

Social Influences on Eating: Analyzed by the Mandometer and Mindful Eating Questionnaire



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Abstract

The social facilitation of eating, eating more with friends, has been investigated before but often with food diaries, which can be biased. When eating with strangers, some studies suggest there is no change in food intake and others suggest a social inhibition of eating. The Mandometer is a scale that can measure eating behaviour objectively; specifically, intake, eating duration and the speed of eating. This study's primary objective was to investigate the differences in eating behaviour when eating alone compared to eating with a friend or eating with a stranger. 50 participants were recruited and ate alone. Of those 50, 33 participated in the friend experiment and 48 participated in the stranger experiment. To assess the differences in eating behaviour in each of these conditions, a Mandometer was used. In addition, a questionnaire with some questions from the Mindful Eating Questionnaire was used to assess eating behaviour. It was hypothesized that eating with another person would change participants' eating behaviour compared to when they ate alone. Additionally, the relationship with the other person, a friend or a stranger, was also hypothesized to result in differing eating behaviours. It was expected that duration would increase when eating with another person and intake was expected to increase when eating with a friend. It was also expected that there would be sex differences as males are known to eat more than females. The meal duration was shortest when eating alone, followed by eating with a friend and finally eating with a stranger was the longest. When split by sex this held true for males but for females there was no difference between the friend and stranger condition, though both were still longer than control. Females also ate longer in the friend condition compared to males. The speed was fastest for control, followed by the friend condition and slowest for the stranger. When split by sex this again held true for males and there was no difference for females between the friend and stranger condition. Males ate faster than females for all conditions. There was no difference in total intake but when split males ate more than females in the control and stranger condition.

Table of Contents

<i>Abstract</i>	2
<i>Introduction</i>	5
<i>Material and Methods</i>	7
Participants	7
Characteristics of Participants	7
Mandometer	8
Meals	8
Eating Behaviour	8
Procedure	8
Pre-experimental set up	8
Experiment 1: Control	9
Experiment 2: Known Companion	9
Experiment 3: Unknown Companion	9
Data Analysis	10
Preparation for Analysis	10
Descriptive Statistics	10
Formulas for the eating behaviour parameters	10
Opinion of Companion	10
Statistical tests	11
<i>Results</i>	12
Meal Duration	12
Speed of first portion	13
Intake	15
<i>Discussion</i>	16
Duration	16
Speed	17
Intake	18
Our Labs Previous Studies	18
Future Perspectives	18
<i>Conclusion</i>	20
<i>References</i>	21
<i>Appendices</i>	25
1.1 Experiment 2 Characteristics	25
1.2 Experiment 3 Characteristics	26
2. Characteristic Questions	27
3. Mindful Eating Questionnaire	28
4. Schedule of participants, which experiment and meal choice	29
5. List of participants and which experiment they took part in	29

6. Mandometer Instructions for App and Scale Use	30
7. Questions Asked After Each Meal	31
8. Makro Script	31
9. Values for outliers	34
10. Investigations into stranger condition	34
11. Participant Comments About Companion	36
12. Correlation between eating questionnaire and eating behaviour	37
13. Investigating personality and eating behaviour	37
Speculations About this Study	37

Introduction

There is evidence that humans have been feasting together dating back about 12 000 years (Munro & Grosman, 2010). Feasting had a big role in negotiation, solidification of social relationships, and integration of communities. Eating with other people can have a strong influence on food intake, often referred to as the social facilitation of eating. Although this report will focus on the social facilitation of eating, there are other factors that can also influence food intake in humans. Eating while being on a smartphone has been shown to increase caloric intake by up to 15% (Goncalves *et al.*, 2019). Studies show that watching TV can result in an increase in food intake, and that intake is further influenced by the type of show that is being watched and if it is something the participant have already seen before (Braude & Stevenson, 2014; Chapman *et al.*, 2014; Mathur & Stevenson, 2015). It is thought that being distracted by technology results in the diminished ability to recognize sensations and physiological cues from the body to terminate eating (Marsh *et al.* 2013; Spence *et al.*, 2019). Investigations into mindless and distracted eating suggest that driving distracts from hunger but also from the process of eating, as drivers are not only mentally but also physically distracted, making it harder to consume the food (Ogden *et al.* 2013). Aspects of a person's environment and characteristics of their food presentation can influence their intake in ways they are often unaware of. Not only can physical objects such as TVs cause distractions and influence eating, but activities such as walking, listening to music, an individual's mood, and various aspects of ambience such as lighting, the temperature of food, colours, and smells can also have an effect (Long *et al.*, 2011; Ogden *et al.*, 2017; Patel & Schlundt, 2001; Stroebele & de Castro, 2004, 2006).

Research about energy intake and what regulates and influences eating behaviour has been going on for years. In the 1990s de Castro *et al.* used 7-day food diaries to track patients' eating and determined that there was a positive correlation between meal size and the number of people present during the meal (de Castro, 1991; de Castro *et al.*, 1990; de Castro & Brewer, 1992). Previously, it was believed that willpower or physiological factors such as glucose or gut hormone levels were the only factors that influenced the regulation of food intake. However, de Castro *et al.* determined that social facilitation has a strong influence on consumption. More recent studies have also found that intake increases when eating with friends compared to eating alone or with a stranger (Hetherington *et al.*, 2006; Ruddock *et al.*, 2019; Salvy *et al.*, 2007). The duration of a meal has also been found to increase when eating with another person (de Castro, 1994; Clendenen *et al.*, 1994). Research looking into the social facilitation that a stranger had on eating is less consistent and therefore seems inconclusive. Some research states that people eat less with strangers and that this could be considered social inhibition (Higgs, Bouguettaya & Ruddock, 2022; Vartanian, Herman & Polivy, 2007). Some researchers found there to be no change from baseline and others postulate that the sex of the stranger may have an influence on eating behaviour (Hetherington *et al.*, 2006; Mori *et al.*, 1987; Young *et al.*, 2009).

The traditional methods of recording food intake involve food records, food frequency questionnaires and 24-h recalls. Each method has strengths and weaknesses and have also been used in the past to aid in the treatment of obesity and disordered eating (Johnson, 2002). A more

modern way of assessing intake and eating behaviour is using computer support, specifically the Mandometer, which was developed at the Karolinska Institute in Sweden. The Mandometer has been used to help treat eating disorders such as anorexia and bulimia nervosa, with very promising results. In a study by Bergh *et al.* (2002), 93% of disordered eating patients stayed in remission using this assessment tool. Additional studies have 75% of participants in remission with only 10% relapse in a 5 year follow up (Court *et al.*, 2008). The remission rates of patients treated exclusively with traditional methods, such as cognitive brain therapy, are lower and the relapse rates are higher (Södersten *et al.*, 2019; Troscianko & Leon, 2020). The Mandometer works by addressing the eating behaviour of the patients directly while they eat (Södersten *et al.*, 2019). It can measure the weight of food at short time intervals, usually every 5 seconds, and from this the speed of eating throughout the meal or at certain phases can be calculated as well. The Mandometer scale goes under the patient's plate and connects to an associated App on a patient's phone that provides visual feedback on eating behaviour based on the change of weight caused by eating food off the plate. When in the training mode, an eating curve is shown on the patient's phone screen, and the patient can adapt their eating curve to a reference curve in real time as they eat. The patient also rates their satiety at regular intervals. When used in the control mode no reference curve is provided and there is no visual feedback of a patient's eating curve, and the satiety meter can be declined at the end of the meal to produce an uninfluenced eating curve (Esfandiari, 2018). There are also methods to measure eating behaviour. The Mindful Eating Questionnaire was developed which uses the subscales "disinhibition external cues", "emotional response", "distraction" and "awareness". A higher score indicates more mindfulness and therefore healthier eating behaviour (Framson *et al.*, 2009).

Our lab has previously used the Mandometer to measure eating behaviour. Last year Kox used the Dutch Eating Behaviour and Mindful Eating Questionnaires to determine disordered eaters and the Mandometer to detect eating patterns (Kox, 2021). She looked at linear and decelerated eaters through a control condition. They had a speed challenge, where they had to eat in two thirds of the time of the control meal, and a mindless challenge, where they had to watch a movie while eating. She found that a restrained eating type predicted a lower food intake in participants. She also found that healthy eaters ate more because they ate faster, not longer. During the two challenges these differences disappeared. Females did not seem to be able to follow the instructions during the speed challenge and did not eat in 2/3s of the time; they did not seem to be able to regulate their eating behaviour as well. For the mindless challenge participants ate for a longer duration and slightly slower but their intake did not differ much.

This study investigated distracted eating, similar to the study done by Janine Cox last year, but this study looked at the social distraction of eating with another person. As familiarity was expected to have an impact on participants' eating behaviour experiments with both a friend and a stranger were done to control for another person being present. The changes in eating behaviour as a result of eating with another person were also compared to the eating behaviour of a participant when eating alone. Additionally, the differences in eating behaviour between males and females was investigated. It was expected that when eating with a friend the intake would increase and that in general eating with another person would increase the duration of the meal as conversations would occur.

