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Effects of a non-eating confederate on food intake do not persist for everyone over time when people are left alone: An exploratory study

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ABSTRACT

An extensive body of research has established that eating with others can have inhibitory effects on food intake. Recent findings suggest that these effects may (partly) persist over time when the eating norm is no longer enforced. To gain more insights into the persistence of effects of a live non-eating stranger, the main aim of the present study is to explore how food intake of young women changes as a result of previous exposure to a non-eating confederate (i.e., adult stranger). To address this aim, an experiment was conducted in which 64 young women, aged 17 to 26 (M = 19.81, SD = 1.95), were given access to chocolates at two different time points. First, participants were all paired with a non-eating stranger (i.e., confederate). Afterwards, half of the participants remained with the non-eating stranger (i.e., together-together condition), while the other half was left alone with the food (i.e., together-alone condition). Results indicated that participants who were left alone increased their intake on average, although raw data revealed interesting individual differences. In contrast, most of the participants who remained with the non-eating stranger did not increase intake. Participants in an ad hoc added control condition (i.e., no exposure to a non-eating confederate; alone-alone condition; n = 26) showed food intake similar to participants in the together-alone condition after they were left alone. Our findings suggest that if intake behaviors are too extreme and divergent from the desire to eat as much as possible, women may, on average, only adhere to these behaviors in the presence of others.

1. Introduction

Social influence is one of the strongest guiding forces behind human eating behavior (Goldman, Herman, & Polivy, 1991; Herman & Polivy, 2005; Higgs & Thomas, 2016). A recent review of experimental work shows that people, particularly women, eat more when others eat more and eat less when others eat little to nothing (Cruwys, Bevelander, & Hermans, 2015). These food modeling effects are largely due to the inhibitory effects of a non-eating or minimal eating confederate (Cruwys, Bevelander, & Hermans, 2015; Vartanian, Spanos, Herman, & Polivy, 2015). Theoretically, other's food intake may provide a reference for what is an appropriate amount to eat (i.e., normative explanation) (Herman & Polivy, 2005; Herman, Roth, & Polivy, 2003). This reference may be particularly important in novel contexts where there is uncertainty about how to behave (Herman & Polivy, 2008; Sharps & Robinson, 2017).

Although plenty of research has shown that social norms can be internalized and persist into non-social situations [e.g., (McDonald & Crandall, 2015)], few studies have specifically focused on the persistence of these effects in food modeling contexts. One study found that naïve participants who were paired with non-eating friends ate less than those who were paired with friends who ate two or more cookies, and that these differences remained when participants were subsequently left alone (Howland, Hunger, & Mann, 2012). Similarly, two other studies found persistence effects of 'live' eating norms (no, low, and high intake) in children (Bevelander, Anschütz, & Engels, 2012) and of 'remote-confederate' eating norms (low and high intake) in adults (Feeney, Pliner, Polivy, & Herman, 2017) when participants subsequently ate alone. However, in the 'remote-confederate' norm study persistence effects varied by norm, with weaker persistence effects for low-intake norms compared to high-intake norms (Feeney, Pliner, Polivy, & Herman, 2017). The authors explain this finding by the fact that the low-intake norm interfered with the desire to eat as much as possible, and was thus disregarded sooner than a high-intake norm. A

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non-eating norm might even interfere more with the desire to eat as much as possible, and might therefore be disregarded sooner than a low-intake norm. Moreover, in a 'live' no-intake condition, impression management mechanisms might play more important roles among adult strangers than among friends and inhibitory effects might immediately disappear when people are left alone. To gain more insights into the persistence effects of a live non-eating stranger, the main aim of the present study is to explore how young woman's food intake, when alone, might change as a result of previous exposure to a non-eating confederate (i.e., adult stranger).

2. Method

2.1. Design

A combined between-subjects (condition: *together-alone* versus *together-together*) and within-subjects (Time: Time 1 versus Time 2) experimental design was employed. At Time 1 (T1), participants in both conditions were exposed to a non-eating stranger (confederate), while having free access to palatable food (i.e., Maltesers). At Time 2 (T2), half of the participants were left alone while the other half remained in the presence of the confederate. The study protocol was approved by the IRB of the Radboud University, Nijmegen, The Netherlands (code number: ECG2012-1912-082a1 & ECG2012-1912-075a1).

