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Commensality or Reverie in Eating? Exploring the Solo Dining Experience

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ABSTRACT

Commensality, the act of eating together, is commonly associated with many benefits. Dining solo, in contrast, is frequently connected to adverse effects on a person. There is a growing interest in human-computer interaction (HCI) and design in how innovations can enhance eating experiences by, for example, facilitating commensality. The steadily growing number of people eating alone and the associated risks beg the question of how HCI and design could contribute to and improve the solo dining experience and whether or not mimicking or facilitating commensality is what solo diners want. This two-phased study reports on the context exploration of the multimodal solitary dining experience. In the first phase, we scoped the literature describing the benefits and drawbacks of solo dining and commensality. For the second phase, a digital food diary was developed and completed by six solo diners to collect further insights and user requirements. Photos and annotations collected as part of the food diary were analyzed using content analysis. The results indicate several advantages of eating alone, including feeling relaxed, perceiving solo dining as a moment of self-pampering, and appreciating the cooking experience. Overall, it seems that solo dining is not merely a lack of commensality, but a unique experience in and of itself, where people seem to strive towards finding reverie in eating.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in interaction design**.

KEYWORDS

commensality; solo dining; food diary; scoping review; eating experience

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1 INTRODUCTION

Commensality — referring to the act of eating together or eating at the same table [31] — can carry significant symbolic and normative meaning [71]. This form of sharing a meal is commonly associated with benefits that go beyond the material qualities of the food [6, 12, 13]. The act of eating a meal alone — also referred to as “solo-dining” — is, in contrast, often perceived critically and less pleasurable to most people [20, 38]. In addition, eating by oneself is frequently associated with loneliness [6, 8] and unhappiness [5]. Nonetheless, eating alone has become an accustomed practice of modern life, and the topic has generated a vast number of studies investigating the individualization of eating patterns and the changes in commensality [27, 76] and occasional appreciation of eating alone [45, 57, 68].

In the context of human-computer interaction (HCI), different projects have explored various ways of enhancing the solo eating experience as part of “digital or computational commensality” [35, 58, 65]. Solutions include systems that allow bridging the temporal and spatial distance between remote diners [56], augmenting the eating experience [72, 73] or creating artificial dining companions that can replace the human counterparts [34, 49, 49]. It seems that most solutions start from the question of “How can we bring commensality to this eating experience?”. However, this line of reasoning implies that the solo dining experience is merely a lack of commensal eating elements and that all solo diners prefer a shared eating experience. There is a lack of research exploring the distinct solo dining experience and how aspects people already seem to enjoy could be enhanced further.

With this qualitative study, we aim to address this gap, and we try to open up a new research branch exploring how to increase and support the solo dining experience. This study is part of a larger research project exploring how HCI solutions can effectively support the solo dining experience. We followed a human-centered design approach for this study, consisting of three phases. This paper reports on the first two phases using the following qualitative



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research questions [1]. We first focused on understanding the research context and, as such, ground the research in the background and related work with a scoping review. With this scoping review, we address the following questions.

- *RQ1 What are the benefits and drawbacks of solo dining and commensality?*
- *RQ2 How can the solo dining experience be enhanced?*
- *RQ3 What technologies are being currently used to enhance the experience of solo dining?*

We included literature relating to solo dining and commensality because initially, we reasoned that improving the solitary dining experience was probably best done by mimicking aspects of the social dining experience (commensality). With the foundation of the literature review, we proceeded in phase two to focus on identifying more specific user needs using the following question.

- *RQ4 How do solo diners perceive the practice of eating alone?*

We will conclude the paper with our insights into the multimodal solo dining experience and a set of design recommendations.

2 PHASE ONE: SCOPING LITERATURE REVIEW

In the first phase of the project, we familiarized ourselves with research findings relevant to the context of the study. We used a scoping review to identify and examine characteristics relating to commensality and the experience of solo dining and approaches to increase the solitary dining experience. Scoping literature reviews allow to examine the range and nature of a particular research topic and identify gaps in the literature [61].

2.1 Method

2.1.1 Protocol. The “Preferred Reporting Items for Systematic Reviews and Meta-Analyses” (PRISMA) extension for scoping reviews was followed to identify core themes [69].