Material and Methods

Participants

51 participants were voluntarily recruited in Groningen, The Netherlands to come and eat lunch. Of the 51 participants who participated in experiment 1 (control), one was excluded due to being an intermittent faster. All 50 participants completed experiment 1 (Table 1). If two participants identified themselves as friends or if a participant recruited another person to the study, they were assumed to know each other well enough to eat a meal together and for the companion to be considered a friend, otherwise participants were excluded from experiment 2. 33 participants completed experiment 2. 33 participants were in the friend condition as one participant turned off the app for the scale before having even consumed the first portion, they were then paired with another friend who was participating resulting in the uneven number of pairs. Finally, participants ate lunch with a stranger. 48 participants completed experiment 3 (Appendix 1.1 and 1.2). The majority of participants were Caucasian (45/50) and Dutch (38/50). At the end of experiment 3 a questionnaire was emailed which contained questions about the characteristics of participants and questions from the Mindful Eating Questionnaire.

Table 1. Characteristics for participants in experiment 1

Characteristic	Total (N=50)		Males (N= 27)		Females (N=23)	
	<i>Mean</i>	<i>SEM</i>	<i>Mean</i>	<i>SEM</i>	<i>Mean</i>	<i>SEM</i>
Age (years)	24.6	0.558	24.59	0.757	24.65	0.843
Height (cm)	177.8	1.497	184.59	1.530	169.83	1.501
Weight (kg)	74.27	2.279	81.778	3.305	65.457	1.861
BMI (kg/m²)	23.28	0.444	23.821	0.707	22.646	0.476
Disinhibited (%)	66.21	1.33	66.14	2.03	66.30	1.69
Distracted (%)	51.67	1.70	57.41	2.33	44.93	1.64
Awareness (%)	70.79	1.89/1.89	71.69	2.61	69.72	2.77

Characteristics of Participants

The characteristic information was collected through the questionnaire that was emailed to participants while they were completing experiment 3 and they filled it out while still sitting in the study room (Appendix 2). The two participants who did not participate in experiment 3 were emailed the questionnaire and asked to fill it out at home. In addition to the questions for age, sex, height, weight and BMI, questions asking about participants usual lunch meals, physical activity, nationality, race and being an extrovert or introvert were included. Furthermore, there was an open question asking the experience of eating with a stranger.

Mandometer

The Mandometer was used to measure participants eating behaviour. This apparatus was developed by Mando Group AB and the Karolinska Institute in Stockholm as a treatment for eating disorders. The scale can connect via Bluetooth to a smartphone and participants follow the instructions in the app (Figure 1). The scale records the weight change about every 5 seconds as food is eaten. With these readings the duration of meal, speed, and eating rate, and total intake which can be used to calculate the total caloric intake. The Mandometer can only be used to record lunch intake between 11:00 and 13:30 (GMT+1).



Figure 1. Mandometer and smartphone application to record eating behaviour (Mandometer, 2022)

Meals

The participants were offered either a vegan meal or one containing meat (Table 2). These meals were delivered frozen at the university and were kept in a freezer on site (-18°C). A microwave was used to heat the meals when participants arrived, and large glass dishes were used to serve the meal as each participant received two portions. Standardized plates and cutlery were provided.

Eating Behaviour

To determine participants eating behaviour questions from the Mindful Eating Questionnaire were used (Framson et al., 2009). The responses for this questionnaire range from 1 (never/rarely) to 4 (usually/often). Seven of the eight questions from the disinhibition subsection, and all the questions from the distraction and awareness subsections were used, three questions and seven questions respectively (Appendix 3). A higher score on the MEQ would indicate healthier eating.

Procedure

Pre-experimental set up

Participants were contacted via email or WhatsApp and were given information about the study and invited to join. The researcher also informed them that the study consisted of 2 or 3 lunch appointments and a questionnaire to be filled out at the end, an overview of the experiments can be seen in figure 2. They were not informed that they would be eating with an unknown and for some a known companion as that may introduce bias into their eating. If they were willing to participate, they were asked for their email, their availability, and what their meal choice would be. The Gmail “mandoruglunch” was created for this study and calendar invitations were sent out for each meal. A google sheet was used as well to record the participant, time slot, meal, and room number (Appendix 4). Another google sheet was used to record participants names and which experiments they had already participated in and was used to plan out who was paired

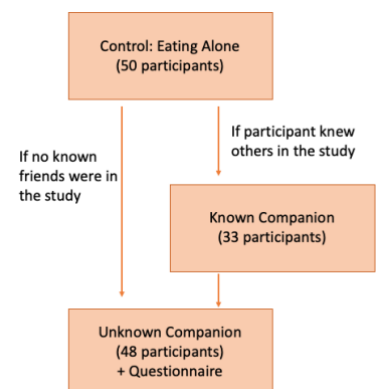


Figure 2. Overview of the experiments.

together for experiments 2 and 3 (Appendix 5). In the day before participants scheduled meals they were sent a reminder about their meal and to not eat in the two hours before.

Before participants arrived, they were added to the Mandometer database through their website. To add them, an account was made for each participant, through this they received a username, password, and patient ID. In the account the researcher assigned only 'control lunch' to each participant, this meant that they were able to record their lunch without the graph that aimed to adapt eating behaviour. The Mandometer scales were randomly assigned to participants each time they came for their lunch as only the ID number was important for identification in the raw data.

Experiment 1: Control

Two portions of the microwaved meal were placed in a serving dish and placed on the table with the cutlery, plate and Mandometer. The participants were asked to download the app and were given their username and password. They were then shown how to connect to their assigned scale in the settings. They were given some instructions about using the Mandometer, were told to eat until they were satisfied, and were then left in the room (Appendix 6). Once they had finished, they notified the researcher, and the researcher came back into the room. Participants were asked four questions were thanked and were told that contact would be made about their following meal (Appendix 7).

Experiment 2: Known Companion

If the researcher knew the participants, then they were paired up with another participant that they knew well. If the participant was unknown to the researcher, they were only partnered up if they had provided the contact information of someone else who was interested in participating as it was then assumed they knew each other. The same procedure was followed as experiment 1. Additionally, participants were asked to hit done in the app whenever they themselves were done even if it was not at the same time as the person they were eating with. The same questions were asked after the meal, the participant was thanked and again informed that contact would be made about their final meal.

Experiment 3: Unknown Companion

The researcher paired people from different studies and with different ages with the expectation that they would not know each other. The researcher did not want to ask participants if they knew each other as they may then be able to guess what the purpose of the experiment was. The same procedure as experiment 2 was used and the same questions were asked. The researcher sent the questionnaire as participants were eating this final meal and participants were asked to fill it out after the usual questions were asked. Once participants had filled out the questionnaire, they were able to ask any in depth questions about the study and were told the background and hypotheses that were driving the study.

Data Analysis

Preparation for Analysis

The raw data collected from the Mandometer was extracted by the developers at the Karolinska Institute at two points in this study. The first set of data was from the begin of the study, January 28th until April 5th. The second set of data was from April 6th until April 26th. The data was emailed as an Excel file and a technician at the University of Groningen was able to convert it into a sorted Excel file by using a MAKRO script (Appendix 8). As other students were also using the Mandometer their data had to be deleted from the Excel file before analysis could begin. This was done by looking at the Patient ID and the time of data collection as the other students used the Mandometer for dinner.

Descriptive Statistics

The descriptive statistics of age, height, weight, and BMI were calculated for each participant and the averages for the group. Additionally, the averages for males and females separately were calculated.

Formulas for the eating behaviour parameters

Meal duration → sec; time until last bite

- When no change in weight was detected at the end of the meal for over 2 minutes these participants were excluded from duration calculations as it was not possible to determine when the last bite was taken

Speed of first portion → kcal/sec; meal size (kcal)/ time of last bite of the first portion of food (sec)

- The time of first portion was defined as the number of seconds up until there was no change in weight recorded for the 30 seconds to a minute that the scale pauses when participants hit “add more food” and then a sharp increase in weight once “continue” is hit.

Mindful Eating Questionnaire → score = sum/number of questions in subsection

→ Percentage (%) = participant score/largest possible score x 100

- Some questions had to be reversed before summation (Framson *et al.*, 2009, see Appendix 3)

Intake → kcal; g to kcal for each meal type (Table 2)

- The cumulative intake (kcal) was calculated by adding the total of each portion and subtracting the left over from each portion.
- When there was no change in weight detected for over 2 minutes it was assumed that the participant forgot to click on “Continue” after adding food and these participants were excluded from intake calculations

Opinion of Companion

The qualitative response to “How was it eating with a stranger? Describe them and the experience in a few words.” was categorized into “pleasant”, “okay” and “slightly awkward” to better analyze.

Statistical tests

Outliers were determined using Tukey's method for each parameter and subsequently excluded. True outliers were always excluded, and the majority of potential outliers were also excluded. If a participant was labelled as an outlier and subsequently excluded when males and females were grouped separately, they were also excluded when the participants were all grouped together for consistency. A list of the values of these outliers can be found in Appendix 9.