2.2. Participants

Participants were recruited through the online research participation system of the Behavioural Science Institute of the Radboud University, Nijmegen. The final sample consisted of 64 female students. Participant's age varied between 17 and 26 years ($M = 19.81$, $SD = 1.95$) and their mean BMI was 23.32 ($SD = 3.93$). Most of the participants were unfamiliar with the confederate ($n = 50$). None of the participants were aware of the real aim of the study, but 5 participants mentioned the camera. Participants and confederates received either course credits or a 10 Euro gift voucher for participation in the study.

2.3. Confederates

Confederates signed up as a participant, but were randomly chosen as confederate and contacted to arrive a few minutes earlier than the participant. During this time, the confederate was instructed to refrain from eating any chocolates during the experiment and to not inform the other participant of these instructions. The confederate in the *together-together condition* was the same at both Time 1 and Time 2. The mean age of the 64 confederates was 20.56 ($SD = 2.40$), ranging from 18 to 30 and their mean BMI was 22.31 ($SD = 2.27$).

2.4. Procedure

Fig. 1 presents the design of our experimental procedure.

2.5. Materials and measures

2.5.1. Food intake

The total number of Maltesers (i.e., single pieces) consumed by participants, at each time point, was used as our dependent variable.

2.5.2. Camera awareness

We measured participants' awareness of being observed during the experiment, which could affect intake (Robinson, Hardman, Halford, & Jones, 2015), by asking participants if they felt that anything inhibited their food intake.

2.5.3. Eating restraint

Dietary restraint was measured with the 10-items cognitive-restraint subscale of the DEBQ (van Strien, Frijters, Bergers, & Defares, 1986). The items were rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*very often*). In the current study, Cronbach's alpha was 0.90.

2.5.4. Hunger

Participants were asked retrospectively how hungry they were before entering the experiment. Answers varied from 1 (*not at all hungry*) to 10 (*very hungry*) (Hermans, Larsen, Herman, & Engels, 2008).

2.5.5. Taste

Participants were asked to evaluate the taste of the Maltesers. Answers varied from 1 (*not at all tasty*) to 10 (*very tasty*).

2.5.6. Body Mass Index (BMI)

Participants' height was measured to the nearest 1.0 cm (Seca 206, Seca GmbH & co. kg., Hamburg, Germany) and their weight to the nearest 0.1 kg (Seca Bella 840, Seca GmbH & co. kg., Hamburg, Germany). BMI was calculated by dividing weight (in kilograms) per squared height (in meters).

2.6. Analytic strategy

Independent samples *t*-tests were performed to test differences between conditions (i.e., randomization check) in age, hunger, eating restraint, taste, BMI, and food intake at T1. Differences in eating behavior between T1 and T2 were visually examined using plots. A repeated measures ANCOVA was conducted to evaluate whether food intake significantly increased at T2 among participants who were left alone. Time point of food intake (T1 versus T2) was entered as within-subjects factor. Experimental condition (*together-alone* versus *together-together*) was entered as the between-subjects factor. A statistically significant Time × Condition interaction was interpreted using paired-samples *t*-tests from T1 to T2, separately for both conditions. Because hunger and taste evaluations correlated with intake both at T1 ($r = 0.45$, $p < .001$, and $r = 0.32$, $p = .011$, respectively) and at T2 ($r = 0.32$, $p = .01$, and $r = 0.40$, $p = .001$, respectively), they were included in the analysis as covariates.

3. Results

3.1. Randomization check

Independent samples *t*-tests on relevant variables indicated no reason to assume that there were differences between experimental conditions (age: $t(62) = -1.03$, $p = .309$; hunger: $t(62) = -0.10$, $p = .921$; eating restraint: $t(62) = -0.92$, $p = .360$; taste: $t(62) = 1.46$, $p = .151$; BMI: $t(62) = -0.90$, $p = .371$; and food intake at T1: $t(62) = -0.09$, $p = .927$).

3.2. Repeated measures ANCOVA

Participants ate on average 1.97 units of Maltesers at T1 ($SD = 3.03$) and 3.63 units at T2 ($SD = 5.48$) in the *together-alone condition* and on average 2.06 units of Maltesers at T1 ($SD = 4.89$) and 1.25 units at T2 ($SD = 3.00$) in the *together-together condition*. There was no significant main effect of time (Wilks' Lambda = 1.00, $F(1, 60) = 0.003$, $p = .955$) or experimental condition on intake ($F(1, 60) = 0.65$, $p = .422$). However, a statistically significant interaction emerged between Time and Condition, after controlling for hunger and taste evaluation of the chocolates (Wilks' Lambda = 0.91, $F(1, 60) = 6.30$, $p = .015$, $\eta^2_p. = 0.10$). The effects remained significant in a model without covariates (Wilks' Lambda = 0.89, F (1,62) = 7.35, $p = .009$, $\eta^2_p. = 0.11$).