2.1.2 Eligibility criteria and information sources. Published articles on the topic of *commensality* and *solo dining* were searched using multiple search terms. The inclusion criteria included: a) Published article and b) English language publication. Both quantitative and qualitative studies were included. As recent publications were deemed more relevant to the topic, only articles dating from 2010 onwards were selected. The databases used for the search are Scopus and Web of Science Core Collection. We conducted the searches in July 2020 and imported all references to EndNote X9.

2.1.3 Search. We preliminary assessed five food-related review papers that focused on solo diners’ experiences as well as HCI and dining-related topics [2, 4, 58, 65, 76] to establish search terms and identify synonyms for those terms. We carried out a three-step search for this scoping review. The first step involved an initial search in the databases Scopus and Web of Science Core Collection. Search terms applied were “commensality”, “solo dining”, and “solo diner” in combination with terms such as “benefits”, “behavior”, “experience”, “environment” (and synonyms). From a rapid evaluation of the first inquiry, exclusion sub-areas were determined, and

the search terms “eating alone”, “companionless eating”, “human-food-interaction” and “de-structuration of meals” were identified. A second exploration included said terms.

We compiled data of the retrieved records into an Excel sheet and removed duplicates. The first author reviewed titles and abstracts, and articles were excluded that were deemed irrelevant to the study. This step was repeated three days later to avoid bias. A review of the list of references from the included articles was performed to ensure any relevant work was not excluded. Five additional articles were identified through this step. Another week later, a full-text evaluation was performed to avoid bias and exclusion of important records. The second author reviewed the included papers based on their title and abstract to assess suitability in a consequential step.

2.1.4 Data charting process and data items. For the data charting process, we captured relevant information electronically. We used the categories of (1) Benefits of commensality; (2) Drawbacks of commensality; (3) Benefits of eating alone; (4) Drawbacks of eating alone; (5) Enhancing the solo eating experience; (6) Technology solutions to enhance the solo eating experience. We synthesized the charted data in a narrative summary.

2.2 Results

2.2.1 Studies identified. Initial database searches retrieved 1,114 studies. After the automated removal of duplicates, 552 studies remained, with five additional records identified through searching other sources. Preliminary screening led to the exclusion of 496 studies. Of the remaining 61 studies (for which we obtained the full text), 49 studies met the inclusion criteria and were included in the narrative synthesis (see Figure 1).

2.2.2 Characteristics of included studies. The 49 included articles were published between 2010 to 2020. Most of the studies focused on the quantitative aspects of commensality. Studies varied from interviews with approximately 15 people to quantitative studies with up to 500 people. Multiple countries were the focus of exploration, ranging from Korea to Spain.

2.2.3 Benefits of commensality. Within the scoped studies, commensality was often described as having many nutritional and social benefits. Studies indicated that eating together is healthier than eating alone [13] and that people eating in the company of others have a lower prevalence of obesity than solo eaters [13, 20, 33]. This was connected to seemingly eating less, which was explained by the social norms that appear due to the presence of other people [20]. Food intake of people sharing a meal was indicated to have a better nutritional value, due to a better food intake and choice, and fewer health problems that relate to nutrition [58]. Lee et al. [43] concluded that people eating in the company of others eat more regularly and slowly, and eat more grains, protein, vegetables and fruits. In addition, they also consume less processed foods, salty foods, and animal fats. Others stated that commensality results in less drug, alcohol or tobacco use [14, 43]. In addition, eating together was connected to a strict adherence to mealtimes [20] and better taste or higher food satisfaction [58, 65].

Other benefits associated with commensality relate to its ability to create a sense of community [32] and its role as a source of cultural heritage [17]. Commensality was seen to improve the