Paired t-tests were used to compare the differences in intake, duration, and speed. The paired t-tests allowed for the inclusion of the participants who only participated in the control and stranger test over a repeated measures ANOVA which would exclude participants who were not in all three conditions. The paired t-test was also preferred due to the fact that some participants forgot to hit continue for only one of the conditions and were therefore excluded for that one condition, but their data could still be used from the other condition. Paired t-tests were also used to compare the eating behaviour parameters between only females and only males and independent t-tests were used to compare male and female parameters to each other.

In the descriptive statistics and the boxplots, the participants who only were in one condition were excluded and the conditions where a participant had technical issues were excluded. If a participant having technical issues resulted in only one condition having valid data this was excluded as well as they would not be used in the t-tests. The number of participants and the means statistical may vary slightly from those in the descriptive statistic and boxplot due to pairing.

One way ANOVA was used to determine if there was a difference between the groups. Independent t-tests were used when analyzing differences in eating behaviour with regard to the sex of the stranger being the same or opposite of the participant. Independent t-tests were also used to analyze the difference between the eating behaviour of self-described introverted and extroverted participants. Bivariate correlation was used to assess the relationship between questionnaire response and eating behaviour.

Table 2. Macronutrient composition of the offered meal.

	Energy (kcal/100 g)	Protein (g/100 g)	Fat (g/100 g)	Carbs (g/100 g)	Availability
Lasagnette	138	6.9	4.4	17	Exp. 1-3
Chilli Sin Carne*	95	3.7	2.7	13	Exp 1
Tikka Masala*	115	7.4	4.6	10	Exp 2-3
Thai Green Curry*	115	7.4	4.6	10	Exp 2-3
Mexican*	128	8.0	3.6	14	Exp 2-3

*Vegan options

Macronutrient composition information retrieved May 2022 from Jumbo and Lazy Vegan websites.

Results

Table 2. Descriptive statistics

	Gender	N	Mean	SEM	Range
Meal duration control (sec)	Both	33	403.91	18.52	170 – 577
	Male	21	386.24	25.43	170 – 577
	Female	12	434.83	23.48	300 – 560
Meal duration friend (sec)	Both	22	540.77	24.40	340 – 700
	Male	16	517.31	31.59	340 – 700
	Female	6	603.33	10.62	560 - 640
Meal duration stranger (sec)	Both	30	702.80	33.60	305 – 1030
	Male	18	722.22	44.65	305 – 960
	Female	12	673.67	51.88	350 – 1030
Speed of first portion control (kcal/sec)	Both	46	1.719	0.116	0.49 – 3.60
	Male	25	2.117	0.150	0.71 – 3.60
	Female	21	1.246	0.118	0.49 – 2.45
Speed of first portion friend (kcal/sec)	Both	32	1.467	0.099	0.54 – 2.78
	Male	20	1.677	0.118	0.69 – 2.78
	Female	12	1.119	0.129	0.54 – 2.08
Speed of first portion stranger (kcal/sec)	Both	46	1.138	0.060	0.39 – 2.18
	Male	25	1.341	0.075	0.73 – 2.18
	Female	21	0.896	0.064	0.39 – 1.46
Intake control (kcal)	Both	36	614.62	36.48	233.45 – 1030.24
	Male	21	743.38.00	40.91	349.60 – 1030.24
	Female	15	434.37	25.69	233.45 – 582.25
Intake friend (kcal)	Both	26	686.25	41.44	281.20 – 971.33
	Male	18	736.48	42.39	308.20 – 971.33
	Female	8	573.23	86.47	281.20 – 869.95
Intake stranger (kcal)	Both	34	631.70	38.16	212.75 – 1019.82
	Male	20	730.63	48.50	328.90 – 1019.82
	Female	14	490.38	38.11	212.75 – 753.28

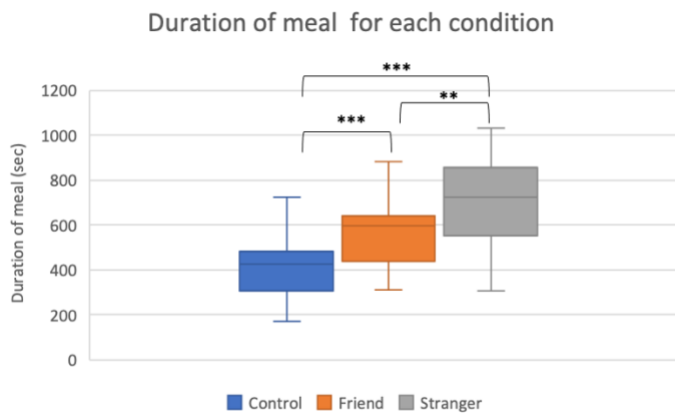
Meal Duration

There was a significant difference in the meal duration between all the groups. Participants ate for a longer time with friends, ($M = 163.10$, $SEM = 23.33$, $p < 0.001$) and with strangers ($M = 293.79$, $SEM = 33.35$, $p < 0.001$) compared to eating alone. The participants also ate for significantly longer when comparing the stranger and friend conditions ($M = 156.94$, $SEM = 46.01$, $p = 0.003$) (Figure 3a).

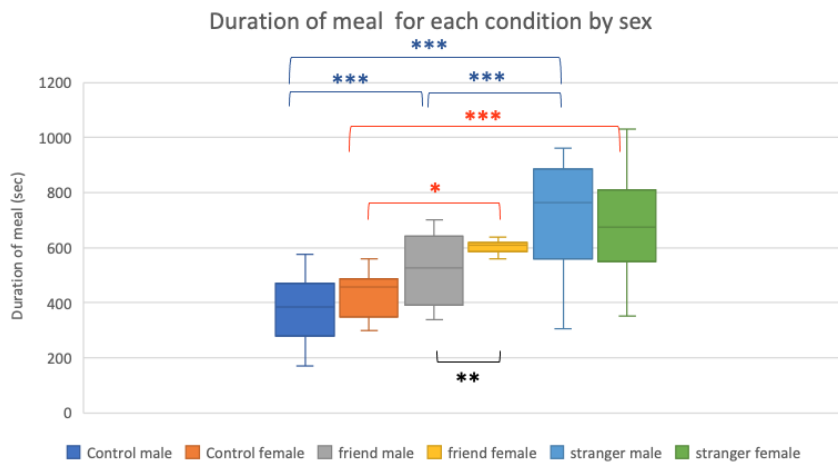
When comparing males and females the only significant difference was in the friend condition, where females ate for a longer time compared to males ($MD = 86.021$, $SED = 33.32$, p

= 0.019). Males ate faster in the control condition compared to the friends ($M=153.13$, $SEM = 27.59$, $p < 0.001$) and compared to the stranger condition ($M = 322.17$, $SEM= 42.01$, $p < 0.001$). Females also had shorter meal durations in the control condition compared to the friends condition ($M = 195.00$, $SEM = 44.87$, $p = 0.012$) and compared to the stranger condition ($M = 247.36$, $SEM = 54.33$, $p = 0.001$) (Figure 3b).

a)



b)



* Significance at 0.05 level

** Significance at 0.01 level

*** Significance at 0.001 level

Figure 3. a) Boxplots with paired t-tests to compare meal duration (sec) between the groups. **b)** Boxplots with independent t-tests (black lines and stars below boxplots) to compare duration between the sexes for each condition and paired t-tests for males (blue lines and stars above boxplots) and females (red lines and stars above boxplots).

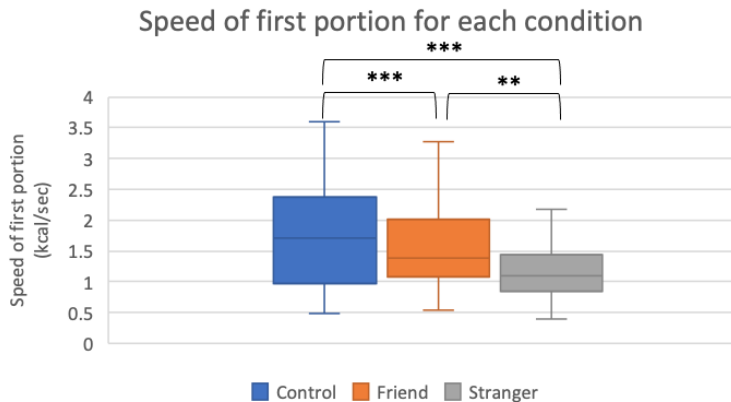
Speed of first portion

There was a significant difference between all the groups when assessing the speed of the first portion. When participants ate alone, they ate their first portion faster than when they ate with

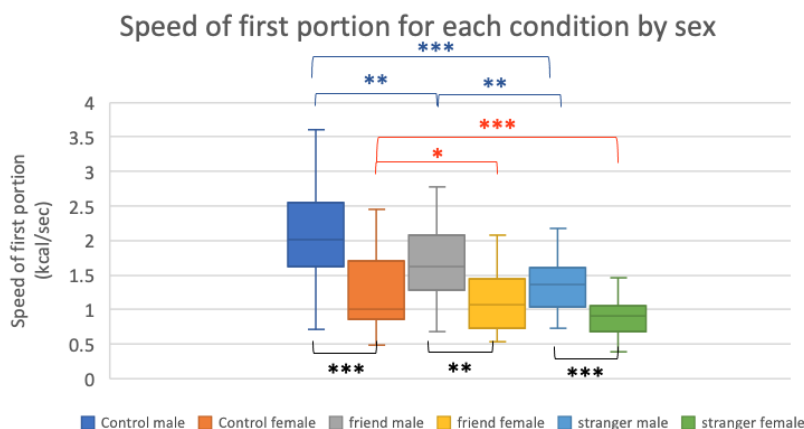
a friend ($m = 0.401$, $SEM = 0.095$, $p < 0.001$). Similarly, when participants ate their first portion alone, they ate faster than when they ate with a stranger ($m = 0.581$, $SEM = 0.080$, $p < 0.001$). When participants ate their first portion with friends they ate faster than when they were with a stranger ($m = 0.232$, $SEM = 0.078$, $p = 0.004$) (Figure 4a).