To examine these differences, we plotted the raw data (see Fig. 2). Fig. 2 shows that the median intake was 0 or close to 0 for participants who were exposed to a non-eating confederate. The patterns of raw data

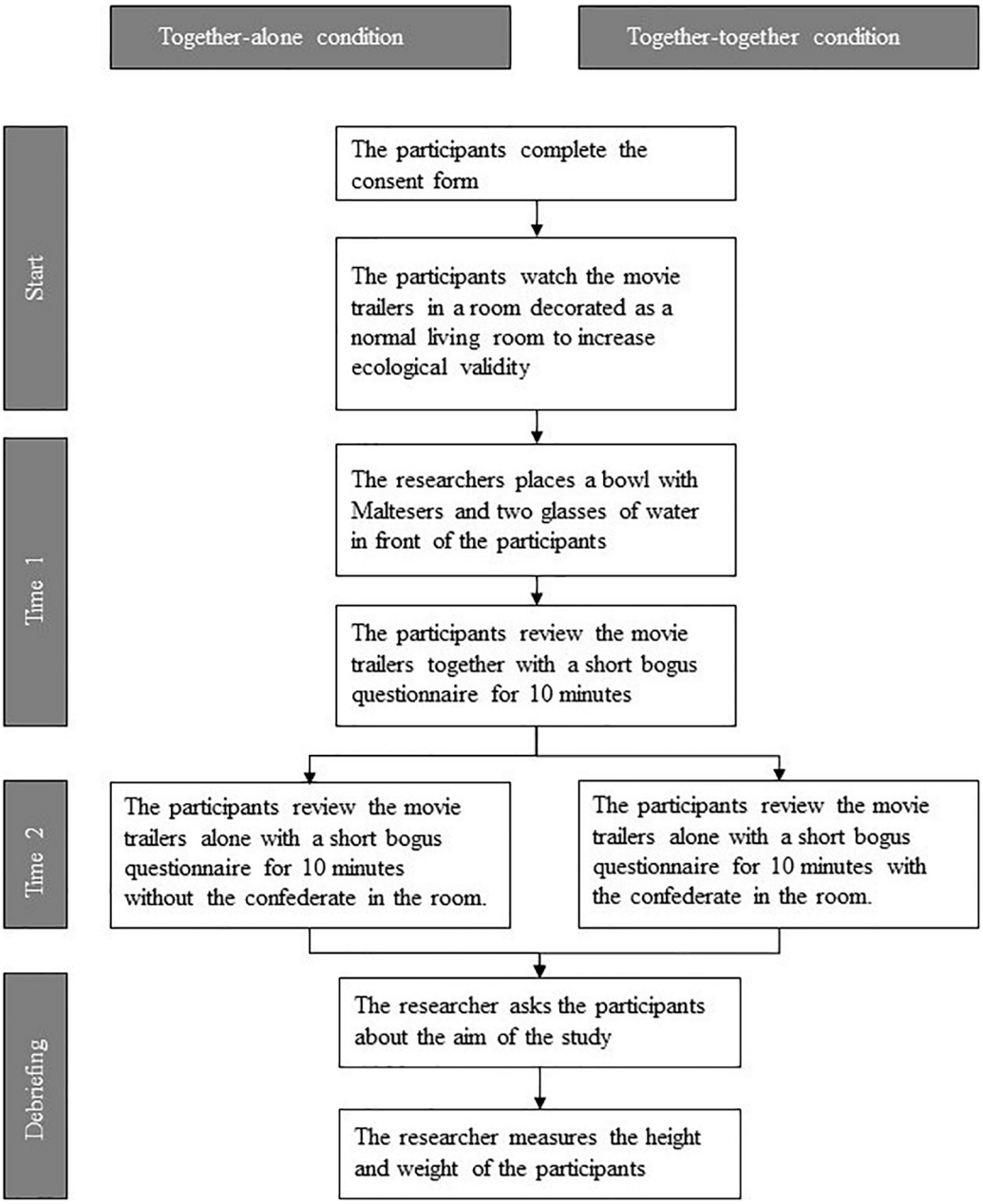

Fig. 1. Experimental procedure.

indicate that in the *together-alone condition*, variability in intake increased drastically from T1 to T2, and many participants increased their intake. A paired-samples *t*-test indicated that this increase was statistically significant ($t(31) = 2.19$, $p = .036$, Cohen's $d = 0.45$). In the *together-together condition*, variability in intake was quite low and many participants had more or less similar intake at both time-points. Moreover, the difference in intake between T1 and T2 was not statistically significant ($t(31) = -1.60$, $p = .120$, Cohen's $d = 0.36$). Our pattern of results did not change as a function of including or excluding participants who mentioned the camera inhibited their food intake.

