

# When does food act as a social surrogate? The interplay of need to belong and social context

Gudrun Sproesser<sup>a,\*</sup>, Jana Straßheim<sup>b</sup>, Harald T. Schupp<sup>c</sup>, Britta Renner<sup>b</sup>

<sup>a</sup> Johannes Kepler University Linz, Department of Health Psychology, Altenbergerstr. 69, 4040, Linz, Austria

<sup>b</sup> University of Konstanz, Psychological Assessment and Health Psychology, Box 47, 78457, Konstanz, Germany

<sup>c</sup> University of Konstanz, General Psychology, Box 36, 78457, Konstanz, Germany

## ARTICLE INFO

### Keywords:

Eating  
Social influences  
Inclusion  
Food intake  
Need to belong  
Social incentive  
Social surrogate

## ABSTRACT

Although food is often described as a 'social surrogate', that is a non-human social target, little is known about how individual differences in the need to belong interact with contexts that satisfy more or less belongingness needs to shape food intake. This experiment addressed this question by examining consumption across three contexts: a control condition (bogus taste test of three ice cream flavors), a social food condition (ice cream explicitly linked to belongingness), and a social inclusion condition (social inclusion episode prior to the social food manipulation and taste test). Moreover, as previous research has shown that effects on actual and perceived intake can differ, both were investigated in the present experiment. A total of 283 participants were randomly assigned to one of these conditions, and both perceived and actual ice cream intake were measured as dependent variables. Two separate  $3 \times 2$  ANCOVAs were conducted, one for actual intake and one for perceived intake, with condition (control, social food, social inclusion) and need to belong (low vs. high) as between-subjects factors. Results revealed the following pattern. First, no differences between low-vs. high-need individuals in the control condition were found. Second, participants high in need to belong reported and consumed more when food was tied to belongingness, an effect that disappeared following prior social inclusion. Third, participants low in need to belong showed an increased intake after social inclusion compared to the neutral situation, but no difference between the control and social food conditions. These findings suggest that food can function as a social surrogate, but this depends on the interplay between individual differences and situational factors.

## 1. Introduction

Food is not only essential for survival but also a key context for social bonding. Shared meals foster affiliation and strengthen interpersonal ties (Dunbar, 2017; Fischler, 2011). For instance, Straßheim et al. (2025) showed that eating together reduced conversational tension, illustrating food's role in smoothing social interaction. Beyond such immediate social effects, food can also acquire symbolic meaning and fulfill belongingness needs even when consumed alone.

Troisi and Gabriel (2011) demonstrated that comfort food can act as a *social surrogate*, that is a non-human social target, buffering the negative effects of social exclusion, but only among individuals who associated the food with positive relationship memories (see also Gardner et al., 2000). In particular, when participants wrote about eating a comfort food, securely attached individuals reported reduced

loneliness following a belongingness threat (Troisi & Gabriel, 2011). In this sense, socially laden foods function as symbolic stand-ins for social connection when direct interaction is absent. Comfort foods are typically consumed in response to stress or negative affect and are often characterized by sensory properties, such as warmth or softness, and indulgence that provide immediate soothing (Spence, 2017; Soffin & Batsell, 2019). Similarly, so-called nostalgic foods are tied to personally meaningful social experiences such as family meals, cultural rituals, or childhood traditions and also function as a social surrogate (Locher et al., 2005; Wang et al., 2018). Loveland et al. (2010) found that individuals whose need to belong had been experimentally heightened preferred nostalgic over non-nostalgic cookies, suggesting that socially laden foods were used to buffer belongingness threats by fulfilling social needs symbolically. Reid et al. (2023) further demonstrated that food-evoked nostalgia directly increased feelings of social connection,

\* Corresponding author.

E-mail addresses: [gudrun.sproesser@jku.at](mailto:gudrun.sproesser@jku.at) (G. Sproesser), [jana.strassheim@uni-konstanz.de](mailto:jana.strassheim@uni-konstanz.de) (J. Straßheim), [harald.schupp@uni-konstanz.de](mailto:harald.schupp@uni-konstanz.de) (H.T. Schupp), [britta.renner@uni-konstanz.de](mailto:britta.renner@uni-konstanz.de) (B. Renner).

<https://doi.org/10.1016/j.appet.2026.108539>

Received 24 September 2025; Received in revised form 2 March 2026; Accepted 11 March 2026

Available online 13 March 2026

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highlighting the unique role of foods in satisfying belongingness needs. Specifically, nostalgia evoked by sampling jelly beans increased social connectedness (Reid et al., 2023). Extending this work, Reid et al. (2025) reported evidence across multiple studies that both comfort and nostalgic foods enhance social connectedness, though through different pathways: comfort foods primarily regulate affect, whereas nostalgic foods reinforce belonging through the activation of relationship memories (see Sedikides & Wildschut, 2019, for a broader discussion of the sociality of nostalgia). However, these studies examined writing about eating comfort foods (Troisi & Gabriel, 2011), food choice (Loveland et al., 2010) or short taste experiences (Reid et al., 2023), leaving it open whether belongingness-relevant food cues affect how much people actually consume.