When comparing males to females (Figure 4b) they ate faster in the control condition ($MD = 0.871$, $SED = 0.196$, $p < 0.001$), in the friend condition ($MD = 0.558$, $SED = 0.182$, $p = 0.005$) and the stranger condition ($MD = 0.445$, $SED = 0.101$, $p < 0.001$). Males ate faster in the control condition compared to the friends condition ($M = 0.449$, $SEM = 0.137$, $p = 0.004$) and compared to the stranger condition ($M = 0.776$, $SEM = 0.115$, $p < 0.001$). Males also ate faster in the friend Females ate significantly faster in the control condition compared to the friend condition ($m = 0.322$, $SEM = 0.110$, $p = 0.014$) and compared to the stranger condition ($m = 0.350$, $SEM = 0.087$, $p = 0.001$). No difference was observed between the friend and stranger condition with respect to eating speed in females (Figure 4b).

a)



b)



* Significance at 0.05 level

** Significance at 0.01 level

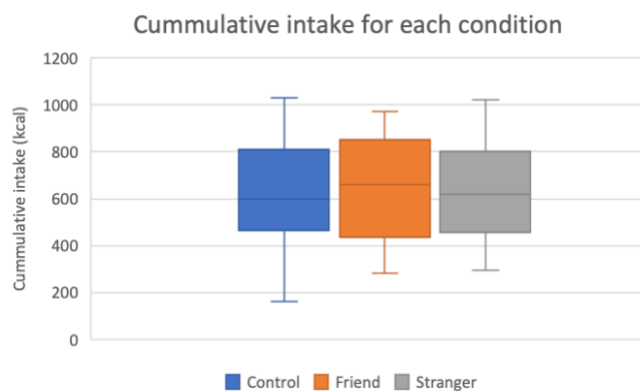
*** Significance at 0.001 level

Figure 4. a) Boxplots with paired t-tests comparing the speed of the first portion (kcal/sec) for each condition. **b)** Boxplots with independent t-tests (black lines and stars below boxplots) to compare duration between the sexes for each condition and paired t-tests for males (blue lines and stars above the boxplots) and females (red lines and stars above the boxplots).

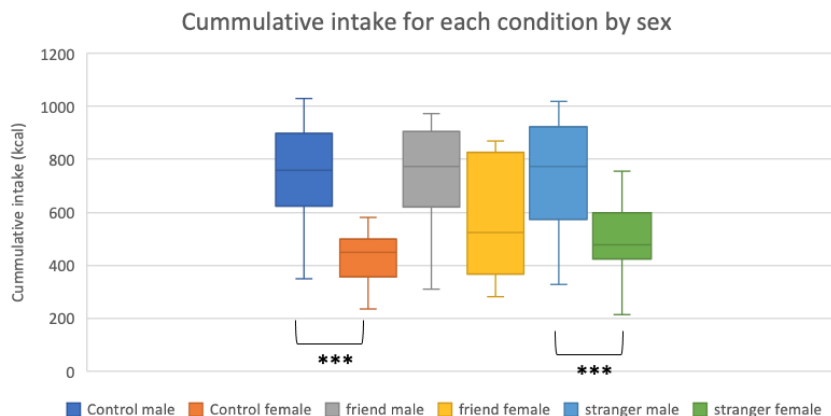
Intake

There was no difference in intake between any of the conditions when men and women were grouped together (Figure 5a). When intake was assessed based on sex there were significant differences. Males ate significantly more than females in the control condition (MD = 309.01, SED = 48.31, $p < 0.001$). Males also ate more than woman in the stranger condition (MD = 240.25, SED = 61.68, $p < 0.001$) (Figure5b).

a)



b)



* Significance at 0.05 level

** Significance at 0.01 level

*** Significance at 0.001 level

Figure 5. a) boxplots for the cumulative intake (kcal) for both sexes for each condition. **b)** boxplots and independent t-tests for the cumulative intake (kcal) separated by sex for each condition.

Discussion

The purpose of this study was to determine how social interactions, eating with a friend and stranger, would distract from eating. This was investigated using a Mandometer and an eating questionnaire in order to assess the changes in eating behaviour. Meal duration was shortest when eating alone and longest when eating with a stranger. Eating speed was fastest when eating alone and slowest when eating with a stranger and men were consistently faster than females. On average there was no change in total caloric intake between eating alone, with friends or with strangers but males ate more than females when alone and with strangers.

Duration

This study shows that meal duration is longer when eating with friends or with strangers compared to eating alone. This was indeed hypothesized, as logically with another person present conversation will occur, and this will increase in the time it takes to eat a meal as talking interrupts the intake. Additionally, the increase in duration with other people present has previously been reported as well (Bell & Pliner, 2003; de Castro, 1990; Clendenen, Herman & Polivy, 1994). In one study talking took up to 40% of the total session, relative to the time they were eating and drinking (Heatherington *et al.*, 2006). Interestingly, eating with strangers took significantly longer than eating with friends. De Castro (1990) had previously found no difference in the duration of a meal between friends and strangers. Alternatively, his study in 1994 found meal duration with friends was longer than with “other” but other was a very broad category with many types of acquaintances included. In the study by Heatherington *et al.* (2006), they stated that eating with strangers resulted in an increase in anxiety and through videos determined that participants looked away from their food more than in the control setting and this may partially explain the longer duration.

The stranger condition being the longest was assessed further as it was an unexpected finding. First participants were assessed by their sex and the sex of their stranger to see if there was a difference in duration, but no differences were found (Appendix 10, Figure 6). Next the previously qualitative question about the participant’s opinion of the stranger and opinion of the experiment was categorized and duration was assessed (Appendix 10, Figure 9a). As Herman (2015) says in his review, de Castro’s “more socialization leads to longer meals and increased intake” there is the assumption that people are enjoying the company and are not rushed to end the meal. No differences were found between the groupings though for the ‘slightly awkward’ category there were only 3 participants; therefore, this could be investigated further with a larger study population as it is likely more participants would be in each category. The validity of the response must also be considered (Appendix 11), as it is possible that responses may not have been their true opinion (Brenner & DeLamater, 2016). It has been previously shown that when the duration was manipulated with strangers, the shorter condition, 12 minutes versus 36, was more enjoyable. Therefore, it was not the extended socialization but the enjoyment of the others’ company that extended the mealtime (Herman, 2015; Pliner *et al.*, 2006). Something that should be taken into consideration is that it may be a stretch to consider these participants true strangers as they have this study to connect them and therefore have something to talk about. When asked participants often said they discussed ideas about what the study could be about.

Without having this commonality it is possible that there would have been a more difficult time finding a topic to discuss and that could have had a larger impact on eating behaviour.

Additionally, the difference between males and females in the friend condition for duration should be taken with caution as there were only 6 females left after excluding those with technical errors and outliers. Continuing to look at males and females separately, we still see that the control meal was shorter compared to the friend condition and compared to the stranger condition. For females there was no difference between the friends' and strangers' conditions which is more in line with Heatherington *et al.* (2006) and de Castro (1990). For male participants the stranger condition was still longer than the friend condition. Further investigation into why this occurred should be investigated and suggestions for investigating why the stranger's duration was so long are mentioned further.

Speed

The speed of the first portion with strangers was eaten at a slower speed than with friends. This is likely due to the duration of the meal, with strangers having the longest meals. Though not stated explicitly, Clendenen *et al.* (1994) found that friends and strangers had the same duration, but strangers ate less, indicating that there was a slower eating rate for strangers compared to friends. The speed of both the friend and stranger condition was slower than the control condition of eating alone which was expected based on the duration taking longer. This is in contradiction to what de Castro (1990) found. In his study, he reported an increased duration but no change in rate as the intake of his participants increased. In contrast, in his study in 1994 he found that eating alone resulted in a faster eating rate than when with friends. De Castro is criticized by some for making overgeneralizations and by not investigating groups with a mix of friends and strangers (Herman, 2015). Additionally, in a qualitative study participants stated they ate faster when alone and meals were seen as more functional and less enjoyable, and they also chose food based on convenience over taste when alone (Danesi, 2012).