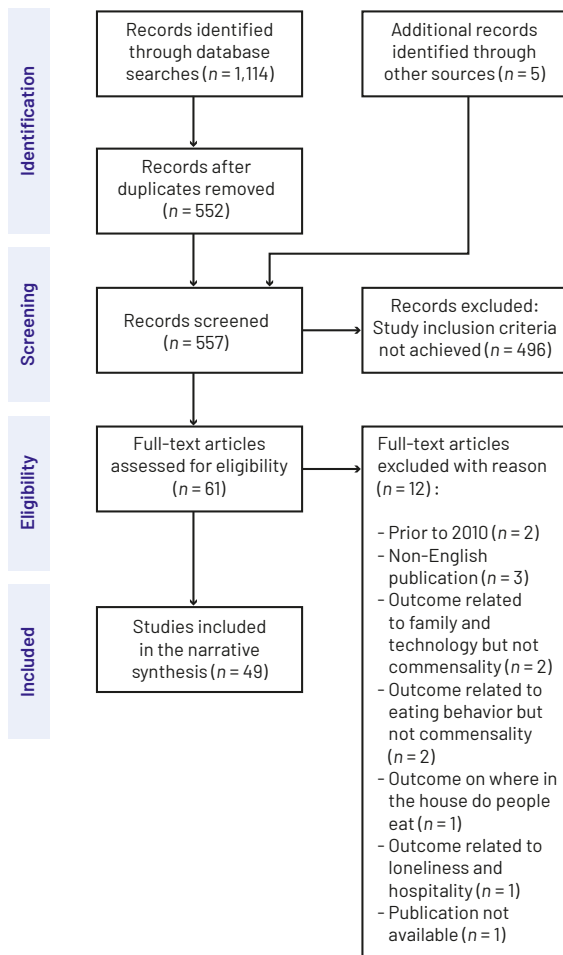


Figure 1: PRISMA flow chart showing the scoping review process.

eating experience and contribute to relaxation [5, 13, 17]. It lets people discover new dishes [14] and even contributed to tourism and cross-cultural contacts since it brings visitors together with local people and local culture [33]. Overall, people sharing a meal were reported to be more likely to feel better about themselves in terms of happiness and their life [36] and eating together was seen as being more enjoyable than eating alone [5, 70]. As such, social dining was seen as comforting and of equal importance as the food consumed [5, 8, 17] and conversations being a key ingredient [70]. Eating together was seen to increase aspects of sociability (bonding, belonging or conviviality) [5, 13–15, 17, 20, 22, 23, 36, 47, 48, 62]. This social bonding was seen to create intimacy between people [20], a sense of security [5], common identity or belonging [36, 48]. Marovelli [47] researched food sharing initiatives in London and discovered that sharing the same table while eating contributes to bonding through establishing social relationships, which was

described by Giacoman [23] as the most important function of commensality. Furthermore, commensality was described to reduce loneliness and increase interconnectedness between people [47].

2.2.4 Drawbacks of commensality. The scoped studies also pointed out several drawbacks associated with commensality. It seems that people eating in the company of others tend to eat more due to longer mealtimes [8, 20], and the larger the group when dining out, the more money is spent [10]. Furthermore, diners can experience the social aspect negatively, such as feeling obliged to find topics of discussion and avoid silence [14]. Furthermore, commensality appears to be negative when there is no affinity among the people eating together or when the diner feels like an outsider, causing tensions or conflicts between people sharing a meal [23, 62, 66]. In some cultures and commensal units, the existing rigid norms and formal manners can be a source of stress, for example, while eating at one's workplace or while sharing a meal in public [14, 15, 23]. Danesi [14] points out additional drawbacks of commensality for young adults, including feeling judged by their companions, especially those who follow a special diet or do not eat a large variety of food.

2.2.5 Benefits of eating alone. The scoped articles mentioned different advantages of eating by oneself, including freedom of choice and timing; a more relaxing experience; focus on the food; having time and space for oneself; and being less time-consuming. Aspects of freedom relate to the choice of food and feeling less committed to eating times [14, 70]. Freedom of choice was also pointed out as a general advantage of eating solo [20, 29, 36, 68]. Freedom aspects include not having to negotiate with others [52] also in regards to location and budget [14]. Finally, freedom is also related to deciding and controlling what to eat without being pressured by other people's views and not having to please anyone, except oneself [68]. Another benefit was mentioned in regards to perceived relaxation and perceiving the moment as self-indulging [14, 36, 50]. Some solo diners seem to experience fewer distractions when eating alone and thus have the opportunity to pay more attention to the food [14] and to focus on what they eat [52]. Other solo diners enjoy having the time and space for themselves [68]. Eating alone was also perceived to save time when eating but also during the preparation of food [5, 36, 52, 76].