That food consumption can serve a social function and that foods can acquire a social incentive is also widely exploited in marketing strategies aimed at increasing purchase and consumption. By embedding foods in social contexts, for instance by depicting consumption as part of shared meals, celebrations, or peer interactions, such marketing practices may encourage consumers to associate food with social connection and belonging, thereby positioning food as a potential social surrogate. Recent research on digital food marketing shows that foods, particularly energy-dense and indulgent products, are frequently presented in contexts emphasizing togetherness, peer interaction, and shared enjoyment (e.g., McCarthy et al., 2022; Winzer et al., 2022). In addition, foods and beverages are often promoted by influencers or celebrities, who tend to cultivate one-sided yet affectively meaningful relationships with their audiences, so-called parasocial relationships, which may further reinforce the perception of these products as socially laden (e.g., Ares et al., 2022; Coates et al., 2019a; Giese et al., 2015; Maksi et al., 2024). Conceptually, this aligns with recent theoretical work emphasizing the central role of social cues, parasocial interaction, and social norms in digital food marketing environments (Freeman et al., 2024).

Together, this literature suggests that, much like physiological hunger, 'social hunger' triggered by belongingness threats can heighten the incentive value of socially laden foods. Yet, although prior research demonstrates that food can serve as a social surrogate, it remains unclear which individuals are most likely to use food in this way. The desire for interpersonal attachments is a fundamental human motivation that shapes affect, cognition, and behavior (Baumeister & Leary, 1995). Yet people differ in their *trait need to belong* - the chronic motivation to form and maintain stable social relationships (Leary et al., 2013; Schreindorfer & Leary, 1996). Those high in need to belong are particularly sensitive to opportunities for social connectedness and, according to Pickett et al. (2004), can be described as having a large 'social appetite'. Consistent with evidence that experimentally heightened *state* need to belong increases nostalgic food choices (Loveland et al., 2010), individuals high in *trait* need to belong may be especially prone to consuming foods that fulfill a social function (see also Gardner et al., 2000, who showed that experimentally heightened state need to belong increased 'social hunger', reflected in a selective memory for social events). Yet this possibility has not been directly tested.

A related question is whether individuals high in need to belong continue to consume socially laden foods when their belongingness needs are already satisfied. Evidence from other domains suggests they may not. DeWall et al. (2008) found that socially accepted participants performed more poorly on tasks framed as diagnostic of interpersonal attractiveness, concluding that satiation of belongingness reduces the drive to seek further acceptance. Similarly, Baumeister and Leary (1995) argued that once belongingness needs are fulfilled, motivation to pursue further belonging diminishes. Translating this to the question whether, when, and in whom belongingness cues affect how much people consume, individuals with a high need to belong may refrain from overconsuming socially laden foods in contexts where social inclusion is already secured. Instead, they may eat at levels comparable to those in neutral contexts.

Taken together, existing research suggests that food can fulfill

belongingness needs by functioning as a social surrogate. However, this process likely depends on both stable individual differences in the need to belong and situational contexts signaling whether belongingness needs are already satisfied. Although prior work has examined these factors in isolation, it remains unclear how they jointly shape food consumption. In addition, although prior studies have examined writing about eating comfort foods (Troisi & Gabriel, 2011), food choice (Loveland et al., 2010), and short taste experiences (Reid et al., 2023), it is unclear whether belongingness-relevant food cues affect how much people actually consume. In other words, it is unknown whether individuals high in trait need to belong increase intake when foods are socially incentivized and whether such increases diminish when belongingness needs are already satisfied through social inclusion.

A related question addresses people's intake perception. Specifically, previous research has shown that how much people actually consume and their *perception* of how much they consumed, can differ (e.g., Keenan et al., 2018). Moreover, past research demonstrated that this difference between actual and perceived intake varied across context, indicating a differential effect of context on actual vs. perceived intake (Renner et al., 2016). This is relevant because what people think they have consumed affects physiological satiation over and above what they actually consumed (Crum et al., 2011). Thus, it is an open question whether potential effects of people's need to belong and of context-specific belongingness satiation on actual intake translate to perceived intake or whether there are differential effects.

The present experiment examined food intake in individuals with low versus high trait need to belong across different social contexts. Participants were randomly assigned to one of three conditions: a control condition assessing food intake only; a social food condition, in which food was experimentally rendered socially laden by explicitly associating food intake with belongingness cues; or a social inclusion condition, in which participants experienced social inclusion prior to receiving socially laden food. Ice cream intake was measured in a bogus taste test, and perceived intake was assessed to examine participants' awareness of consumption (see also Renner et al., 2016 for a related assessment of actual and perceived intake).

