for the vegetarian lunch option is the café location. The café where the study was conducted is located within a research institution that focuses on environmental sustainability. Café patrons in this building may have been more environmentally conscious than average and may have been more susceptible to vegetarian modeling. The café location may therefore have partially explained the stronger modeling effect observed for vegetarian meals. It is important to replicate this study in another location.

Study 1 meal choice modeling results provide support for the normative account of eating modeling, whereby people model others' eating behaviour because it provides a guide for

appropriate behaviour (Herman et al., 2003; Herman & Polivy, 2005). Affiliative motivations for modeling are less likely because most participants in our study had no expectation of interacting with the model in the future. Frequently, the model had even moved outside of hearing range by the time participants placed their order, making it less likely that participants were motivated to affiliate with the model. Therefore, we argue that it was much more likely that people were using the model's lunch choice as a point of reference of a social norm in that café. Although not statistically significant, Study 2 results are also descriptively consistent with the normative account of modeling because people who were unfamiliar with the café were more likely to model than people who had eaten there previously.

Modeling and Relationship Type

Contrary to our hypotheses, but in line with previous intake modeling studies (Kaisari & Higgs, 2015; Salvy et al., 2007), modeling rates were not significantly higher for acquainted people compared to strangers in Study 1. One possible explanation is that perhaps in-group or out-group membership status is more important than specific relationship status when people determine who can provide a model for a social norm. Intake modeling has been demonstrated to occur only when the confederate was believed to be from the same university of the participants but not when she was presented as from a rival university (Cruwys et al., 2012). In that study, the authors concluded that modeling of eating behaviour only occurs for in-group members. Most café patrons in our study were students so it is possible that participants did not model at different rates depending on relationship to the model because they viewed all models as in-group members and in-group membership may be sufficient for modeling to occur. Future research could examine cafés with more diverse clientele in order to address this question. Alternatively, moderating effects of relationship may only occur at more intimate relationship

types than we were able to test (our sample only had one person who reported being in a romantic relationship with the person in line ahead of them). Indeed, longitudinal survey research on similarity of food choice over time reported the highest level of similarity between spouses (Pachucki et al., 2011), suggesting that future research should testing whether modeling effects are stronger for romantic partners.

Awareness of Modeling

Study 1 results provided support for our hypothesis about awareness of lunch choice modeling with matching orders still occurring significantly higher than chance for those who said they were not influenced by the prior order. Modeling rates were, however, higher for participants who said they were influenced by the prior order compared to those who said they were not, suggesting that only some of the people who modeled reported doing so. Taken together, these results suggest that either only some people have insight into their own modeling behaviour or that all people are aware of modeling, but some people are reluctant to acknowledge social influences on their behaviour. Recent research suggests that the latter may be the case with individuals higher in conformity, self-monitoring, sociotropy, and lower in conscientiousness being more likely to acknowledge social influences on their eating behaviour (Spanos, Vartanian, Herman, & Polivy, 2015). This is an important area for future research because interventions that capitalize on social norms may be best targeted at individuals who report that their eating behaviour is influenced by other people.

Limitations and Future Directions

Across both studies, there were some sample size limitations. For Study 1, the online subsample was considerably smaller than the total sample. The online subsample consisted of only 16% of the full sample. The reason for the small response rate is likely twofold: (1) the

online part of the study started three months into data collection and (2) the incentive for participation (entering a draw) may not have been large enough. There were, however, no statistically significant demographic differences between the online subsample and the full sample (see Table 3) suggesting that the online sample was representative of the full group of Study 1 participants.

Unfortunately, all of the results of Study 2 are inconclusive due to the small sample size. An a priori power analysis indicated that 150 participants would be needed for 80% power to detect a medium-sized effect (based on Study 1 results) at an alpha level of .05 (Faul, Erdfelder, Lang, & Buchner, 2007). Due to some unforeseen limitations of the study design and time constraints, the obtained sample size was less than half of the target sample size. In addition to the Study 1 exclusion criteria exclusions, 57 participants were excluded from Study 2 analyses because there was nobody in line ahead of them to model a meal choice. Because we wanted participants to order food without realizing they were being watched, it was not possible to ask participants to wait until somebody else got in line ahead of them before they ordered their food. Future studies could limit participation to only the busiest time of day to mitigate this loss or perhaps invite participants to the café in groups so that participants can serve as models for each other in line.