2.2.6 Drawbacks of eating alone. The scoped papers also point towards different disadvantages, including health and nutritional disadvantages; changed eating habits; lack of social interaction; and when eating alone in a restaurant or public space. Health and nutritional disadvantages include an increase in abdominal obesity and a potentially increased risk for metabolic syndrome, which could lead to diabetes type 2 and cardiovascular diseases [41, 60]. Eating alone was seen to result in a higher prevalence of unhealthy eating behavior [43] and the effects seem to be more robust for men than women [41]. Solo diners seem to eat less fruit and vegetables [4, 68] and a generally decreased variation of food [68]. An explanation for the less nutritious food intake might be that cooking a variety of dishes is considered too much work for a person who is eating alone [32]. Solo diners were also pointed out to eat less home-cooked food in general, are less likely to eat at a table, have poor table manners, and eat quicker and less regularly [5, 14, 20].

Eating alone is considered to be less pleasurable [20, 38] not a proper meal [8] and indicative for feelings of solitude and social isolation [5, 48, 52, 68]. Therefore solo dining was often associated with loneliness [5, 8, 68] and linked to negative physical and emotional impacts [5]. This negative impact was seen to make people less motivated to prepare food [68]. Finally, negative experiences related to solo dining were boredom [8] and depressive symptoms [68].

The disadvantages of eating alone seem to be more pronounced when solo diners eat in a public space or restaurant. Danesi [14] determined that a fear of judgement leads solo diners to avoid going to a restaurant and choose fast food instead. This perceived stigmatization creates feelings of discomfort, embarrassment and shame when eating alone [5, 42] and lets solo diners fear being seen as a kind of loser [42]. It was also mentioned that solo diners often feel lonely when dining in public [29] and stressed due to feeling isolated [52]. The dining experience becomes functional for them (solo diners just finish their meal to get full) instead of pleasurable [5]. The perceived stigmatization might be the reason that solo diners' intentions to eat in a restaurant are higher in a restaurant with low crowding [26].

2.2.7 Enhancing the experience of solo diners. Vesnaver et al. [70] suggest that focusing on the pleasure of certain foods balances the reduced enjoyment of mealtime when eating alone. And Lee et al. [43] recommend several measures to enhance the healthy food intake in people who eat alone. These include providing information on healthy menus for eating alone by the government, developing cooking programs tailored to solo diners to educate them about healthy cooking or creating a kitchen sharing system. Additional measures include providing healthy meals for solo diners and developing food delivery apps to become more user-friendly for people who eat alone. Furthermore, ready-made dishes and takeaway meal options can be seen as a relief by solo diners [66].

In a public context, solo diners use different techniques to enhance their eating experience. According to Brown et al. [5], solo diners use some distractions. For example, by observing other restaurant visitors or reading a book. Furthermore, they use their smartphone as a virtual dining companion or to connect with others in online communities. In addition, solo diners take photographs of the food and send them to others [48]. Solo diners prefer tables surrounding an open kitchen because they feel like they are sitting next to other solo diners and are also separated from group diners [52]. Restaurants have developed several strategies to attract solo diners, including providing one-person seating arrangements and training staff to welcome solo diners appropriately. Restaurants are also developing concepts that explicitly focus on improving the solo dining experience. For example, the strategy "Go Solo" contributes to an inclusive environment for solo diners [5]. Others exclusively cater to people eating alone, offer large stuffed animals as dinner companions [16], or bring diners together by letting them share a table [5].

2.2.8 Technological solutions to enhance the experience of solo diners. Information and communication technology (ICT) allows creating a sense of companionship [65] and commercial and newly developed prototypes seem to positively influence mealtime routines [19, 25, 51]. In the context of shared eating experiences, ICT

devices are used as a source of entertainment and contribute to a shared sense of conviviality [18, 19].

The proliferation of blogs and discussion forums on the internet offers solo diners the opportunity to link up with a "digital community" [48] and possibilities for remote dining experiences are enabled through the use of videoconferencing technologies. As mentioned by Ferdous et al. [17], even minimal social connectedness could improve the dining experience of solitary eaters. The development of technology to increase the eating experience focused on the shared [19, 51, 53, 55, 74] as well as solo dining context [25, 30, 32, 34, 39, 54, 67, 75]. HCI solutions for solo diners, can be divided into digital technologies that enable solo diners to connect with other people and technologies focused on making eating alone more commensal.