Based on previous research the following hypotheses and research questions were formulated:

- (1) As there is no evidence that people with low versus high need to belong differ in actual and perceived intake in a neutral context, we assumed no differences in actual or perceived intake between individuals with low versus high need to belong in the control condition.
- (2) As those high in need to belong are particularly sensitive to opportunities for social connectedness and, according to Pickett et al. (2004), can be described as having a large 'social appetite', we assumed that, in the social food condition, individuals high in need to belong would display an increased intake relative to the control condition. Furthermore, we expected that people with low need to belong, who are assumed to have a smaller 'social appetite', would display a smaller increase in the social food relative to the control condition than people with high need to belong.
- (3) We further examined whether these effects would also be reflected in perceived intake or whether potential differences would remain unnoticed, effectively 'flying under the radar' (cf. Szymczak et al., 2021). Specifically, we aimed to investigate whether a potential interplay between condition and need to belong, as specified under (2), differs for actual compared to perceived intake.
- (4) As satiation of belongingness reduces the drive to seek further acceptance (DeWall et al., 2008), we assumed that, in the social inclusion condition, individuals with high need to belong would not consume more than in the control condition, as their

belongingness needs were assumed to have already been satisfied through prior social inclusion.

## 2. Methods

### 2.1. Procedure and experimental conditions

Participants were recruited at the University of Konstanz. The only exclusion criterion was the presence of a food intolerance. Participants were randomly assigned to one of three experimental conditions. To standardize satiety levels, all participants were instructed during appointment scheduling to refrain from eating for at least 2 h before participation; 98.6% of participants reported adherence to this instruction. Participants in all three conditions were informed that they would take part in two ostensibly unrelated studies on first impressions and food tasting. Moreover, participants in all three conditions took part in a tasting study that assessed actual and perceived intake. In the social food and social inclusion conditions, participants additionally experienced the social incentive manipulation in an ostensibly unrelated pilot study on cinema advertising prior to the tasting study. Last, in the social inclusion condition, participants moreover experienced the social inclusion manipulation in the ostensibly unrelated study on first impressions prior to the study on cinema advertising.

The present study had a  $3 \times 2$  design with condition (control, social food, social inclusion) and need to belong (low vs. high) as between-subjects factors, and intake type (actual vs. perceived) as a within-subject factor.

**Social food condition.** Upon arrival, participants were informed that the study on first impressions had to be cancelled and that room occupancy required a short waiting period before the tasting study could begin. During this time, they participated in an ostensibly unrelated pilot study on cinema advertising. The social incentive manipulation consisted of two elements: First, the waiting room was decorated with posters depicting people happily eating ice cream together. Second, participants viewed a 1-min ice cream advertisement (Langnese, "Like ice in the sunshine"; <https://www.youtube.com/watch?v=zaZ-KX2XQj0>; last accessed July 22, 2025) that portrayed ice cream consumption as fostering positive social relationships. After briefly evaluating the advertisement, participants proceeded to the main study on ice cream tasting. The posters and ice cream advertisement were selected based on the prerequisite of a strong association between eating ice cream and social connectedness. Following a systematic screening of food advertisements by the research team, the most suitable materials were identified and subsequently piloted in a qualitative study, in which participants confirmed a strong perceived link between the depicted ice cream consumption and social connectedness.

In the *social inclusion condition*, participants first completed filler questionnaires on impression formation and media-consumption habits. Social inclusion was then manipulated using a modified version of the Stillman et al. (2009) paradigm (see also Sproesser et al., 2014). Participants were shown a prerecorded introduction video from a same-gender "partner" (a confederate) discussing topics such as career aspirations. They then recorded a similar video of themselves answering the same questions. While participants completed an evaluation of their partner, the experimenter left the room for approximately 8 min under the pretense of delivering the participant's video to the ostensible partner. Then, the social inclusion manipulation was administered. Specifically, upon returning, the experimenter provided bogus positive feedback, informing participants that the partner was looking forward to meeting them and had evaluated them very favorably. Participants were then told that the tasting study would take place before the planned face-to-face meeting in order to allow some time between the virtual and in-person interaction. However, before the tasting study began, participants took part in the same pilot study on cinema advertising as in the social food condition, as they were told that the room for the planned tasting study was not yet available.

In the *control condition*, participants were informed that the study on first impressions had to be cancelled and proceeded directly to the tasting study.

In the *tasting study*, participants of all three conditions completed a bogus taste test (Herman & Mack, 1975; Renner et al., 2016; Robinson et al., 2017; Sproesser et al., 2014), which allows the assessment of actual food consumption without relying on self-report or retrospective recall (e.g., Evers et al., 2009). Participants first completed demographic questions and rated their general liking of ice cream. They were then presented with three flavors of ice cream (each ~95 g; ~188 kcal), served in identical bowls at a standardized temperature. Participants evaluated each flavor on 20 taste and texture items (e.g., sweetness, creaminess, mouthfeel) and were instructed to eat as much as they liked. The experimenter left the room during the taste test. After 12 min, the experimenter returned, administered a brief questionnaire assessing perceived ice cream intake (Renner et al., 2016), trait need to belong (Leary et al., 2013), height, and weight, and removed the bowls to weigh them in a separate room.

**Debriefing and suspicion check.** At the end of the experiment, a funneled debriefing procedure (Bargh & Chartrand, 2000) was used to assess participants' awareness of the study purpose. Thirteen participants expressed suspicion about either the authenticity of their partner or ice cream consumption being a primary study variable. Analyses were repeated excluding these participants; as results were comparable, the full dataset was retained.

