



# Modelling of food intake in Brazil and Germany: Examining the effects of self-construals



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## ABSTRACT

The current research focused on the influence of informational eating norms on people's food intake, and examined whether this influence was moderated by participants' self-construal levels. In two experiments, a two (intake norm manipulation: low vs. high) by two (self-construal manipulation: interdependent versus independent) between-participant factorial design was used. The studies were conducted in Brazil (Experiment 1) and in Germany (Experiment 2) as participants' self-construal levels differ between these countries. In Experiment 1, results indicated that participants exposed to a high-intake norm ate more than participants exposed to a low-intake norm. However, self-construal was not found to moderate the influence of food intake norms on participants' intake. In Experiment 2, replicating the results of Experiment 1, exposure to a high-intake norm increased participants' food intake, but self-construals again did not moderate modelling effects on food intake. Although differences in individuals' self-construal were found between both countries, they did not affect the magnitude of modelling effects on eating. Our studies provide evidence for cross-cultural similarity in the extent to which Brazilian and German female young adults are vulnerable to modelling effects on food intake, independent on their self-construal.

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## 1. Introduction

To date, the number of studies on non-physiological factors that affect when and how much people eat has rapidly been increasing. Noteworthy among these factors is the immediate social environment (Herman, Roth, and Polivy, 2003). It has been shown consistently that people model the food intake of others: eating more or less when others do so (c.f. Cruwys, Bevelander, and Hermans, 2015). The most dominant explanation for why people adapt their food intake to that of others is that they use the amounts consumed by others as a source of normative information indicating how much is appropriate to consume within the given context (Herman and Polivy, 2005; Herman et al., 2003; Hermans, Larsen, Herman, and Engels, 2012). Although it has long been assumed that these modelling effects are not moderated by individual differences (Herman, Koenig-Nobert, Peterson, and Polivy, 2005), recent evidence demonstrates that some personal characteristics (e.g., self-esteem, impulsivity, empathy, and the need to please others) could have impacted on the magnitude of the modelling effect (Cruwys et al., 2015; Hermans et al., 2013). Most of these studies, however, have used a design in which participants interact with a co-eater. Much less attention has

been paid to the influence of individual differences in studies using a remote-confederate paradigm, in which participants are exposed to informational eating norms. Although both research designs have been found to induce modelling effects on eating (Feeney, Polivy, Pliner, and Sullivan, 2011), it is not yet clear whether individual difference factors could also moderate the effects of informational eating norms (Robinson, Benwell, and Higgs, 2013).

An important factor that could influence the extent to which people are vulnerable to the effects of informational norms on eating is their self-construal. This concept refers to one's self-views, or the extent to which a person defines herself independently of others or interdependently with them. The independent self-construal is characterized by a focus on autonomy and distinctiveness from others, whereas the interdependent self-construal emphasizes social bonds, group memberships and social relationships for self-definition (Markus and Kitayama, 1991). Self-construals can be operationalized in different ways. For instance, state self-construal is often manipulated through priming (Holland, Roeder, Brandt, and Hannover, 2004; Oyserman, Coon, and Kimmelmeier, 2002; Trafimow, Triandis, and Goto, 1991), whereas dispositional (i.e. chronic) self-construals have been assessed using self-report scales (c.f. Gudykunst et al., 1996; Singelis, 1994), or are inferred on the basis of national background (van Baaren, Maddux, Chartrand, de Buter, and van Knippenberg, 2003).

Numerous studies have been conducted on the relationship between self-construals and adherence to social norms and conformity.