The system "Food Media" is an intuitive interaction platform designed to engage remote people in entertainment and social communication. The system consists of a video connection enhanced with multi-sensory interactions such as touch, smell, and taste. As such, it transports the experience of family dining to people who are eating alone remotely from each other [74]. Wei et al. [75] designed the system "CoDine" as a dining table embedded with interactive subsystems that augment and recreate the experience of communal family dining to create a sense of coexistence among remote family members. CoDine is described as a solution for solo eaters to enhance the solitary diner experience by creating digital commensality. Korsgaard et al. [39] used mixed-reality conversations and virtual environments with the elderly to give the impression of eating in a living room. The FridgeMatch application is an online social network for food leftovers, connecting strangers to cook and eat together. By signing into their Facebook account, the users begin the matching process by entering ingredients, availability to have dinner and a location where they can offer the dinner [32]. The system "KIZUNA" is a tele-dining system which enables diners to enjoy a meal together by transmitting recorded video messages virtually. Tests suggest that using the system can influence the diners' communication and eating behaviors [30]. Grevet et al. [25] developed a system that shared basic information on a screen (e.g., eating at home or out) about the shared eating-related activities of a group of friends. Their findings suggest that the system conveys a sense of connection and can be a catalyst for rich interaction and communication. Nam et al. [54] designed "Dinner Party", a tabletop application with which a solo diner can have a dinner party with virtual, animated creatures. The authors concluded that people might feel less lonely having the table as an imaginary friend in a solitary modern society. Khot et al. [34] designed a speculative robot named "FoBo", a robotic dining companion that can behave similarly to a human counterpart. Takahashi et al. [67] developed a virtual co-eating system that places a fictional character into the real space (using virtual reality) as a partner to eat together. The authors concluded that by facilitating a conversation with an empathetic virtual partner, the system provides a better eating-alone experience.

2.3 Discussion

We used a scoping literature review to gain an understanding of how the eating experience of sharing a meal versus eating alone

is perceived and which advantages and drawbacks are associated with the differing situations. We discuss the scoping review findings regarding the three research questions used for the study.

RQ1 What are the benefits and drawbacks of solo dining and commensality?

Eating alone was often positioned in contrast to commensality, perceived negatively and associated with stigma. A person who eats alone was described in many studies as lonely or having failed to build social relationships. Eating by oneself was also pointed out to carry health-related disadvantages and connected to negative health implications such as metabolic syndrome and or risk of depression. However, studies also indicate that solo diners appreciate certain advantages when eating alone [68]. For instance, solo diners experience a sense of freedom relating to the *freedom of food choice* (what to eat) and *time freedom* (when and for how long to eat). They can *feel relaxed* during mealtime since they can enjoy *a moment just for themselves* lacking external expectations and pressure. In addition, some solo diners mentioned perceiving fewer distractions while eating, which helped them pay *more attention to the food*. People who eat alone were pointed out to be often living alone, either part of the younger and urban generations or older adults — particularly widows.

RQ2 How can the solo eating experience be enhanced?

Just few authors elaborated on how to improve the experience of eating alone. Suggestions included *adjusting the effort spent into cooking*, focusing on multisensory aspects such as *sound* or *visual* elements, using *technological* (e.g., a smartphone) or *non-technological* distractions (e.g., a book), *adding features of social connectedness* or shifting the *focus on enjoying the cooking or eating experience*. These recommendations seem to either focus on increasing the health aspect of solo dining or on a public context where stigma might play a more significant role. It remains unclear which specific aspects of solo dining could and should be improved when the dining takes place in the home environment.

RQ3 What technologies are being currently used to enhance the experience of eating alone?

The scoped literature suggests that the developed HCI solutions aim to connect solo diners with others or make the solitary dining experience more pleasurable by recreating elements of commensality. The technologies that connected solo diners with others included tele-dining and mixed reality dining systems, which focus on creating “digital commensality” by connecting remote people to share a meal. The technologies that focused on improving the solo dining experience often included artificial virtual dining companions. This suggests that research efforts might be based on the hypothesis that essential factors of commensality can be recreated in a digital space. It also needs to be considered that many of the identified HCI solutions to enhance the experience of eating alone require installing sophisticated hardware and software, which might prevent a broader use of such technologies by “real-world” solo diners. Furthermore, there seems to be little focus on improving the solitary dining experience by strengthening the advantages of solo dining. This might be due to a lack of involvement of solo

diners in the development process or the preconception that research already indicates a clear picture of what solo diners crave. We focused on gathering user needs and insights to address this gap by deploying a food diary. In the next section, we outline the details of this second phase of the research.