### 2.2. Sample

A total of 283 participants took part (25% men; mean age and other demographics are reported in Tables 1 and 2). Participants received either course credit or a small monetary reward. All provided written informed consent. The study protocol was approved by the University of Konstanz ethics board (approval date: October 27th, 2021; approval reference number: 38/2021) and conducted in accordance with the Declaration of Helsinki and relevant institutional guidelines. The privacy rights of participants have been observed.

A power analysis was conducted using G\*Power 3.1.9.7 (Faul et al., 2007, 2009) for a  $3 \times 2$  ANCOVA (see section 2.4). Assuming  $\alpha = .05$ , statistical power of .80, the required sample size to detect a small to medium effect ( $f = .20$ ) was estimated at  $N = 244$ . The final sample exceeded this threshold.

**Table 1**  
Demographics by experimental condition ( $N = 283$ ).

	Control ( $n = 94$ )	Social Food ( $n = 95$ )	Social Inclusion ( $n = 94$ )	Comparison of conditions
<b>Gender</b>				$\chi^2(2) = 5.65, p = .059, \eta_p^2 = .14$
Women (%)	79.8	66.3	78.7	
Men (%)	20.2	33.7	21.3	
<b>Age, <math>M</math> (SD)</b>	23.47 (8.91)	22.69 (7.21)	22.59 (7.32)	$F(2, 280) = .35, p = .702, \eta_p^2 = .00$
<b>BMI, <math>M</math> (SD)</b>	23.09 (3.22)	22.32 (2.85)	21.88 (2.81)	$F(2, 280) = 4.02, p = .019, \eta_p^2 = .03$
<b>Need to belong, <math>M</math> (SD)</b>	2.87 (.49)	2.82 (.56)	2.92 (.48)	$F(2, 280) = .85, p = .430, \eta_p^2 = .01$
Low need group ( $n$ )	48	52	43	
High need group ( $n$ )	46	43	51	
<b>Liking of ice cream in experiment, <math>M</math> (SD)</b>	3.12 (.48)	3.16 (.49)	3.23 (.49)	$F(2, 280) = 1.07, p = .346, \eta_p^2 = .01$
<b>Liking of ice cream in general, <math>M</math> (SD)</b>	3.71 (.48)	3.55 (.65)	3.70 (.50)	$F(2, 280) = 2.69, p = .070, \eta_p^2 = .02$

Note.  $M$  = mean; SD = standard deviation; BMI = body mass index.

**Table 2**  
Means (*M*), standard deviations (*SD*), and correlations between study variables (*N* = 283).

	<i>M</i> ( <i>SD</i> )	1.	2.	3.	4.	5.	6.	7.
1. Gender <sup>a</sup>	-	-						
2. Age	22.92 (7.83)	.13*	-					
3. BMI	22.43 (3.00)	.06	.26***	-				
4. Need to belong	2.87 (.51)	-.32***	-.22***	-.15**	-			
5. In- experiment liking of ice cream	3.17 (.49)	-.05	-.05	.08	.05	-		
6. General liking of ice cream	3.65 (.55)	-.05	-.14*	.06	.09	.15*	-	
7. Actual intake (g)	122.44 (64.39)	.40***	.05	.04	-.21***	.19**	.18**	-
8. Perceived intake (g)	177.36 (111.64)	.22***	.04	.07	-.14*	.16**	.18**	.67***

Note.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>a</sup> Gender was coded with 1 (*female*) and 2 (*male*).

### 2.3. Measures

All study participants completed the following measures.

**Demographic and anthropometric measures.** Participants reported age, gender, height, and weight. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. In addition, participants were also offered to have their height and weight measured at the end of the experiment. As a few participants declined these measures, self-reported weight and height were used in the present study to avoid missing data issues. Self-reported measures have been shown to yield acceptable results when BMI is used as a continuous variable rather than for categorizing people, for example, into normal-vs. overweight (Ng, 2019).

**Need to belong.** Trait need to belong was measured using a German translation of the Need to Belong Scale (Leary et al., 2013; Schreindorfer & Leary, 1996; available at <https://www.psychologie.uni-konstanz.de/en/working-group-renner/research/questionnaires-and-scales/personality-psychology-scales/need-to-belong-scale/> last accessed on July 23rd, 2025). The scale consists of 10 items (e.g., “I try hard not to do things that will make other people avoid or reject me”) rated on a 4-point rating scale from 1 (not at all true) to 4 (very much true). The scale demonstrated acceptable internal consistency in the present study (Cronbach's  $\alpha = .83$ ). Higher scores indicate a stronger need to belong. Based on a median split ( $Mdn = 2.90$ ), participants scoring above 2.90 were categorized as “high need to belong” ( $n = 140$ ), and those scoring 2.90 or below as “low need to belong” ( $n = 143$ ). This cutoff aligns with prior research (e.g., De Cremer & Leonardelli, 2003; Kaneko & Ueda, 2023; Leary et al., 2013).

**Liking of ice cream.** Liking of each ice cream flavor during the experiment was rated on one item (“This ice cream tastes good.”) using a 4-point scale from 1 (not at all true) to 4 (very much true). Ratings were averaged across the three flavors to yield an overall in-experiment liking score. General liking of ice cream was assessed separately with the item “I like eating ice cream” on the same response scale.