When comparing the sexes, control continued to be the fastest speed. Males also ate faster than females in all the conditions. This was expected, as this difference in speed between the sexes had been investigated before (Hill & McCutcheon, 1984; Park & Shin, 2015). When investigating if the sex of the stranger had an influence on the speed of the first portion of a participant's meal, no difference was found for males or females, which was unexpected as intake was expected to differ, this is expanded on further (Appendix 10 Figure 8). There was also no difference in speed based on the opinion of the stranger and the experience of eating with them (Appendix 10 Figure 9b). It was not possible to investigate the speed of the whole meal without losing many participants to technical errors, therefore only their first portion was used. However, for some participants their first portion of food was their only portion, and this may result in more of an average speed rather than the first portion when participants would have been most hungry and therefore likely eating the fastest. When eating alone 7 participants ate only one portion, with one participant putting almost 1000 calories of food on the plate for the one serving. When eating with friends 2 participants ate only one portion and 3 participants had only

one portion when eating with a stranger. The majority of participants had more than one portion and therefore it can be assumed that they were at their hungriest during that first portion.

Intake

Unexpectedly, there was no difference in intake with friends compared to eating alone or in the stranger condition, therefore the hypothesis that intake would increase with friends was not supported. This was based on many previous studies indicating that intake increased with friends (de Castro, 1990, 1994; Herman, Roth & Polivy, 2003). There are some possible explanations for why no difference in intake was seen. Receiving two portions of the meal was meant to simulate ad libitum food, but some participants ate the entire serving bowl, such as 12 of the 50 participants in the control condition. The majority of participants did not finish and therefore ad libitum intake was assumed. A few of the participants mentioned that if they were close to done, they were not able to leave leftovers in the bowl, some saying this was a personal choice, others mentioned how in their culture it was not normal to have leftovers. These comments were made by the participants and conclusions cannot be made from them, but it is interesting to note their speculations. Plate cleaning tendency has been shown to increase food intake (Sheen, Hardman & Robinson, 2018). There is also a phenomenon known as matching which is when a person increases their intake, to match that of their companion, to make a good impression which may be why no difference was seen (Roth *et al.* 2001; Salvy *et al.*, 2007). Ruddock *et al.* found that sometimes people will give themselves bigger portions before a social meal and this is suggested to be in anticipation of eating with others (Ruddock *et al.*, 2021). This could be another reason for why no difference was seen as participants knew when they were eating alone they would also have subsequent meals with other participants.

As it was expected that there would be a difference in intake, this was investigated further by looking if there were any differences between the sexes. In the control and stranger conditions, males consumed more food than females, but this was not seen in the friend condition. Males consuming more than females was expected (Brindal *et al.*, 2015). Even when males and females were separated there was no difference in intake between the three conditions. Additionally, there was no difference in intake for either sex when looking at the sex of the stranger (Appendix 10 Figure 8). Others have found that females eat less when a male was present compared to when eating with others of the same sex, sometimes referred to as the minimal eating norm (Brindal *et al.*, 2015). The opinion of the stranger and the eating experience with them also was not associated with any differences in intake (Appendix 10 Figure 9a). This was slightly unexpected because in some studies females have eaten less and the inhibition of intake was heightened when they found the male to be more attractive (Vartanian, Herman & Polivy, 2007 review). However, there is a chance that matching was occurring (Salvy *et al.*, 2007). It is difficult to determine which of these patterns a woman will follow (Higgs & Thomas, 2016).

Our Labs Previous Studies

Combining this research with the research previously done by our lab, specifically with the work done by Janine Kox, it seems that the female participants often experienced greater changes in their eating behaviour, specifically their intake. This could be seen in Kox's research

when females ate significantly faster in the speed challenge but for the same duration, resulting in an increased intake. In this study females increased their intake by almost 150 kcal during the friend condition and by over 50 kcal in the stranger condition. Though these differences were not significant for the females, there was only a variation of a maximum of 13 kcal for males in the stranger condition and 6kcal in the friend condition, a considerable drop in variation by comparison. Something else to consider is if the control condition can be considered a true control. For most participants it is unlikely that sitting alone in a room, with no technology and knowing that they are participating in a study is considered the norm eating situation. Many participants commented on how it was odd that they were unable to use their phone, as normally if they were eating alone, they would either be on their phone or watching TV. The control condition may therefore not be portraying true normal eating behaviour, which then makes it difficult to be used as a comparison. We postulate that eating with friends or housemates would be considered more normal for many of the participants. It may, therefore, be unnecessary to compare to control condition and more accurate to just observe the differences in eating behaviours between the multiple types of distraction.

Future Perspectives

The Mindful Eating Questionnaire clearly focuses on eating, and the awareness and distraction questions relate solely to eating, being very intrinsically food related. Therefore, it may be that this questionnaire is not the best for assessing how externally distracted the participants of this study were while eating, as there was no association between the sub sections and eating behaviour (Appendix 12). For a future study, more questions about extrinsic distractions should be included for future research. The one question asking participants to self-identify as either an introvert or an extrovert may not have been sufficient enough, as there were no differences found between extroverts and introverts for any of their eating behaviours or any of the three conditions (Appendix 13). Perhaps a questionnaire such as the NEO-FFI, which is a shorter version of the NEO-PI, may be beneficial to gather a more complete representation of a participant's personality. This may give more insight into how their meal with a stranger would go. For eating studies such as this, there is the bias of the participants sitting in a room knowing they are partaking in an eating experiment though they may not know the exact subject of the research.

For future studies or follow ups it would be beneficial for each participant to complete all 3 conditions, and therefore, the researcher should try to always recruit in pairs so this is possible. Due to quite a few participants (16/50) forgetting to hit "continue" after adding food in at least one of the conditions, a sheet with very simple instructions should be left on the table beside each participant so that they can refer back to it. An alternative option would be to weigh the glass serving bowl with food before serving it and after to confirm intake matches recorded by the Mandometer, but this does not help with the issue of not knowing the exact duration without using the Mandometer properly. Another aspect of students' lives to consider is drinking the evening before. It is possible this had an impact on intake as some participants who were friends with the researcher made comments about being hungover and not hungry days after the study. Thus, it would be advised to ask participants not to drink the night before coming. Another idea

for a future study would be to use a device that is able to measure the sound level to see if the amount of conversation is correlated to the duration and speed of intake, and differences between friends and strangers with respect to the conversation could also be assessed. Another suggestion would be to not only have the qualitative response asking about the stranger and that interaction, but some quantitative responses so that numbers are not arbitrarily assigned to written responses. These questions could include “how comfortable were you eating with a stranger?”, “how attracted to the stranger were you?”, and “how aware of your eating were you?” with responses similar to the questionnaires with 1 being not very to 4 Extremely. Additional questions that would be interesting would be “did you stop eating when your friend stopped eating?” and “did you stop eating when the stranger stopped eating?” which would have a yes and no response. With these questions, if the Mandometer data is more consistent with its recordings, it would be interesting to see if there is matching of the partner’s eating pattern (Roth *et al.*, 2001; Salvy *et al.* 2007).

Conclusion

In summary, not all of the eating behaviours for this study were as expected. While the duration of the meal with friends was expected to be the longest, the duration of the meal with strangers was the longest but as expected the duration of the meal alone was shortest. Similarly, the speed of the meal with friends was expected to be the slowest but the meal with the stranger was the slowest and there was no influence of the sex of the participant or stranger on speed. As expected, the speed of the first portion when eating alone was the fastest. Additionally, unexpectedly there was no change in intake between any of the three conditions when it was expected that the friend condition would have an increase in intake, and there was no influence of the sex of the participant or the stranger on intake in the stranger condition.

The Mandometer is a good objective measurement of intake, duration and speed and studies should continue using this apparatus to measure eating behaviour. It can be used not only as a tool for therapy but also for research. Social interactions almost always involve some sort of food and peoples eating behaviours may differ from their normal behaviours when eating alone. Awareness of these eating behaviours and what can influence them may help people who are trying to watch their weight or for those who are trying to lose weight. Even those who are of healthy weight should be conscious of the influence others have on their eating behaviour.