Alternatively, Study 2 results may indicate a true absence of modeling. It is possible that participants in Study 2 behaved differently than participants in Study 1 because only Study 2 participants were aware that they were participating in a study when they made their lunch choice. Possibly, the awareness of being in a study caused people to put more effort into deciding what to order. If modeling occurs unconsciously, then this more effortful decision making may have made modeling less likely. Most past research demonstrating modeling effects, however,

has been conducted in laboratory studies where participants knew they were in a study so this more effortful decision making explanation seems unlikely. Additionally, many participants expressed surprise that the research team was tracking orders, indicating that they did not expect their lunch choice to be analyzed. Future research should ask participants if they were aware of their orders being observed to control for the possibility of people behaving differently when they are aware of being watched.

Future research should test whether our results generalize to other types of lunch choices. The two options at the café were typically quite similar (e.g. stew with a vegetable-base or stew with a meat-base), so it is important to test whether meal choice modeling occurs with more dissimilar choices and also when there are multiple meals to choose from. It is important to test whether meal choice modeling is attenuated or eliminated when there are several options to choose from (like in snack choice modeling; Robinson & Higgs, 2013) especially because in many eating environments people are presented with multiple choices.

This research has implications for interventions on healthy eating behaviour; namely that meal selection is subject to social influence. College students, in particular, may represent an ideal target for social modeling of healthy food choices because they may be purchasing the majority of their own food for the first time and there is consistent evidence of weight gain during the first year of college (Vella-Zarb & Elgar, 2009). Future research should examine whether 'light touch' approaches like using snack food wrappers as an indicator of past participants' choices (Prinsen et al., 2013) could also be effective for indicating popular past meal choices. For example, researchers in campus cafeterias could place fewer of the 'healthy' lunch options on display to indicate choosing that option is the norm to test whether social meal choice norms can be conveyed through subtle environmental cues.

Conclusion

In order to stem the tide of the obesity crisis, it is crucial to better understand social influences on eating behaviour. This research provides the first empirical evidence of meal choice modeling and demonstrates that this effect can occur outside of conscious awareness. The ecologically valid study design increases the generalizability of the results, but future research should replicate these findings in other settings and examine whether meal choice modeling occurs when people are presented with multiple options. Interventions may benefit from harnessing the powerful effects of social modeling on eating behaviour to help people make healthier choices.

Table 1
Study 1 order types depending on prior order

Prior Order	Participants' Orders	
	Meat-based	Vegetarian
Meat-based	140/168 (83.3%)	28/140 (16.7%)
Vegetarian	31/63 (49.2%)	32/63 (50.8)

Table 2

Demographic characteristics of Study 1 online subsample and comparisons to full sample

	Full sample	Online subsample	χ^2	*p-value*
N	231	38	N/A	N/A
Modeling rate	74.5%	81.6%	0.89	.347
Participant gender (female)	49.1%	57.9%	1.01	.316
Gender of person placing prior order (female)	44.8%	34.2%	1.49	.223
Relationship between participant and person placing prior order				
Strangers	75.3%	71.1%	0.30	.582
Acquaintances[a]	12.1%	15.8%	0.40	.525
Close friends	12.1%	13.2%	0.04	.848
Romantic partners	0.4%	0.0%	0.15	.697

Note. [a] "We are casual acquaintances" and "We recently became friends" were collapsed together into acquaintances.