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For example, van Baaren et al. (2003) found that priming individuals with the concept of interdependence increased people's tendency to mimic other's behaviours. Moreover, they showed that Japanese individuals (considered to be more interdependent), were more likely to mimic the behaviour of others than Americans (viewed as more independent). In another study, however, it was found that people with a stronger individualistic orientation were less likely to follow descriptive norms (Lapinski, Rimal, de Vries, and Lee, 2007). Likewise, and more related to the current research, it has also been demonstrated that those who were preoccupied with maintaining social harmony and pleasing others (which may relate to a more interdependent self-view) were more likely to adapt their food intake to that of others (Exline, Zell, Bratslavsky, Hamilton, and Swenson, 2012). To the best of our knowledge, there is no research that has examined the effects of self-construal on people's tendency to model others' food intake. Yet, because an interdependent self-construal has been related to social bonds and group membership, and modelling of food intake is assumed to reflect an attempt to affiliate or ingratiate with others (Cruwys et al., 2015), it is expected that conformity to informational eating norms is higher among interdependents than among independents.

In order to provide sufficient evidence of the possible effect of self-construals on modelling, we opted not only to manipulate state self-construal but also to assess dispositional self-construal in two countries in which possible differences in self-construal might be expected. Specifically, we chose to compare Brazil and Germany, as Brazilians have shown to have higher levels of interdependence than Germans (Fernández, Paez, and González, 2005; Friedlmeier, Schäfermeier, Vasconcellos, and Trommsdorff, 2008). Additionally, as individuals living in collectivist countries have been found to have a greater tendency to conform to norms (Bond and Smith, 1996), another aim was to explore possible differences between two countries (i.e., Brazil and Germany) that vary in the dimension of individualism and collectivism (Hofstede, 1980; Hofstede, Hofstede, and Minkov, 2010).

Altogether, the present work investigated whether self-construals have an impact on the magnitude of the modelling effect, thereby adding evidence to the research on individual characteristics that could moderate modelling effects on eating. As such, two experiments were conducted: one in Brazil (Experiment 1) and the other in Germany (Experiment 2). In both countries, it was expected that conformity to intake norms would be stronger among interdependents than among independents. To date, the possible effects of culture on social modelling have remained understudied; therefore it is not clear if country of origin would play any role in the modelling of food intake. However, given that modelling of food intake has been shown in different countries, it was hypothesized that, regardless of cultural background, female young adults would conform their intake to that of a remote-confederate.

## 2. Experiment 1 (Brazil)

### 2.1. Experimental methods

#### 2.1.1. Design

A 2 (intake condition: low intake vs. high intake norm)  $\times$  2 (self-construal condition: independent vs. interdependent) between-participants design was used. Participants were randomly assigned to one of the four conditions. All participants were exposed to a sheet containing information on the amounts consumed by ten previous fictitious participants in the same study, who had consumed between 1 and 3 small chocolates in the low-intake condition and between 18 and 20 chocolates in the high-intake condition. These numbers were based on a pilot-study and represent what Brazilian participants believed to be high or low numbers of chocolates that can be eaten in 10 min. All procedures involving human subjects were approved by the University of Brasilia.

#### 2.1.2. Participants

In total, 99 female undergraduate students from the University of Brasilia participated in the study. Sixteen participants were excluded afterwards: two became aware of the actual aim of the study, one encountered technical problems with the priming task, one felt sick and was excused from the experiment, and two suspected the numbers on the table were false. Furthermore, ten participants did not complete the follow-up questionnaire one week later. The final sample, then, consisted of 83 females with a mean age of 21.28 years ( $SD = 4.15$ ) and mean BMI of 21.92 ( $SD = 3.47$ ).

#### 2.1.3. Procedure

Under the pretext of a study on "women and product evaluation", participants were asked to evaluate a food product and answer a questionnaire. This cover story was used to avoid awareness of the actual aim of the study. Participants were tested individually and each session took about 30 min in total.