**Perceived ice cream intake.** Participants estimated their intake for each flavor in grams in an open-ended format (“How many grams of ice cream X did you eat?”). An anchor indicated that one spoon contains approximately 9 g. Estimates for the flavors were summed to create a total perceived intake score.

**Manipulation checks.** Two manipulation checks were administered via questionnaires. To assess the effectiveness of the social incentive manipulation, the perceived social incentive of ice cream was measured after the bogus taste test in all three conditions. Participants rated six statements (e.g., “Eating ice cream together can increase your popularity”, “Ice cream tastes better when eaten together”) on a 4-point scale from 1 (not at all true) to 4 (very much true). Scores were averaged ( $M = 2.55$ ,  $SD = .72$ ), with higher scores indicating a stronger perceived social incentive. Internal consistency was acceptable (Cronbach's  $\alpha = .73$ ). To assess the effectiveness of the social inclusion manipulation, feelings of social inclusion were measured using four items assessing momentary emotional states: feeling accepted, rejected (reverse scored), good, and

sad (reverse scored). Participants rated each on a visual analogue scale from 0 to 100. In the control and social food conditions, this measure was administered at the beginning of the study, whereas in the social inclusion condition it was administered immediately after the inclusion manipulation. Scores were averaged ( $M = 82.38$ ,  $SD = 12.67$ ), with higher scores indicating greater feelings of inclusion and positive affect. Internal consistency was acceptable (Cronbach's,  $\alpha = .74$ ).

### 2.4. Analyses

All Statistical analyses were conducted using IBM SPSS statistics software (Version 30.0 for Windows). Missing data were imputed using the Expectation-Maximization (EM) algorithm in SPSS (Gold & Bentler, 2000). For all variables with missing data, the proportion of missing values was below 1%. The significance level was set at  $\alpha = .05$ .

To test our hypotheses, two 3 x 2 analyses of covariance (ANCOVA) were conducted with condition (control, social food, social inclusion) and need to belong (low vs. high) as between-subject factors, and actual and perceived intake as dependent variables. Gender, liking of ice cream in general, and liking of ice cream in the experiment were included as covariates, as each was significantly related to both actual and perceived intake. In addition, because BMI differed significantly across conditions (see Table 1), BMI was also included as a covariate.

Prior to running the ANCOVA, model assumptions were examined. Four outliers exceeding three times the interquartile range were removed, resulting in a final sample of  $N = 279$ . Levene's test indicated heterogeneity of variances for perceived intake; therefore, perceived intake was transformed using the Box-Cox method to stabilize variance.

## 3. Results

Means, standard deviations, and correlations between study variables are displayed in Table 2.

### 3.1. Manipulation checks

**Social incentive manipulation.** To test the effectiveness of the social incentive manipulation, we compared all three conditions in an ANOVA. Although both the social food and social inclusion condition experienced the social incentive manipulation, we treated them separately because participants in the social inclusion condition experienced additionally the social inclusion manipulation prior to filling in the social incentive measure. Results indicated a significant linear trend effect of condition,  $F(1, 280) = 4.35$ ,  $p = .038$ ,  $\eta_p^2 = .02$ . Although the main effect was not significant ( $F(2, 280) = 2.18$ ,  $p = .115$ ,  $\eta_p^2 = .02$ ), a contrast analysis showed that participants reported a significantly lower social incentive of ice cream in the control condition ( $M = 2.44$ ,  $SD = .68$ ) than in the social inclusion condition ( $M = 2.66$ ,  $SD = .71$ ;  $t(280) = 2.09$ ,  $p = .038$ ,  $d = .30$ ). Also, participants reported a lower social incentive of ice cream in the control condition ( $M = 2.44$ ,  $SD = .68$ ) than in the social food condition ( $M = 2.56$ ,  $SD = .76$ ); however this contrast was not

significant,  $t(280) = 1.15, p = .252, d = .17$ ).

**Social inclusion manipulation.** As both the control and social food conditions completed the measure on feelings of social inclusion at the beginning of the study, the effectiveness of the social inclusion manipulation was tested using a two-group independent-samples *t*-test comparing participants who did not experience the social inclusion manipulation (i.e., those in the control and social food conditions,  $n = 189$ ) with participants who experienced the social inclusion manipulation (i.e., those in the social inclusion condition,  $n = 94$ ). Results showed a significant difference,  $t(281) = 3.63, p < .001, d = .46$ . Participants reported lower feelings of social inclusion when the manipulation was absent ( $M = 80.50, SD = 13.29, n = 189$ ) than when it was present ( $M = 86.17, SD = 10.38, n = 94$ ).

### 3.2. Food intake

Two 3 (condition: control, social food, social inclusion)  $\times$  2 (need to belong: low vs. high) ANCOVAs were conducted, with actual and perceived intake as dependent variables. Gender, BMI, general liking of ice cream, and liking of the ice cream used in the experiment were included as covariates. Results revealed a significant condition  $\times$  need to belong interaction for both actual and perceived intake (see Table 3). Above that, a significant main effect of condition emerged for perceived intake.