Table 3

Demographic characteristics of Study 2 sample

	% or *M*	*n*
Modeling rate	56.5%	69
Participant gender (female)	60.9%	69
Participant age (SD)	20.58 (3.06)	69
Participant ethnicity		
Caucasian	32.8%	67
East Asian	32.8%	67
Other	35.9%	67
Gender of person placing prior order (female)	54.5%	55
Relationship between participant and person placing prior order		
Strangers	97.1%	69
Acquaintances[a]	1.4%	69
Close friends	1.4%	69
Romantic partners	0.0%	69

Note. [a] "We are casual acquaintances" and "We recently became friends" were collapsed together into acquaintances.

Figure 1: Modeling rates by relationship type.

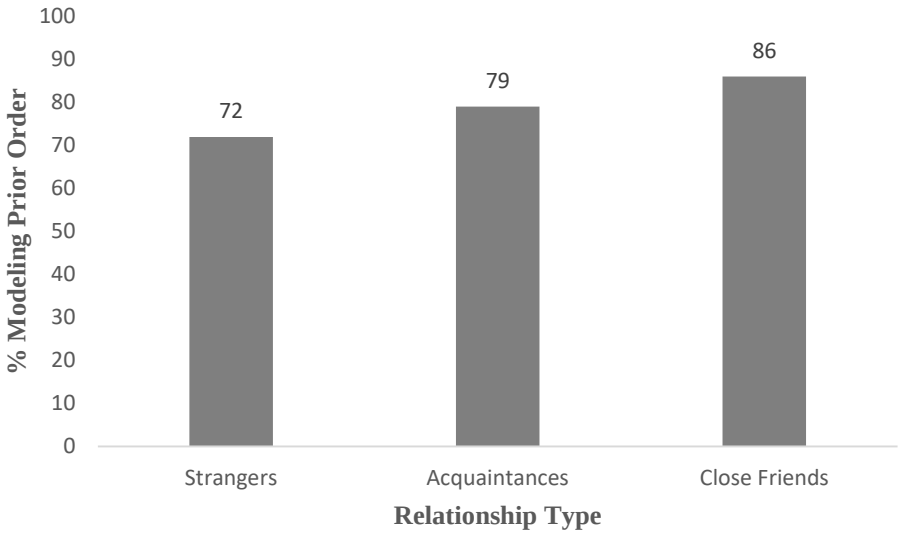

Figure 1: Modeling rates by relationship type.
Note. None of the proportions are statistically significantly different from each other.

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Appendix A: General Flexibility of Eating Behaviour & Lunch Enjoyment Questions

Flexibility of Eating Behaviour

Participants were asked to rate, on a 7-point scale ((1 = s*trongly disagree* -7 = *strongly agree*) the extent to which they agreed or disagreed with the following 5 statements:

I tend to eat the same foods for lunch everyday

I like to try new foods

If I see somebody order food that sounds tasty, I will likely try it too

When eating with a friend, I often order whatever my friend is having

Cost is often a primary concern when I order food

Lunch Enjoyment

Participants were asked to rate, on a 7-point scale ((1 = s*trongly disagree* -7 = *strongly agree*) the extent to which they disagreed or agreed with the following 3 statements:

The food I ate was satisfying

I enjoyed the food I ate

I feel like I made the right choice ordering what I did

Appendix B: Familiarity with Café & Familiarity with Social Environment Questions

Familiarity with the café

Before today, had you ever bought lunch at the Loop café? (yes or no)

Before today, had you ever bought the specific lunch item that you ordered from the Loop? (yes or no)

Within the last six months, how many times have you bought lunch from the Loop café? (1-3 times, 4-6 times, 7-9 times, 10+ times)

How familiar or unfamiliar would you say that you are with the Loop's lunch menu?

(not familiar at all, slightly familiar, moderately familiar, very familiar, extremely familiar)

Social environment/student status questions

Are you a UBC student? (yes or no)

How long have you been a student at UBC? (note if you are a transfer student who started at UBC this year you would choose "This is my FIRST year at UBC"

(This is my FIRST year at UBC, this is my SECOND year at UBC, this is my THIRD year at UBC, this is my FOURTH year at UBC, this is my FIFTH or more year at UBC)