Firstly, participants were asked to sit in front of a computer, where they were left alone for about 5 min to activate the independent or interdependent self-construal. To do so, participants were asked, with an open-ended question, either to report what they had in common with (for interdependence) or what differentiated them from (for independence) their close friends and family (Trafimow et al., 1991). Directly after this priming procedure, participants were asked to indicate how much overlap they felt with their close friends and family (see below). Subsequently, participants were exposed to either the low- or high informational intake norm (with a fictitious list containing information on the amounts consumed by previous participants). Participants were left alone for a couple of minutes with this sheet of paper, while the experimenter arranged the test food. After returning, the experimenter pretended to notice it, telling the participant that this list was already complete and therefore she did not have to complete the number of chocolates consumed. She was asked to ignore the sheet and received a large bowl containing 40 small chocolates (BIS - Lacta; Mondeléz International), water and a bogus questionnaire. Before tasting, participants indicated how hungry they were. Participants were told that they could eat as many chocolates as they wanted during this task and were left alone for 10 min.

Finally, participants completed a short questionnaire about the number of chocolates they had consumed and how much they thought the other participants had consumed. They were also asked about their weight, height and awareness of the study aims. At least one week later, they completed online measures of chronic self-construal, dietary restraint and nutritional style. After the completion of this questionnaire, participants were debriefed and rewarded.

#### 2.1.4. Materials and measures

**2.1.4.1. Actual food intake.** The experimenter measured food intake based on the number of empty wrappers in the garbage bin and double checked her observations by subtracting the remaining amounts in the bowl with the number of wrappers in the bin (which should add up to 40). The total number of chocolates was used as the dependent variable. Each unit of BIS weighed approximately 6.3 g and contained circa 31 kcal.

**2.1.4.2. Interpersonal closeness.** Interpersonal closeness with close friends and family members was measured immediately after the self-construal priming task, with the Inclusion of Other in the Self (IOS) (Aron, Aron, and Smollan, 1992). The IOS is a single-item, pictorial measure of interpersonal closeness.

**2.1.4.3. Self-construal (dispositional measure).** Self-construal was measured with the Brazilian version of the Singelis Self-Construal Scale (Gouveia, Singelis, and Coelho, 2002; Singelis, 1994), consisting of 24 items rated on a 7-point scale, with 1 = strongly disagree to

7 = strongly agree. The independence subscale measures emphasis on separateness and uniqueness and consists of 12 items. Cronbach's  $\alpha$  was .65. The interdependence subscale measures personal emphasis on connectedness and social relations. Cronbach's  $\alpha$  was .69.

**2.1.4.4. Hunger.** Before consumption, participants rated their subjective hunger on a 10-point scale from “not at all hungry” to “extremely hungry” (Hermans, Larsen, Herman, and Engels, 2008).

**2.1.4.5. Dietary restraint.** Participants' dietary restraint was measured with the 6 item subscale of the Portuguese short version of the Three Factor Eating Questionnaire (Natacci and Ferreira Júnior, 2011; Stunkard and Messick, 1985). Cronbach's  $\alpha$  was .82.

**2.1.4.6. Liking of the test food.** Participants reported how much they agreed with the statement “I like this product” on a 7-point scale from “strongly disagree” to “strongly agree”.

**2.1.4.7. Nutrition habits.** Participants' nutrition habits were measured with the Nutrition Style scale (Renner and Schwarzer, 2003). This instrument has 19 items on a 4-point scale with responses ranging from “not at all true” to “exactly true”. The Cronbach's  $\alpha$  was .66.

**2.1.4.8. Analytic strategy.** Our sample allowed us to run statistical analyses with at least 20 observations per cell, which should be appropriate to detect most effects (Simmons, Nelson, and Simonsohn, 2011). First, we examined whether participants differed with respect to potential confounding variables. Hunger ( $r = .50, p < .001$ ), liking of the test food ( $r = .26, p < .05$ ) and nutrition habits ( $r = -.25, p < .05$ ) significantly correlated with intake, and were therefore included in the model as potential confounds. It should be noted that results remain the same when these variables were not included in the main analyses (Simmons et al., 2011). ANOVAs showed no significant differences between conditions in respect to these confound variables. To answer the main questions, an ANCOVA was used to examine the main and interaction effects of the norm and priming manipulations on the participants' total food intake (in units of chocolates). The main and interaction effects of the norm manipulations and the dispositional measure of self-construal were examined using a regression-based moderation test with the PROCESS macro for SPSS (Hayes, 2008).