Actual and perceived intake as a function of condition and need to belong are displayed in Table 4 and Fig. 1, along with the results of simple main effect analyses from the 3  $\times$  2 ANCOVAs.

In line with our first hypothesis, in the control condition actual and perceived intake did not differ between participants with low versus high need to belong.

**Table 3**

Results of the two 3  $\times$  2 ANCOVAs with condition (control, social food, social inclusion) and need to belong (low vs. high) as between-subjects factors and actual and perceived intake as dependent variables. Gender, BMI, general liking of ice cream, and liking of the ice cream used in the experiment were included as covariates ( $N = 279$ ).

	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
<b>3 <math>\times</math> 2 ANCOVA with actual intake as dependent variable</b>				
Main effect condition	2, 269	2.28	.105	.017
Main effect need to belong	1, 269	.73	.394	.003
Condition $\times$ need to belong interaction	2, 269	3.75	.025	.027
<i>Simple main effects need to belong</i>				
Control condition	1, 269	.53	.466	.002
Social food condition	1, 269	2.27	.133	.008
Social inclusion condition	1, 269	5.19	.024	.019
<i>Simple contrasts within low need to belong</i>				
Control vs. social food condition	1, 269	.00	.956	.000
Control vs. social inclusion condition	1, 269	4.57	.033	.017
Social food vs. social inclusion condition	1, 269	4.59	.033	.017
<i>Simple contrasts within high need to belong</i>				
Control vs. social food condition	1, 269	5.07	.025	.019
Control vs. social inclusion condition	1, 269	.41	.522	.002
Social food vs. social inclusion condition	1, 269	2.81	.095	.010
<b>3 <math>\times</math> 2 ANCOVA with perceived intake as dependent variable</b>				
Main effect condition	2, 269	5.87	.003	.042
Main effect need to belong	1, 269	1.72	.191	.006
Condition $\times$ need to belong interaction	2, 269	4.10	.018	.030
<i>Simple main effects need to belong</i>				
Control condition	1, 269	.85	.358	.003
Social food condition	1, 269	1.67	.198	.006
Social inclusion condition	1, 269	7.19	.008	.026
<i>Simple contrasts within low need to belong</i>				
Control vs. social food condition	1, 269	1.41	.236	.005
Control vs. social inclusion condition	1, 269	7.50	.007	.027
Social food vs. social inclusion condition	1, 269	2.69	.102	.010
<i>Simple contrasts within high need to belong</i>				
Control vs. social food condition	1, 269	11.02	.001	.039
Control vs. social inclusion condition	1, 269	1.10	.295	.004
Social food vs. social inclusion condition	1, 269	5.61	.019	.020

Also in line with our second hypothesis, among high-need-to-belong participants, intake was higher in the social food condition than in the control condition, a pattern also reflected in perceived intake. For low-need-to-belong participants, no such difference emerged, neither in perceived nor actual intake. This finding is consistent with the notion that individuals with high need to belong show an increased “social appetite” when food is explicitly associated with belongingness, whereas individuals with low need to belong do not.

However, this finding contrasts with our third assumption of a differential effect for actual vs. perceived consumption. That is, when comparing the control and social food conditions among both people with low and high need to belong, effects were identical for actual and perceived intake. Hence, people with high need to belong were aware of their increased intake in the social food condition.

In line with our fourth hypothesis, high-need-to-belong participants did not consume more in the social inclusion condition than in the control condition, again mirrored in perceived intake. In contrast, low-need-to-belong participants showed the opposite pattern: the social inclusion condition led to significantly greater actual and perceived intake compared to the control condition.

## 4. Discussion

The present study investigated perceived and actual food consumption of individuals with low versus high trait need to belong in three contexts: a control condition, a situation in which food was experimentally associated with belongingness cues (social food), and a condition in which participants experienced social inclusion prior receiving socially laden food (social inclusion). In line with our assumptions, no differences between low- and high-need-to-belong participants emerged in the control condition. When food was explicitly associated with belongingness however, individuals high in need to belong showed an increased “social appetite” (Pickett et al., 2004), reflected in both actual and perceived intake. Importantly, this increase did not occur when social inclusion preceded the food task, suggesting that satiation of belongingness needs reduced the motivation to consume socially laden food. Unexpectedly, individuals low in need to belong showed increased intake in the social inclusion condition compared to the control condition.