3.3. Ad hoc analyses

To gain additional insight into whether or not the increased food intake at T2 in the *together-alone condition* still reflects partial persistence of the suppressive effect of the non-eating confederate, we added an ad hoc control condition (i.e., *alone-alone condition*) in which participants were not exposed to a non-eating confederate. This condition contained similar recruitment and experimental procedures as the other conditions. Moreover, participants in this condition ($n = 26$) were comparable in age, hunger, eating restraint, taste, and BMI to the participants in the *together-alone* and *together-together conditions* (all p's $> .10$). Participants who were aware of the real aim of the study ($n = 4$) were excluded. The participants in the alone-alone condition ate on average 4.86 units of Maltesers at T1 ($Mdn = 3.0$, $SD = 5.37$) and 1.36 units at T2 ($Mdn = 1.5$, $SD = 1.43$). Fig. 2 shows that the variability in intake was especially high at T1, and most participants decreased their intake at T2. Independent samples *t*-tests showed no differences between participants' average intake at T1 in the ad hoc *alone-alone condition* and at T2 in *the together-alone condition*, $t(52) = 0.82$, $p = .414$, but showed differences between participants' average intake at T1 in the ad hoc *alone-alone condition* and at T2 in the *together-together condition*, $t(52) = 3.17$, $p = .003$. The percentage of non-eaters was higher in both the *together-alone* condition (50% at T1, 53.1% at T2, and 46.9% at both time points) and the *together-together condition* (68% at T1, 68% at T2, and 59.4% at both time points)