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Appendices

1.1 Experiment 2 Characteristics

	Gender	N	Mean	SEM	Range
Age (years)	Both	33	24.64	0.62	20 – 34
	Female	12	25.91	1.24	22 – 34
	Male	21	23.90	0.65	20 – 32
Height (cm)	Both	33	178.36	1.77	155 – 196
	Female	12	169.67	2.38	155 – 183
	Male	21	183.33	1.65	167 – 196
Weight (kg)	Both	33	74.05	2.92	52 – 135
	Female	12	63.46	2.03	52 – 75
	Male	21	80.10	3.88	60 – 135
BMI (kg/m²)	Both	33	23.06	0.58	19.69 – 35.87
	Female	12	22.00	0.40	20.20 – 24.09
	Male	21	23.66	0.87	19.69 – 35.87
Disinhibited (%)	Both	33	66.02	1.70	42.86 – 89.29
	Female	12	66.96	2.41	50 – 78.57
	Male	21	65.48	2.32	42.86 – 89.29
Distracted (%)	Both	33	52.52	2.19	33.33 – 75
	Female	12	43.06	2.48	33.33 – 58.33
	Male	21	57.94	2.47	33.33 – 75
Awareness (%)	Both	33	67.86	2.16	50 – 96.43
	Female	12	65.48	3.24	50 – 85.71
	Male	21	69.22	2.86	50 – 96.43

1.2 Experiment 3 Characteristics

	Gender	N	Mean	SEM	Range
Age (years)	Both	48	24.77	0.57	20 – 39
	Female	21	25	0.89	21 – 34
	Male	27	24.59	0.757	20 – 39
Height (cm)	Both	48	177.81	1.56	155 – 200
	Female	21	169.10	1.55	155 – 183
	Male	27	184.59	1.530	167 – 200
Weight (kg)	Both	48	74.30	2.35	52 – 135
	Female	21	64.69	1.79	52 – 85
	Male	27	81.78	3.305	60 – 135
BMI (kg/m²)	Both	48	23.28	0.45	19.69 – 35.87
	Female	21	22.58	0.46	20.20 – 27.13
	Male	27	23.821	0.707	19.69 – 35.87
	Male	27	44.15	2.75	20.00 – 72.00
Disinhibited (%)	Both	48	66.22	1.36	42.86 – 89.29
	Female	21	66.33	1.775	50.00 – 78.57
	Male	27	66.14	2.03	42.86 – 89.29
Distracted (%)	Both	48	52.08	1.75	33.33 – 75.00
	Female	21	45.24	1.78	33.33 – 58.33
	Male	27	57.41	2.33	33.33 – 75.00
Awareness (%)	Both	48	70.83	1.96	50.00 – 100.00
	Female	21	69.73	3.01	50.00 – 100.00
	Male	27	71.69	2.61	50.00 – 100.00

2. Characteristic Questions

Name: _____

Email: _____

Today's date: _____

Age: _____

Height: _____

Weight: _____

Nationality: _____

Race: _____

Sex:

Select one Male/Female/Prefer not to say

How would you describe your normal lunch?

Typical Dutch meal/warm foods/Ready-made foods/Other _____

On average how often do you sport in a week?

Never/ one or two times/ three or four times/ five or more times

How was it eating with a stranger? Describe them and the experience in a few words. _____

Would you label yourself as an introvert or extrovert?

Select one introvert/extrovert

3. Mindful Eating Questionnaire

Responses

- 1 = Never/Rarely
- 2 = Sometimes
- 3 = Often
- 4 = Usually/Always

Disinhibition

- 1. I stop eating when I'm full even when eating something I love.
- 2. When a restaurant portion is too large, I stop eating when I'm full.
- 3. When I eat at "all you can eat" buffets, I tend to overeat. *
- 4. If there are leftovers I like, I take a second helping even though I'm full. *
- 5. If there's good food at a party, I'll continue eating even after I'm full. *
- 6. When I'm eating one of my favorite foods, I don't recognize when I've had enough. *
- 7. If it doesn't cost much more, I get the larger size food or drink regardless of how hungry I feel. *

* responses have to be reversed before summation; 1=4, 2=3, 3=2, 4=1.

Awareness

- 9. I notice when there are subtle flavors in the foods I eat.
- 10. Before I eat I take a moment to appreciate the colors and smells of my food.
- 11. I appreciate the way my food looks on my plate.
- 12. When eating a pleasant meal, I notice if it makes me feel relaxed.
- 13. I taste every bite of food that I eat.
- 14. I notice when the food I eat affects my emotional state.
- 15. I notice when foods and drinks are too sweet.

Distracted

- I focus on my food while eating and my thoughts don't wander. (mirrored)
- I don't think about other things while I eat. (mirrored)
- I eat at a speed that allows me to taste what I am eating. (mirrored)

4. Schedule of participants, which experiment and meal choice

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Name	experiment type	food choice		assistant	Room	Name	experiment type	food choice		assistant	Room
162	week	4-Apr						5-Apr					
163	13	Monday						Tuesday					
164		11:45						11:30					
165		Julius Boterman	Stranger	Lasagnette	Kim	240		Laurens Hamersma	Control	Tikka Masala	Kim	240	
166		Rafael Munteanu	Stranger	Thai Green Curry	Kim	240							
167													
168		12:00						12:00					
169													
170													
171													
172		12:30						12:30					
173								Bram Wonink	Stranger	Lasagnette	Kim	240	
174								Mayerli Prado	Stranger	Lasagnette	Kim	240	
175													
176		12:45						13:00					
177		Melaine Wong	Stranger	Lasagnette	Kim	240							
178		Sebastiaan Legemaat	Stranger	Lasagnette	Kim	240							
179													

5. List of participants and which experiment they took part in

	A	B	C	D	E	F	G	H
1	Name	Control	Friend Test	Stranger Test	Email	Questionnaire	Do they want their data	
2	Lonneke Luijendijk	TESTED	Pien	Samy	lonnekeluijendijk@gmail.com			
3	Marc Zuurbier	TESTED	Melanie	Rutger	marc.z@live.nl			
4	Annemarie van den Born	TESTED	Larissa	Mila	annemarievdorn@gmail.com			
5	Thijs Kienstra	TESTED	Naud	Meine	kienstrathijs@gmail.com			Experiment
6	Larissa Benus	TESTED	Annemarie	Marina	larissabenus@hotmail.nl			Tested
7	Pien Rootliep	TESTED	Lonneke	Jesper	pienrootliep@hotmail.com			Planned
8	Maaïke Weegink	TESTED	no friend	Jessie	maaike7321@gmail.com			Invited
9	Melanie Wong	TESTED	Marc	Sebastiaan	melly.w96@hotmail.com			Invite
10	Floris Feiner	EXCLUDE	DOES INTERMITTENT FASTING			f.a.feiner@student.rug.nl		No
11	Sebastiaan Legemaat	TESTED	Hanne Lise	Melanie	sebastiaanlegemaat@hotmail.nl			Questionnaire
12	Hanne Lise Doosje	TESTED	Sebastiaan	Ruben	h.l.doosje@student.rug.nl			Send it
13	Sebastiaan Vonk				texted			Sent
14	Rutger Boesjes	TESTED	no friend	Marc	r.boesjes@student.rug.nl			Received
15	Anouck Nugteren	TESTED	no friend	Laura	anoucnugteren@gmail.com		* wants the report	No
16	Maxine Offringa	TESTED	no friend	Jorn	Maxineoffringa@gmail.com			

6. Mandometer Instructions for App and Scale Use

1. Download the device application.
2. Open the application and use Username & Password that belong to the ID in the Mandometer website.
 - For ease participants username was their first name and the password was 100.
3. Turn on the scale by pressing the red button on the bottom of the scale.
4. Go to Settings > Scale > Connect (make sure the Bluetooth for the phone is turned on).
5. Exit settings and press on the plate icon to come back to the meals.
6. Click on Lunch and then Control.
7. Place a plate on the scale. Press **Done** to continue
8. Put food on the plate (0%).
 - Press **Start** when ready to eat (100%)
9. When not entirely full, then press **add more food**. Once a sufficient amount has been added to the plate hit **Continue** for the Mandometer to continue recording the change in weight.
10. When meal is finished, press **End** and Finish to end the meal. Click No Satiety Meter after finishing the meal.

Video on the use of a Mandometer: <https://www.jove.com/v/57432/control-of-eating-behavior-using-a-novel-feedback-system>

Mandometer App & Scale: Don'ts

- Do not lift/push/pull the Mandometer during the experiment!
- Do not lock your phone during the experiment!
- Do not leave the app to go answer texts/emails etc.!
- Do not go away with your phone during the experiment!
- Do not lift/push the bowl/plate!
- Do not rest the cutlery on the plate!

7. Questions Asked After Each Meal

1. Are you satisfied with the amount that you ate?
2. Where there any distractions?
3. Do you have any comments about the meal itself?
4. Is there anything else you think is important for the researcher to know for this round of the study?