## 2.2. Results

### 2.2.1. Manipulation checks

Participants exposed to the high intake norm assumed that others consumed a larger number of chocolates ( $M = 17.08; SD = 8.63$ ) than those exposed to the low intake norm condition ( $M = 4.78; SD = 4.55, t(74) = -7.83, p < .001$ ), indicating that our norm manipulation was successful.

To examine whether the activation of the independent or interdependent self-construal had been successful, we compared the IOS scale scores of participants in both conditions. Additionally, we coded the open-ended question on whether participants felt similar (interdependent) or dissimilar (independent) to their family or friends. This enabled the exclusion of participants whose textual content did not overlap with the task instruction (i.e. their answers did not refer to similarities or differences with family or friends according to the corresponding conditions). Only after excluding twelve participants who failed to comply with the instructions, this difference was significant,  $t(64) = -2.25, p < .05$ . Participants who were primed with interdependence reported higher overlap with family and friends than those primed with independence. Furthermore, to avoid loss of statistical power and because no difference in the pattern of the results emerged between both analyses, we decided to conduct our main analyses with the whole sample.

### 2.2.2. Impact of informational eating norms and self-construals on intake

A significant difference in intake was found among participants in both norm conditions,  $F(1,74) = 12.56, p < .01$ , while controlling for hunger, liking and nutrition habits. Participants exposed to a high-intake norm consumed more chocolates ( $M = 6.63; SD = 3.58$ ) than those exposed to a low intake norm ( $M = 3.95; SD = 3.05$ ). The effect size of the norm manipulation was large,  $d = 0.82$ , 95% CI 0.11 - 1.53 (Cohen, 1988). No main effect on intake was found for the self-construal priming manipulation,  $F(1,74) = 1.99, p = .16$ , neither was the interaction between the norm manipulation and primed self-construal significant,  $F(1,74) = 0.25, p = .88$ . Fig. 1 shows the number of chocolate consumed in the different conditions.

To examine the moderating effect of dispositional self-construal, it was also tested whether participants' inter- and independence scores affected the magnitude of the modelling effect. No main effect on intake was found for the independence and interdependence subscales,  $b = 0.45, t(69) = 1.16, p = .25$  and  $b = -0.63, t(69) = -1.33, p = .19$ , respectively. Furthermore, no significant interaction was found between the eating norm intake and the participants' independence scores,  $b = -.39, t(72) = -0.52, p = .60$  or their interdependence scores,  $b = -1.27, t(72) = -1.39, p = .17$ .

## 3. Experiment 2 (Germany)

### 3.1. Experimental methods

#### 3.1.1. Design

A 2 (intake condition: low intake vs. high intake norm)  $\times$  2 (self-construal condition: independent vs. interdependent) between-participants design was used. Participants were randomly assigned to one of the four conditions. All procedures involving human subjects were approved by the University of Bremen.

#### 3.1.2. Participants

In total, 107 female undergraduate students from the University of Bremen, Germany, participated. Seven participants were excluded afterwards: three became aware of the actual aim of the study, one refused to complete self-construal manipulation, two did not fill in the follow-up questionnaire and one had a chocolate allergy. The final sample consisted of 100 participants with a mean age of 23.41 years ( $SD = 4.99$ ) and a mean BMI of 21.91 ( $SD = 2.64$ ).