3 PHASE TWO: FOOD DIARY

Several advantages and disadvantages of commensality and dining alone are mentioned within the existing literature. In the second phase of the research, we focused on the following research question: *RQ4 How do solo diners perceive the practice of eating alone?* using a food diary to collect user insights. Diary studies can take on different forms to encourage users to reflect on their experience and essential features influencing the experience [3]. The diary study we used was based on an interpretive paradigm which focuses on how individuals construct meaning in their lives rather than determining generalizable effects and consequences [7, 24]. The diary produced qualitative and quantitative data, which was analyzed using direct content analysis [28] and descriptive statistics [21].

3.1 Method

3.1.1 Study procedure. In the food diary, we focused on the dining experience because it is the meal commonly eaten within a shared eating setting [60]. The food diary was distributed in the form of an online survey (Qualtrics platform) that participants could fill out digitally. Photos of the eating experience could be uploaded as part of the survey. Next to the food diary part, respondents received an introductory online survey on the first day and a final survey upon completion, see Table 1. Participants were asked to respond to nine questions in the first survey and rate the solo dining experience. Participants were asked to fill out a diary entry form on four different days for the food diary during a two-week period. We focused on four occasions since we expected participants to dine occasionally with others. The pilot we ran also indicated that filling out the survey and uploading the photos took quite some time. Respondents were asked to fill out the diary entry form only after the completion of their dinner but also to capture moments with their smartphone camera during the dining experience. Guidance on filling out the diary entry was provided by giving additional prompts (e.g., what type of food was eaten, the mood or dining setting (formal/casual)). The final survey focused on the advantages of solo dining and the specific needs of the solitary diner during the evening meal. This study was approved by the University of Twente, and participants provided informed written consent.

3.1.2 Sample. With this diary study, we target occasional or regular solo diners, guaranteeing that the participants are accustomed to the experience of eating alone. We aimed for people living in the Netherlands that eat dinner alone at least two times per week. We report on this in Table 2. We used convenience sampling [9] by recruiting participants through our personal network for this study. We, furthermore, posted a flyer and link to the study on social media. The respondents received a €20 gift voucher as compensation for their participation. The diaries were completed from November 2020 to January 2021. All participants were of Dutch nationality and lived in the Netherlands. Four participants were female, see Table 2.

Table 1: Overview of food diary components

Part	Detail	Aspect
First survey	Six questions covering demographic details	Age, gender, occupation, country, town, time living alone
	Two questions covering eating behavior	Dietary restrictions, instances eating alone per week
	Rating of two items on a 5-point Likert scale (1=very satisfying to 5=very unsatisfying)	Eating alone experience and cooking for oneself
Food diary	Two text entries	Participant ID and date of entry
	One photo entry	Instructions to take a photo of dining setting/environment
	Five text entries	Instructions to description the (1) cooking process; (2) the food; (3) solo dining experience; (4) eating environment
	Five photo entries and accompanying text entry	Instructions to take at least one photo of anything that influences the eating experience or is meaningful or important. The accompanying text entry field should be used to describe the photo and describe its meaning to the user.
Last survey	One text entry	Participant ID
	Rating of seven items on a 5-point Likert scale (1=strongly disagree to 5=strongly agree)	Rating of solo dining aspects mentioned in the literature including (1) enjoyment of freedom; (2) taking less time; (3) more relaxing; (4) time for oneself; (5) lack of manners and etiquette; (6) possibility to eat healthier; (7) focus on the food.
	Rating of three items on a 5-point Likert scale (1=not at all important to 5=extremely important)	Rating aspects relating to (1) the quality of the food; (2) being entertained; (3) being socially connected.
	Rating of eight items on a 5-point Likert scale (1=strongly disagree to 5=strongly agree)	Rating of aspects participants miss when eating alone (1) socialising; (2) having company; (3) being more entertained; (4) experience to be more playful; (5) experience to be more fun/celebratory; (6) increased social interaction; (7) to eat more healthy; (8) interact and share the experience with other solo diners.
	Three text entries	Three questions covering (1) aspects of commensality currently missing when eating alone; (2) how the solo dining experience could become more pleasurable; (3) description of an ideal dinner scenario.
	Rating of two items on a 5-point Likert scale (1=very satisfying to 5=very unsatisfying)	Rating of aspects the (1) experience of cooking for oneself; (2) eating alone.