8. Makro Script

```
Sub Extract_from_text2()  
    'Workbooks.Add  
  
    'find meal data cell  
    Cells.Find(What:="<", After:=A1, LookIn:=xlFormulas, LookAt:= _  
        xlPart, SearchOrder:=xlByRows, SearchDirection:=xlNext, MatchCase:=False _  
        , SearchFormat:=False).Activate  
    'define column with time and weight data  
  
    'L = Len(ActiveCell)  
    BC = ActiveCell.Column  
    'define startrow  
    BR = ActiveCell.Row  
  
    ER = Range("a2").End(xlDown).Row  
  
    Application.ScreenUpdating = False  
  
    'add extra sheet for combined time and weight columns  
    With ActiveWorkbook  
        .Sheets.Add(After:=.Sheets(.Sheets.Count)).Name = "Combined data"  
    End With  
  
    'go back to sheet1 (original data)  
    Worksheets(1).Select  
  
    'Set destination column in combined data sheet  
    DC = 1  
  
    Do Until BR = ER  
  
        Rows(BR).Select  
        Selection.Copy  
        Sheets.Add After:=Sheets(Sheets.Count)  
        'Sheets.Add After:=ActiveSheet  
        Range("A2").Select  
        ActiveSheet.Paste  
  
        'run macro time_weight  
        time_weight2  
  
        'Switch of screenupdating to speed up macro  
        Application.ScreenUpdating = False  
  
        'copy data to combined data sheet
```

```

Worksheets("Combined data").Columns(DC) = ActiveSheet.Columns(1).Value
Worksheets("Combined data").Columns(DC + 1) = ActiveSheet.Columns(2).Value

DC3 = DC + 3
DC = DC3

BR2 = BR + 1
BR = BR2
Worksheets(1).Select

Loop
'[A1].Select

Application.ScreenUpdating = True

End Sub
Sub time_weight2()

'Switch of screenupdating to speed up macro
Application.ScreenUpdating = False

'Switch of automatic calculation of worksheet to speed up macro
Application.Calculation = xlCalculationManual

'find meal data cell
Cells.Find(What:="<MEAL>", After:=[A1], LookIn:=xlFormulas, LookAt:= _
    xlPart, SearchOrder:=xlByRows, SearchDirection:=xlNext, MatchCase:=False _
    , SearchFormat:=False).Activate
'define column with time and weight data
SC = ActiveCell.Column

'set headers
[A1] = "PatientID"
[B1] = "Date"
[A4] = "T"
[B4] = "W"

'name startrow for data destination
SR = 5
Cells(2, SC).Select

L = Len(ActiveCell)
'd.Text = ActiveCell.Text
'bt= begin tijd
'et= eind tijd
'It = lengte tijd (aantal tekens)
'bw= begin weight
'ew= eind weight
'Iw= lengte weight (aantal tekens)
'n=volgende begin tijd

bt = InStr(ActiveCell, "<T>") + 3

If bt = 3 Then
Exit Sub
Else

```



```

End If

et = InStr(ActiveCell, "</T>")
lt = et - bt
bw = InStr(ActiveCell, "<W>") + 3
ew = InStr(ActiveCell, "</W>")
lw = ew - bw
Cells(SR, 1).Value = Mid(ActiveCell, bt, lt)
Cells(SR, 2).Value = Mid(ActiveCell, bw, lw)
SR2 = SR + 1
SR = SR2
n = ew + 1
Do
    bt = InStr(n, ActiveCell, "<T>") + 3
    If bt = 3 Then
        Exit Do
    Else
        End If
    et = InStr(n, ActiveCell, "</T>")
    lt = et - bt
    bw = InStr(n, ActiveCell, "<W>") + 3
    ew = InStr(n, ActiveCell, "</W>")
    lw = ew - bw
    Cells(SR, 1).Value = Mid(ActiveCell, bt, lt)
    Cells(SR, 2).Value = Mid(ActiveCell, bw, lw)

    SR2 = SR + 1
    SR = SR2
    n = ew + 1

    Loop
    "Turn automatic calculation back on
    Application.Calculation = xlCalculationAutomatic
    'Switch on screenupdating
    Application.ScreenUpdating = True

    '[A1].Select
End Sub

```

9. Values for outliers

Duration outliers

- Participant 25 – friend condition = 310 seconds
- Participant 26 – friend condition = 1075 seconds,
- Participant 35 – friend condition = 1204 seconds
- Participant 53 – control condition = 1075 seconds and friend condition = 1148 seconds
- Participant 62 – control condition = 722 seconds
- Participant 69 – control condition = 739 seconds
- Participant 70 – stranger condition = 1415 seconds
- Participant 76 – friend condition = 856 seconds

Speed of first portion outliers

- Participant 38 – friend condition = 3.28 kcal/sec
- Participant 79 – stranger condition = 4.73 kcal/second

Intake outliers

- Participant 52 - control condition = 163.03 kcal

The rest of the participants who were not included was due to incorrect use of the equipment. As previously mentioned, if participants were excluded from one of the conditions due to being an outlier then they were excluded from all analysis as they were always compared to themselves.

10. Investigations into stranger condition

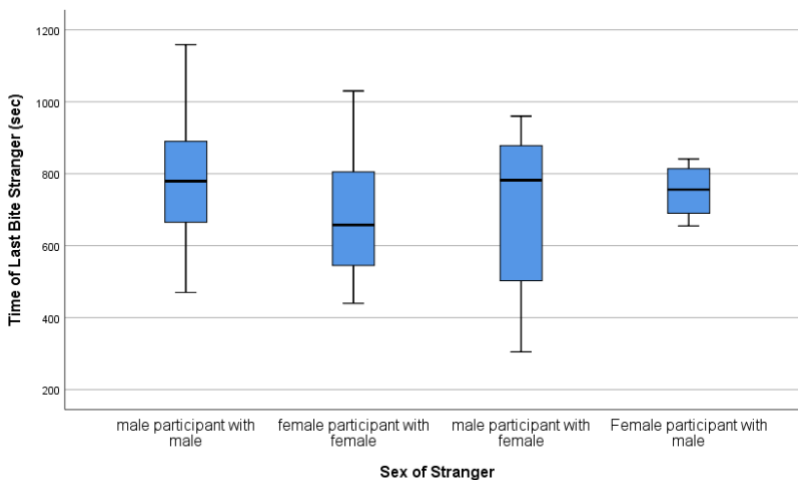


Figure 6. Boxplots for the sex of the participant and the sex of stranger for duration of eating with a stranger. There was no significance between for males eating with males and males eating with females (MD = 91.50, SED = 95.21, $p = 0.349$). There was also no difference between females eating with females and females eating with males (MD = 76.20, SED = 95.19, $p = 0.439$).

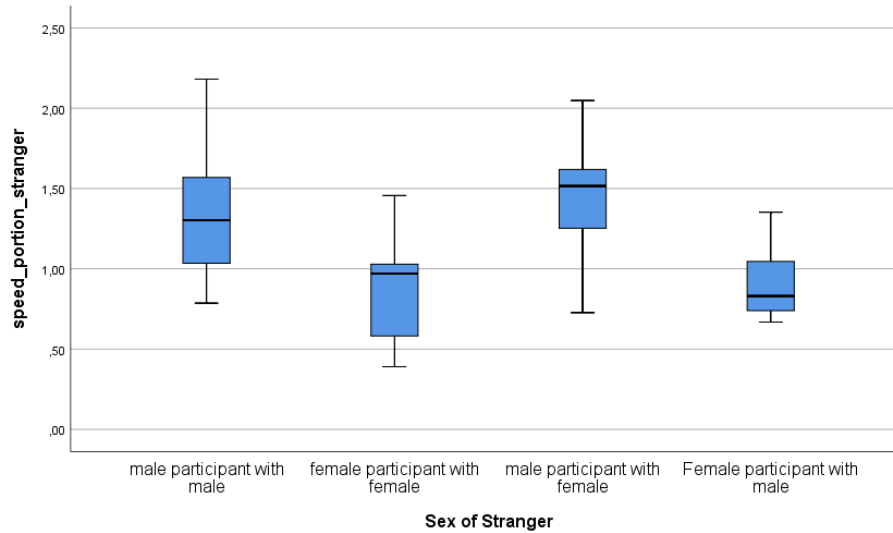


Figure 7. Boxplots for the sex of the participant and the sex of the stranger for the speed of the first portion of the meal. There was no difference between males eating with males and males eating with females (MD = 0.115, SED = 0.167, $p = 0.496$). There was also no difference between females eating with females and females eating with males (MD = 0.017, SED = 0.134, $p = 0.903$).

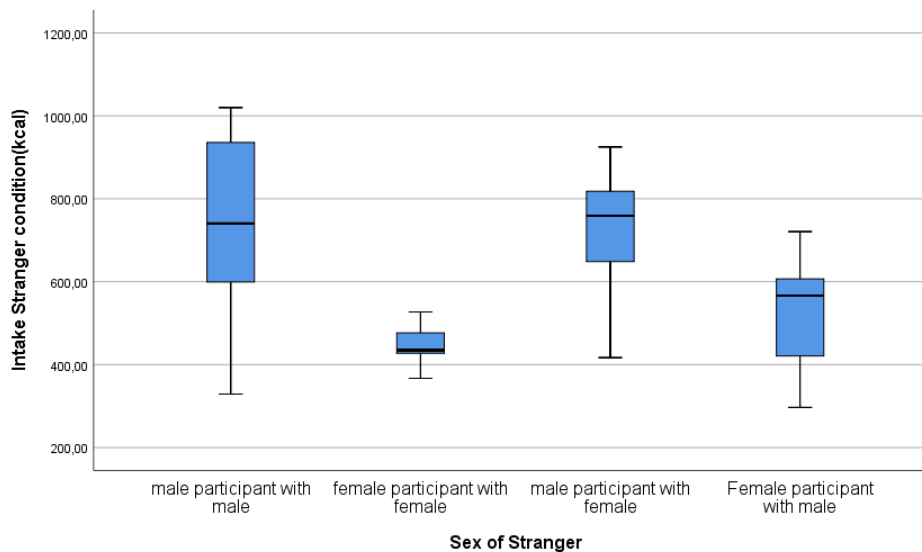


Figure 8. Boxplots for the sex of the participant and the sex of the stranger looking at the intake in the stranger condition. There was no difference between males eating with males and males eating with females (MD = 17.39, SED = 100.32, $p = 0.864$). There was also no difference between females eating with females and females eating with males (MD = 81.60, SED = 60.78, $p = 0.206$). Intake was already shown to be different between males and females in the results section and therefore not assessed here.