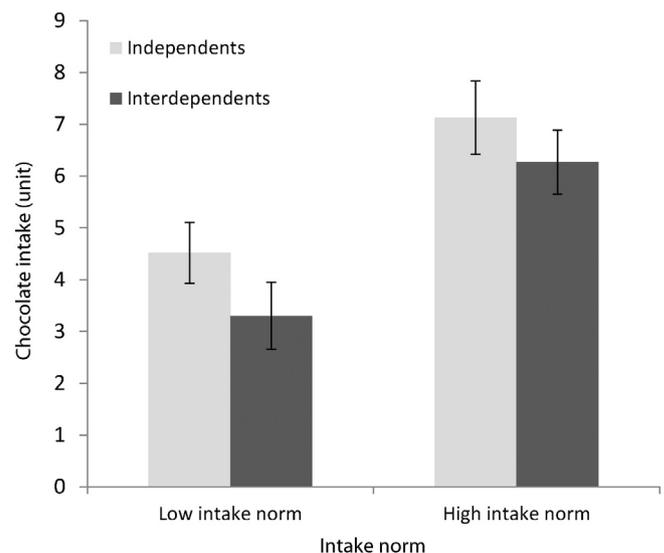


Fig. 1. Mean chocolate intake between participants primed for independence and for interdependence exposed to the low intake norm and the high intake norm.

### 3.1.3. Procedure

The procedure was similar to that of Experiment 1 with two exceptions: (1) a different product was used as test food, and (2) the norm manipulation differed in the number of chocolates that represented the low (between 1 and 3 chocolates) and high (between 7 and 9 chocolates) intake conditions. Participants were offered Kinder Schoko-bons (Ferrero). This product is similar to the one used in Brazil, in terms of weight and calories (contains circa 6.3 g and 36 kcal). The norm manipulation in Experiment 2 was based on a pretest measuring the high numbers of chocolates that German participants could eat, or the low number of chocolates they believed they could eat, both within a period of 10 min.

### 3.1.4. Materials and measures

The measures used in Experiment 2 were similar to those used in Experiment 1, but adapted into the German language.

**3.1.4.1. Self-construal (dispositional measure).** Participants' self-construal was measured with the German version of the Singelis' Self-Construal Scale (Hannover, Kühnen, and Birkner, 2000). Cronbach's  $\alpha$  for the independence subscale was  $= .67$  and  $\alpha = .68$  for the interdependence subscale.

**3.1.4.2. Dietary restraint.** Cognitive eating restraint was measured with a 21 item subscale of the Three-Factor Eating Questionnaire (Pudel and Westenhöfer, 1989),  $\alpha = .89$ .

**3.1.4.3. Nutrition habits.** Participants' nutrition habits were measured with the German version of the Nutrition Style scale (Renner and Schwarzer, 2003),  $\alpha = .69$ .

### 3.1.5. Analytic strategy

Hunger ( $r = .26, p < .05$ ) and liking of the test food ( $r = .23, p < .05$ ) significantly correlated with intake, and were therefore included in the model as potential confounds. Results remained the same when these variables were not included in the main analyses (Simmons et al., 2011). As with experiment 1, the hypothesis was tested with a factorial ANCOVA and the PROCESS macro for SPSS (Hayes, 2008).

## 3.2. Results

### 3.2.1. Manipulation checks

Participants exposed to the high intake norm indicated that others consumed a larger number of chocolates ( $M = 7.83; SD = .44$ ) than those exposed to the low intake norm condition ( $M = 2.32; SD = 1.07$ ),  $t(93) = -33.40, p < .001$ .

It appeared that participants primed with an interdependent self-construal did not feel more overlap with their family and friends than those primed with an independent self-construal,  $t(98) = 0.77, p = .44$ , suggesting that our priming procedure did not work. Nevertheless, we decided to continue with testing the possible moderating role of primed self-construal on modelling effects on intake and to come back to this issue in our Discussion section.

### 3.2.2. Impact of informational eating norms and self-construals on intake

Participants exposed to a high-intake norm consumed more ( $M = 4.46; SD = 1.88$ ) than those exposed to a low-intake norm ( $M = 3.06; SD = 1.95$ ),  $F(1,94) = 10.57, p < .01, d = 0.73, 95\% CI 0.37-1.11$ , while controlling for hunger and liking. No main effect on intake was found for the self-construal priming manipulation,  $F(1,94) = 1.71, p = .19$ , neither was the interaction between the norm manipulation and primed self-construal significant,  $F(1,94) = 0.70, p = .41$ . Fig. 2 shows the number of chocolate consumed in the different conditions.