Table 2: Sample of food diary study (n=6)

Country	the Netherlands (n=6)
Gender	Male (n=2) • Female (n=4)
Age	20-30 years (n=1) • 31-40 years (n=3) • 41-50 years (n=0) • 51-60 years (n=2)
Living alone	1-2 years (n=1) • 2-3 years (n=1) • more than 3 years (n=4)
Eating alone	0-1 days a week (n=1) • 2-3 days a week (n=0) • 4-5 days a week (n=3) • 6-7 days a week (n=2)
Diet	None (n=3) • Whole food plant based (n=1) • Low on FODMAPs (n=1) • High protein (n=1)
Occupation	IT (n=1) • Secretary (n=1) • Finance (n=1) • Construction (n=1) • Communication (n=1) • Marketing (n=1)

3.1.3 Analysis. We used direct qualitative content analysis [28] to analyze the qualitative data. Direct content analysis focuses on validating or extending a specific framework or theory and helps to predetermine variables of interest that can, in turn, guide the analysis process. We will refer to such predetermined topic of interest as *a priori codes*. A priori codes are predetermined codes we were interested in. We derived them from our scoping literature review results and included them in the themes of “advantages of solo dining” or “aspects that improve the experience”. Direct qualitative analysis also allows accounting for codes and themes outside the initial determined a priori codes. We will refer to these findings as *emergent codes*.

First, the data was retrieved from Qualtrics and exported into an Excel document. We started familiarizing ourselves with the data by reviewing the entries. We also developed operational definitions of the thirteen a priori codes. We then conducted an initial analysis

of four diary entries by applying the a priori codes to the text data. The provided images were used as complementary data to contextualize the text entries. Text that could not be coded into one of our a priori codes was coded with another label as an emergent code. Emergent codes were refined, named and combined with an operational definition for further analysis. We then reviewed and applied the defined codes to all six food diary entries. We also recorded how often we identified a specific code positively (respondent mentioned the code in a positive context) or negatively (respondent mentioned the code in a negative context) within the diary entries. The code’s recurrence was counted, providing a code summary that showed which codes were most frequently mentioned. The different themes were clustered into main themes (see Table 3).

The initial and final surveys were retrieved from Qualtrics and exported into an Excel document. Descriptive statistics [21] were used to present and analyze the data.

3.2 Results

3.2.1 Diary entries. Five participants completed all four diary entries, and one participant completed only two diary entries. Most of the participants (four out of six) found both eating and cooking alone somewhat or very satisfying. Table 3 shows the outcome of the coding process. In addition to the a priori themes of “advantages of solo dining” and “aspects that improve the experience”, we defined three additional themes titled “practical aspects”, “food-related quality” and “experiential qualities”. We also defined eleven additional emergent codes during the analysis process.

The most cited advantage of eating alone based on our a priori codes that we derived from the literature was *feeling relaxed* (17),