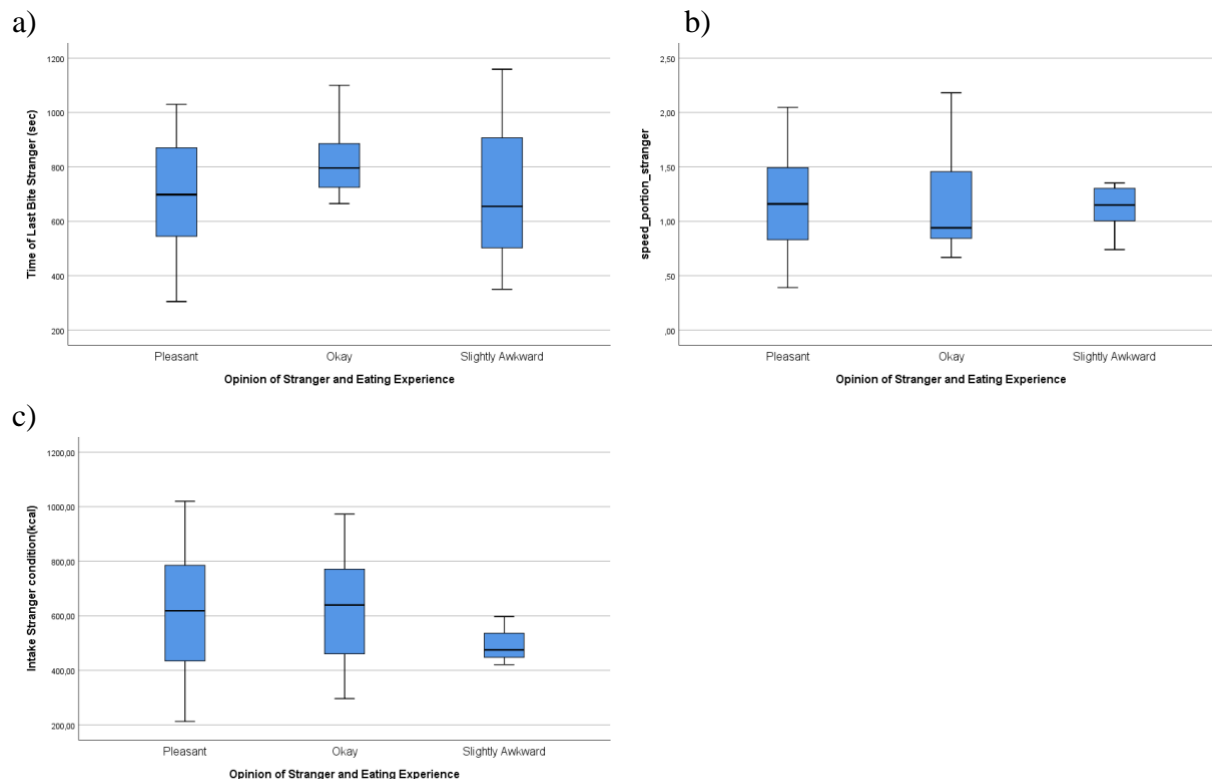


Figure 9. Boxplots with the opinion of the stranger and the experience with eating behaviour. **a)** There was no difference in duration of meal when grouped by the opinion of the stranger and the experience ($F(2, 34)$, [1.14], $p = 0.331$). **b)** There was no difference in speed of first portion when grouped by the opinion of the stranger and the experience ($F(2,44)$, [0.046], $p=0.956$). **c)** there was also no difference in intake when grouped by the opinion of the stranger and the experience ($F(2,33)$, [0.528], $p = 0.595$).

11. Participant Comments About Companion

It is likely that the participants responses to the question “How was it eating with a stranger? Describe them and the experience in a few words.” cannot be assumed to be fully valid. The questionnaires were filled out while sitting across from the stranger and it is possible that this influenced people’s responses. Some of the participants are friends with the researcher and they made comments about the meal that were not always in line with the responses. One participant remarked that it was “nice experience with a kind person” and later commented to the researcher along the lines of “he finished before I was ready to finish but I was too uncomfortable to keep eating when he had stopped”. Some other friends of the researcher who participated stated similar views and therefore it is assumed that some strangers may also not have put down their honest opinion.

For future research it may be beneficial to have the participants fill out the questions relating to the stranger later that day so that they still remember the experience, but they do not feel the pressure of the stranger sitting across from them. Another suggestion would be to have a few questions relating to the experience having distinct categorical answers.

12. Correlation between eating questionnaire and eating behaviour

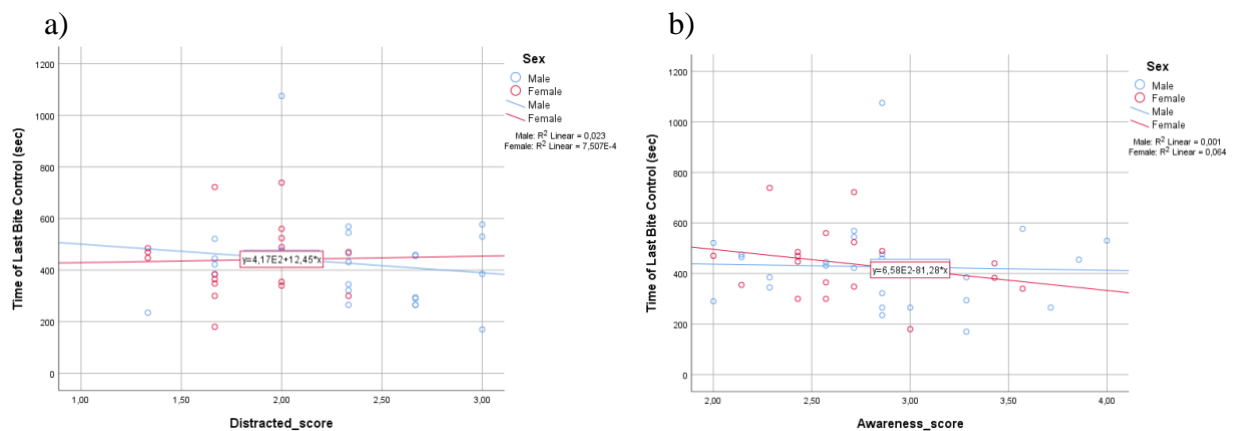


Figure 10. Scatterplot for time of last bite in the control condition by a) distracted score and b) awareness score. There was no correlation between participants when grouped together or when males and females were analyzed separately. This was also done for the friend condition and stranger condition and there was also no correlation. Visually there were also no distinct groupings of participants in the scatterplot and therefore it was not explored further.

13. Investigating personality and eating behaviour

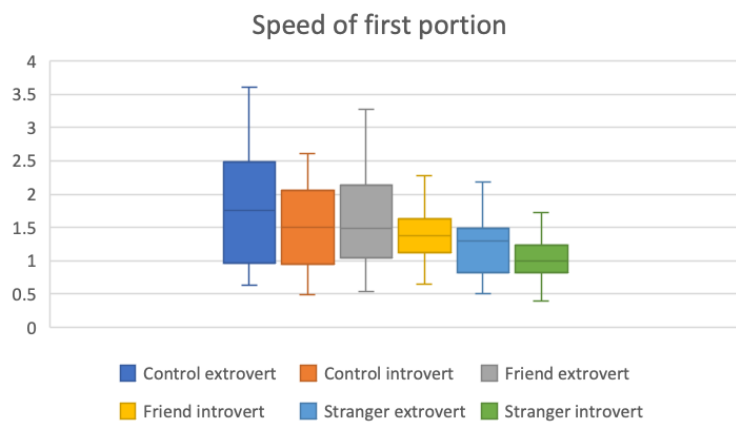


Figure 11. Boxplots for the speed of the first portion for introverted and extroverted participants. There were no significant differences between the two types for any of the three conditions ($p = 0.118$, $p = 0.220$, $p = 0.927$, respectively). Duration and intake for introverted and extroverted were also analyzed and had no differences.

Participant Speculations About this Study

1. If the walls were going to be painted different colours and intake was going to be assessed.
2. If different types of music were going to be played and intake was going to be assessed.

3. If different objects were going to be placed in the room as distractions and intake was going to be assessed.
4. Some participants joked about racing their friend to finish the whole serving bowl of food.