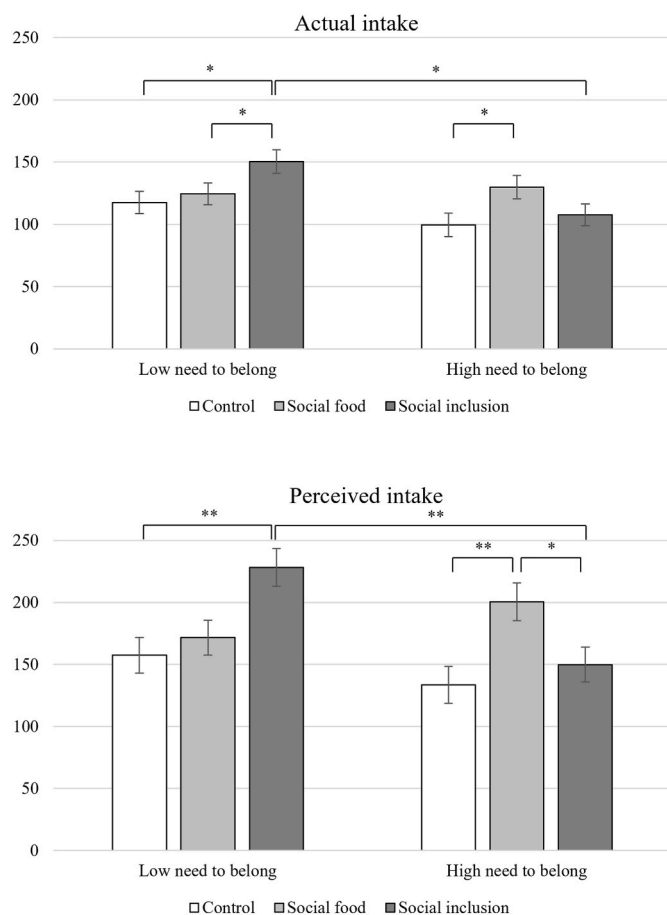
The finding that high-need-to-belong individuals consumed more when food was explicitly associated with belongingness is consistent with prior research showing that social incentives influence those especially motivated by belonging needs (Gardner et al., 2000; Loveland et al., 2010; Pickett et al., 2004). When belongingness needs were satisfied through social inclusion, however, this effect disappeared. This is in line with research suggesting that fulfilling belongingness needs temporarily reduces the motivation to seek further social connection (Baumeister & Leary, 1995; DeWall et al., 2008). Still, it is important to note that the overall level of feeling socially included was high across conditions. Although the social inclusion manipulation was effective in increasing this feeling, the items used to assess this feeling refer to general feelings. Against the background that the desire for interpersonal attachments is a fundamental human motivation (Baumeister & Leary, 1995), it makes sense that participants across conditions reported high levels of feeling socially included, presumably due to their social contacts outside of the experiment. Hence, the social inclusion manipulation used in the present experiment should be interpreted as a temporary, situational increase in the satiation of the need to belong, whereas participants in the control and social foods condition, despite reporting lower levels, generally felt included as well. Altogether, the present findings support the notion that socially incentivized food can function as a social surrogate, but does not do so in situations in which belongingness needs are satiated.

Low-need-to-belong participants, as expected, did not increase their intake in the social food condition. Surprisingly, they did show higher intake in the social inclusion condition. One possible explanation is that

**Table 4**  
Actual and perceived intake by experimental condition and need to belong ( $N = 279$ ).

		Control ( $n = 93$ )		Social food ( $n = 93$ )		Social inclusion ( $n = 93$ )	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Actual intake	Low need to belong	117.51	65.95	124.59	63.89	150.47	76.68
	High need to belong	99.56	55.98	129.93	57.56	107.56	50.90
Perceived intake	Low need to belong	157.51	85.77	171.73	79.33	228.37	149.50
	High need to belong	133.62	74.18	200.67	115.44	149.90	78.92

Note. *M* = mean; *SD* = standard deviation. Please note that 1 g of ice-cream corresponds to 1.98 kilocalories.



**Fig. 1.** Mean actual and perceived ice cream intake as a function of condition and need to belong. Error bars indicate standard errors of the mean. \* $p < .05$ , \*\* $p < .01$ .

individuals low in need to belong are generally less attentive to subtle social cues (Pickett et al., 2004), which may have limited the effectiveness of the social food manipulation for them. In contrast, the social inclusion experience may have primed their sensitivity to social information, thereby triggering increased consumption. This interpretation remains speculative, but an additional analysis indicated that the social incentive manipulation was indeed less effective for low-need-to-belong participants ( $M = 2.42$ ,  $SD = .81$ ) than for high-need-to-belong participants ( $M = 2.72$ ,  $SD = .65$ ,  $t(92.95) = -2.02$ ,  $p = .023$ ,  $d = .41$ ) in the social food condition, whereas it was equally effective across groups in the social inclusion condition ( $M = 2.64$ ,  $SD = .65$  vs.  $M = 2.67$ ,  $SD = .76$ ,  $t(92) = -.21$ ,  $p = .418$ ,  $d = .04$ ).

With regard to differential effects for perceived vs. actual intake, we found that the increase in actual intake for participants with high need to belong in the social food as compared to the control condition was mirrored in perceived intake. In other words, people with high need to belong were aware of their increased intake in the social food condition.