Furthermore, no main effect on intake was found for both the independence and interdependence subscales, with  $b = 0.31, t(94) = 1.16,$

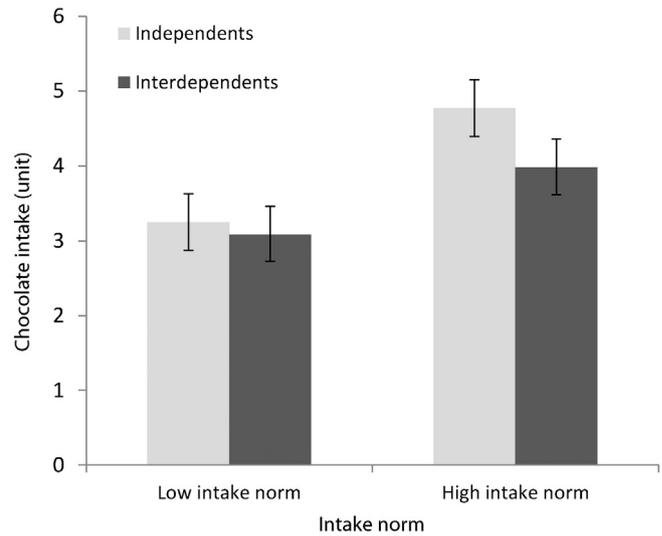


Fig. 2. Mean chocolate intake between participants primed for independence and for interdependence exposed to the low intake norm and the high intake norm.

$p = .25$  and  $b = 0.11, t(94) = 0.30, p = .77$  respectively. No significant interaction emerged between participants' compliance to the intake norm and their scores on either the independence subscale,  $b = -0.05, t(94) = -0.1, p = .92$ , or the interdependence one,  $b = -0.25, t(94) = -0.34, p = .73$ .

### 3.2.3. Comparison between experiment 1 and experiment 2

First, we checked whether both samples replicated previously encountered differences between self-construals, (Fernández et al., 2005; Friedlmeier et al., 2008). Indeed, Brazilian participants scored higher on interdependence ( $M = 4.92; SD = 0.74$ ) than Germans ( $M = 4.40; SD = 0.66$ ),  $t(179) = -4.93, p < .001$ . However, no significant difference was found in independence between the two countries  $t(176) = -0.49, p = .63$ . Thus, in line with previous evidence (Fernández et al., 2005; Friedlmeier et al., 2008), Brazilians were found to be more interdependent than Germans.

As an exploratory secondary goal, we examined whether this difference influenced the extent to which people modelled in both countries. Therefore, we compared the effect sizes of both modelling effects. We opted to compare effect sizes (and not pooling the data), because of the differences in test foods and norms in both experiments. The suggested statistical test for comparing two effect sizes is the  $z$  test (Matthews and Altman, 1996). Although the effect of the norm was higher in Brazil (Cohen's  $d = 0.82$ ) than in Germany (Cohen's  $d = 0.73$ ), this difference was not significant ( $z = 0.78, p = .22$ ). This finding suggests that participants in both countries were equally affected by the informational eating norms.

## 3.3. Discussion

Although it has been demonstrated recently that personal characteristics could have an impact on the magnitude of the modelling effect when two people are eating (Cruwys et al., 2015; Hermans et al., 2013), little is known about the possible individual factors that could moderate modelling effects when participants are only exposed to informational eating norms. Therefore, the present study examined the possible moderating effect of self-construals on the effect of informational eating norms on food intake. Specifically, it was investigated whether both situational and dispositional self-construal affected the magnitude of the modelling effect in two different countries.