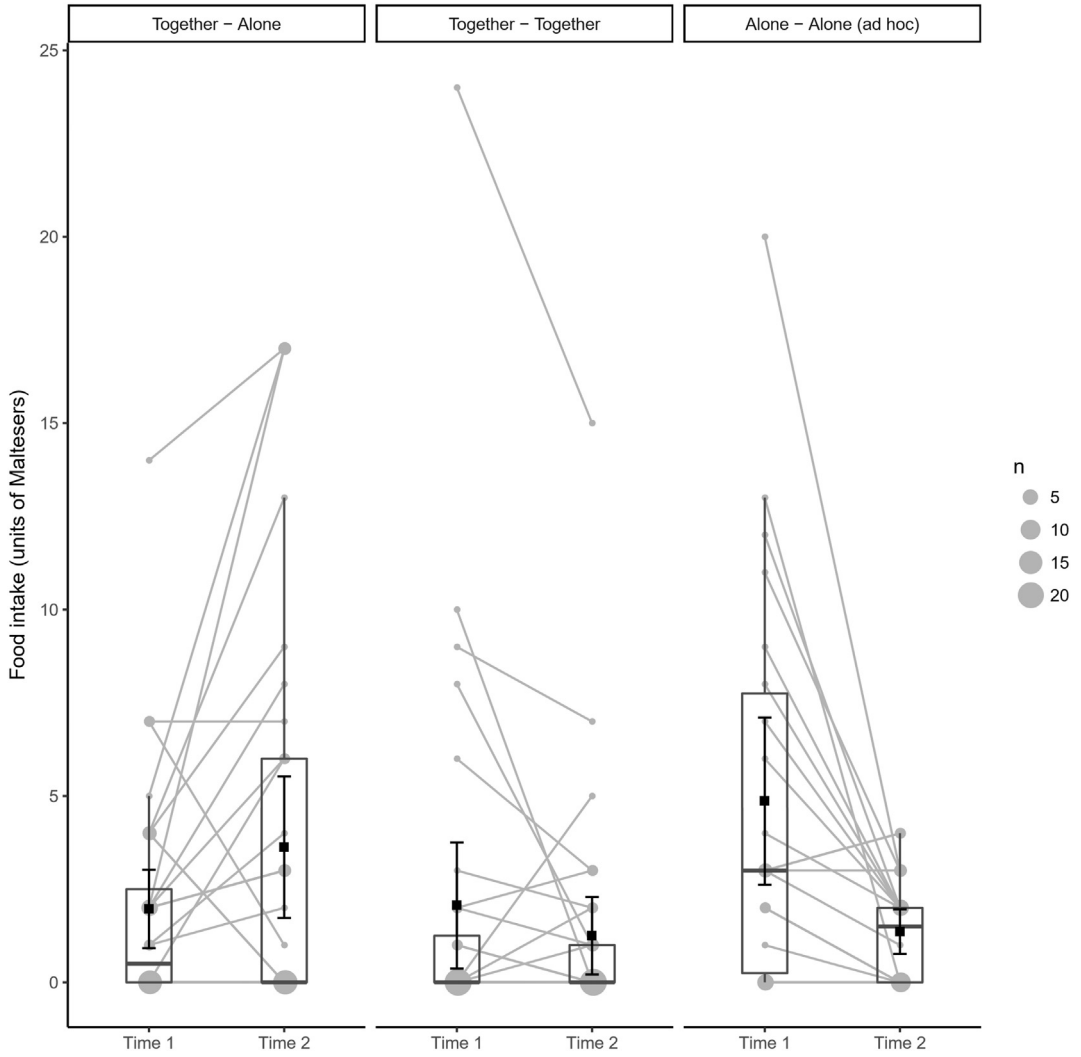

Fig. 2. Intake of Maltesers per condition, including the raw data (lines indicate intake of the same person), a boxplot and the mean with confidence interval.

compared to the *alone-alone condition* (27.3% at T1, 45.5% at T2 and 27.3% at both time points).

4. Discussion

Extensive research showed the relevance and impact of social influence on food intake (Cruwys, Bevelander, & Hermans, 2015; Goldman, Herman, & Polivy, 1991; Herman & Polivy, 2005; Higgs & Thomas, 2016). Less is known about the persistence of these influences over time in non-social eating situations. Some recent evidence suggests that people may continue to follow eating norms over time when the source of the normative information is no longer present (Feeney, Pliner, Polivy, & Herman, 2017; Howland, Hunger, & Mann, 2012). However little is known about the persistence of effects of non-eating norms in adults. To foster this understanding, this study examined whether young women's food intake changed when left alone after being exposed to a non-eating confederate. Our findings suggest that, on average, participants increased intake – comparable to levels of intake in a control condition – when left alone. However, for some participants, the effect of the non-eating confederate seemed to remain after the confederate left.

Previous studies suggest that the guidelines set during confederate exposure, at least to a certain extent, persist over time for friends (Howland, Hunger, & Mann, 2012), children (Bevelander, Anschütz, & Engels, 2012) and adults exposed to remote confederates (Feeney, Pliner, Polivy, & Herman, 2017). Our study suggests that effects might *not* hold on average for adults exposed to a non-eating confederate. However, some people continued their zero intake after being left alone and this percentage was higher compared to the non-eating percentage in an ad hoc added control condition. Because previous studies did not report raw data, we cannot be certain whether the persistency effects reported in those studies apply to everyone. Future research may explore whether different processes are also in play for eating norms that are modeled by friends and remote confederates by exploring patterns of raw data. Though speculative, persistent non-eating norm effects may be greater among friends than among strangers, as intimacy, support, and positive affect between friends are argued to promote norm influence over time (Brechwald & Prinstein, 2011). In contrast, temporary impression management effects may be more salient among strangers compared to friends. By examining remote versus live confederates as a between-subjects condition, it would be possible to partly disentangle impression management (live model) from purely normative information (remote models). In addition, future studies could explore whether fewer people adhere to a norm if it diverges more from what people would like to eat. In line with this, a recent study using remote confederates found weaker persistence effects for low-intake compared to high-intake norms (Feeney, Pliner, Polivy, & Herman, 2017).

This study is not without limitations. First, the sample was restricted to highly educated females. Future research should determine if the

effects found in this study generalize to more diverse samples. Second, we assessed hunger retrospectively (Hermans, Larsen, Herman, & Engels, 2008). This has been done before, but might lead to less valid findings of this covariate than if hunger had been assessed prior to the experiment. Finally, our sample size is relatively small. This limited our ability to detect small effects and highlights the importance of replication studies.

All in all, the present study was an important step in understanding how social influences on food intake may resonate on intake once people are left alone. Basically, our findings suggest that after exposure to a non-eating stranger, two different processes might be at play. On average, women did not seem to continue suppressing their intake after being left alone. However, for some women, the effect of the non-eating confederate seemed to persist. Given the significance and robustness of social influences on food intake, it is important to further foster the knowledge of why, and under what conditions, participants do or do not adhere to inhibitory eating influences. Practically, our findings suggest that if intake behaviors are too extreme and divergent from the desire to eat as much as possible, women may on average only adhere to these behaviors in the presence of others.

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