Hence, one might assume that this perception translates into physiological satiation (see Crum et al., 2011), which in turn may prompt compensatory reductions in subsequent intake, though this remains to be tested in future research. Still, across conditions, a clear difference between actual and perceived intake was that participants generally overestimated their consumption ( $M_{\text{actual}} = 121.09$  g,  $SD = 63.67$ ;  $M_{\text{perceived}} = 172.41$  g,  $SD = 103.41$ ; note that these values differ slightly from Table 2 due to exclusion of four outliers,  $t(278) = -11.04$ ,  $p < .001$ ,  $d = .66$ ). Prior research on intake estimation has yielded mixed results, with some studies reporting overestimation (Lasschuijt et al., 2019; Renner et al., 2016; Wolkoff et al., 2011) and others documenting underestimation (e.g., Block et al., 2013; Gustafson & Zeballos, 2019). One explanation for these discrepancies is that underestimation is more likely to occur for larger portions, whereas overestimation tends to occur for smaller portions (see Keenan et al., 2018). Accordingly, the overestimation observed in the present study may be attributable to the relatively small portion size of the food provided.

From a practical perspective, even relatively small intake differences may be meaningful over time. For example, a daily energy imbalance of approximately 70 kcal has been estimated to correspond to a weight change of roughly 12 pounds over one year (Rosenbaum & Leibel, 1998). Intake differences between conditions were of a comparable magnitude: low-need-to-belong participants consumed about 65 kcal more in the social inclusion condition than in the control condition, while high-need-to-belong participants consumed about 60 kcal more in the social food condition than in the control condition. Rather than suggesting specific behavioral prescriptions, these findings highlight the importance of awareness: understanding that food intake may be driven by social motives rather than physiological hunger could help individuals to better recognize situations in which socially incentivized foods exert influence. In addition, providing social support may be particularly beneficial for individuals with a high need to belong, as social connectedness has been shown to buffer belongingness threats and reduce compensatory behaviors (Baumeister & Leary, 1995; DeWall et al., 2008). At a broader level, the findings have implications for food marketing practices, as foods are frequently promoted through social cues, including influencer marketing and peer-oriented portrayals of consumption (Coates et al., 2019b; McCarthy et al., 2022; Winzer et al., 2022). Increased transparency and regulation of such practices, such as requirements for influencers to disclose commercial content, may help consumers better recognize socially incentivized food cues and critically evaluate their impact on eating behavior (Freeman et al., 2024).

Several limitations and future directions warrant consideration. First, reliance on a predominantly female student sample limits generalizability. Although gender was controlled for in the analyses, the small proportion of men may have resulted in under-identified gender differences, suggesting that future studies should include more gender-balanced samples. Second, because no validated cut-off for low versus high need-to-belong exists, a median split was used. Nevertheless, comparisons with previous studies suggest our sample scores were typical (De Cremer & Leonardelli, 2003; Kaneko & Ueda, 2023; Leary et al., 2013). Third, the social incentive manipulation was not as effective in the social food condition as in the social inclusion condition and effects were small. Although the overall main effect of condition on perceived social incentive did not reach statistical significance, the

significant linear trend and the ordered pattern of means (control < social food < social inclusion) suggest that the manipulation shifted perceptions in the intended direction. However, the magnitude of this effect was modest. Hence, future research should employ stronger manipulations of the social incentive of food. Last, as with laboratory studies in general, the present experiment offers high internal validity but limited external validity. Eating alone in a laboratory setting may not reflect typical contexts for comfort eating, and it remains unclear whether the findings generalize to other food types beyond ice cream. Future research should therefore employ research designs with higher external validity and examine a broader range of foods.

#### 4.1. Conclusion

The present research examined the notion that food can act as a social surrogate by considering both individual differences and situational factors. Specifically, we experimentally manipulated the social incentive of food and combined it with a social inclusion manipulation to investigate their interactive effects with trait need to belong. Results show that high-need-to-belong individuals increase intake when food is linked to belongingness, but not when socially included beforehand, whereas low-need-to-belong individuals increase intake only after experiencing social inclusion. These findings highlight that food can act as a social surrogate, but whether it does depend on both individual differences and situational context. This dynamic person–situation interaction is in line with a long tradition in psychology, showing that the effects of personal traits on behavior depend on the situation and vice versa (Li, 2023, see also for example Mischel & Shoda, 1995).

#### CRediT authorship contribution statement

**Gudrun Sproesser:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jana Straßheim:** Writing – review & editing, Investigation. **Harald T. Schupp:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Britta Renner:** Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Investigation, Funding acquisition, Conceptualization.

#### Ethical statement

All procedures were performed in compliance with relevant laws and institutional guidelines and have been approved by the appropriate institutional committee (University of Konstanz ethics board; approval date: October 27th, 2021; approval reference number: 38/2021). Moreover, the privacy rights of human subjects have been observed and informed consent was obtained for experimentation with human subjects.

#### Role of the funding source

This study was funded by Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2117–422037984 (the Centre for the Advanced Study of Collective Behaviour), and by the Bundesministerium für Bildung und Forschung (BMBF, Federal Ministry of Education and Research) under 01EL1820A (SMARTACT). The funding sources had no involvement in the study's design; the collection, analysis, and interpretation of data; the writing of the manuscript; and in the decision to submit the manuscript for publication.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

#### Acknowledgements

We would like to thank Bettina Ott, Julian Oberwein, and Emma Erhard for their assistance, as well as the student assistants of the Chair of Psychological Assessment and Health Psychology for their valuable support in data collection.

#### Data availability

Data will be made available on request.

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