Our results confirmed previous findings that young women are likely to align their food intake to that of others (Cruwys et al., 2015). Females in both studies adapted their intake to that of

remote-confederates, eating more or less when they believed others had eaten more or less. Extending the available literature, the current research provides evidence that such modelling effects in eating behaviour are not restricted to industrialized Western samples. Individuals in Brazil and Germany guided their intake on the basis of what they believed others had consumed, underscoring the importance of social influences on food intake. In contrast to our hypotheses, however, participants' self-construal did not influence the extent to which they adhered to the perceived eating norms. Neither state nor dispositional self-construals affected the strength of the modelling effect in either country. Moreover, although the Brazilians' self-construal was indeed more interdependent than the Germans', this difference did not correspond to a stronger modelling effect in the former culture. A few possible explanations for this unexpected finding are offered.

Firstly, our hypotheses on the moderating role of self-construal on modelling effects were based on more general studies of imitative behaviours, such as mimicry of foot shaking or playing with a pen (van Baaren et al., 2003). Although these studies found moderating effects, their dependent variable was unrelated to food intake or eating behaviour. Therefore, the lack of a moderating effect might be due to differences in the nature of modelling of food intake with other kinds of imitative behaviours. Secondly, although both remote and live confederates provide information about how to behave in a given context (i.e. "informational social influence," Herman et al., 2003), it is possible that actual live confederates may induce other psychological mechanisms that remote confederates cannot evoke (Robinson et al., 2013). That is, only when people actually interact with the model, its influence might be explained by ingratiation or impression-management strategies (Cruwys et al., 2015; Robinson et al., 2013). This notion is relevant for the current experiments since the level of self-presentational concerns of participants has been shown to be related to their self-construal levels. Interdependence increases impression management concerns related to social appropriateness (Lalwani and Shavitt, 2009). Therefore, the impact of different self-views on the strength of the modelling effect may be weaker in the remote confederate paradigm than in a live model paradigm, as in the first paradigm the confederate might not activate self-presentational concerns. This suggestion is in line with the findings from Robinson and colleagues who demonstrated that trait-empathy moderated the modelling effect in a live-confederate study (Robinson, Tobias, Shaw, Freeman, and Higgs, 2011), but not in a remote-confederate study (Robinson et al., 2013). Thirdly, it is possible that self-construals failed to moderate the intake of others because the priming was not strong enough to elicit the expected self-construal differences among participants, as females in Experiment 2 did not show any difference in their IOS scores after the self-construal priming manipulation. If this manipulation was indeed ineffective or too subtle, then it clearly could not yield any significant impact on intake. Given that many other studies with Germans (or other Europeans) have shown self-construal priming effects on different kinds of behaviour (Cross, Hardin, and Gercek-Swing, 2011), replication of our findings therefore would be justifiable.

This is the first study which attempts to look into the possible moderating role of self-construals and to compare countries with respect to the modelling of eating behaviour. The results of the present study indicate that modelling effects have a powerful influence on female young adults' food intake, regardless of their cultural background. Our study further suggests that individual differences in one's self-view are overruled by a general tendency to adhere to informational eating norms. When left alone with the knowledge of how much others ate, participants comply with these norms, regardless of viewing themselves as more socially connected or separate. All in all, our results offer additional support to the notion that modelling, especially within a remote confederate design, occurs despite certain individual characteristics (Herman et al., 2005).

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#### Contributors

Briefly, Elizabeth Hirata was involved with formulating the research question, designing and conducting the study, writing the protocol, analysing the data and writing the article. Ulrich Kühnen and Sonia Lippke were involved with formulating the research question, designing the study, analysing the data and writing the article and Roel Hermans was involved with analysing the data and writing the article. All authors read and approved the final manuscript.

#### Conflict of interest

All authors declare that they have no relevant financial interests in the manuscript. Furthermore, they certify that there is no personal financial disclosure/conflict of interest.

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