Table 3: Overview of final codes

	A priori code	Definition	Pos.	Neg.	Total
Advantage of solo dining	Freedom of what to eat	Freedom to decide what food to eat	1	0	1
	Time freedom	Deciding at what time to eat (not need to stick to a schedule) and how long to take to eat or how long to cook	1	0	1
	Feeling relaxed	Feeling relaxed as part of the meal experience	16	1	17
	No etiquette or manners	Not having to worry about etiquette or manners	9	0	9
	Focus on food	Being able to exclusively pay attention to the food, its flavors, taste and appearance	9	0	9
	Time for oneself	Enjoying having a moment “just for myself”	1	0	1
Improving the experience	Effort into the cooking	Amount of effort put into cooking	7	0	7
	Sound experience	Listening to something while cooking/ eating	6	0	6
	Visual experience	Watching something (TV, movie, TV series) while cooking/ eating	27	0	27
	Technological distraction	Use of mobile technologies (smartphone or tablet) while cooking/ eating	3	0	3
	Non-technological distraction	Use of printed media (Magazines, books or brochures) while cooking/ eating	4	0	4
	Social connectedness	Experience of feeling close and connected to others while cooking/ eating	0	1	1
	Enjoyment of eating/ cooking	Eating as an enjoyable/ pleasurable/ fun/ celebratory experience	5	1	6
	Emergent code	Definition	Pos.	Neg.	Total
Practical asp.	Cooking with what I have	Cooking with the ingredients available to the participant	12	0	12
	Practicality in eating and cooking	Cooking and eating easy dishes and eating quickly. Not taking too much time or effort to prepare food or eating it	27	0	27
	Routine or established practice	Sticking to an established habit about how to cook, where or what to eat	7	0	7
Food qual.	Nutritional value of food	Focus on the nutrients or the nutritional value/ quality of the food	10	0	10
	Following dietary restrictions	Paying attention to the type of food consumed because of one's diet	3	0	3
	Food as memory/ seasonality	Memories brought back by food or enjoying the seasonality	11	0	11
Experiential qualities	Mindful eating	Playing full attention to experiences, cravings and physical cues when eating without distractions	3	0	3
	Experience of the environment	Environmental stimuli that have an impact on the experience of the participant	12	3	15
	Self-nurturing	Treating/ pampering yourself	10	1	11
	Impact on mood	Experience having an impact on participant's mood	0	3	3
	Focus on the cooking	Paying attention to the cooking process	2	0	2

followed by *focusing on the food* and not worrying about *etiquette or manners* (9 each). Participants referred once to each of the following advantages: *Freedom of what to eat*, *time freedom* and *time for oneself*. The most commonly named codes that could improve the solo dining experience related to some secondary or side-line activity (e.g., watching TV while eating). The most frequently named code was *visual experiences* (27), followed by putting some *effort into the cooking* (7), a *sound experience* (e.g., listening to something) (6), *enjoyment of the cooking or eating experience*, having a *non-technological distraction* (4) or *technological distraction* (3). It needs to be pointed out that some responses indicated that participants did not enjoy having any distractions while eating as it was preferred to focus exclusively on the food.

We defined eleven emergent codes (aspects not mentioned in the scoped literature) that participants referred to positively and negatively. The theme of *practical aspects* was most frequently named in regards to positive aspects. The theme contained the three codes of *practicality when eating and cooking* (27), *people cooking with what they have* (12), and following a *routine or established practice* (7). *Food-related qualities* also seem to play a role in the dining experience and codes under this theme included the codes seeing *food as memory/ seasonality* (11), focusing on *the nutritional*

value of the food item (10), *following dietary restrictions* (3). The third theme consisting of codes describing the *experiential qualities* of cooking and eating alone consisted of several codes referred to as positive and negative. The most frequently named code *experience of the environment/atmosphere* was named twelve times positive and three times as a negative aspect. Additional negative aspects included that solo dining *impacted one's mood* (3) and the experience being *self-nurturing* (1). However, the latter was also named in a positive way (10), along with *mindful eating* (3) and *focus on the cooking* (2).

3.2.2 Final survey. Figure 2 summarizes to what extent respondents agreed with the advantages of eating alone derived from the scoping review. Generally, respondents agreed with the benefits of freedom to choose when and what to eat and having time just for themselves. It needs to be pointed out that the latter was mentioned only once in the diary entries. Four out of six participants disagreed with the advantage of not having to worry about manners or etiquette, and only one participant evaluated this aspect as significant. Yet, some of the respondents' photographs displayed an informal eating setting, showing participants eating dinner at the coffee table in front of the TV. Others ate on the couch while covering their legs with a blanket. Furthermore, four out of six participants

disagreed with the statement that eating alone is more relaxing than eating with others. Three of six participants strongly disagreed with the statement that they were missing company when eating alone. Four of the six participants found cooking and eating alone very satisfying or satisfying. Two participants recognized cooking alone as somewhat unsatisfying, and one respondent rated eating alone as very unsatisfying.

To the open-ended question asking participants what they liked about eating with others that so far is not included when eating by themselves, participants mentioned the following aspects: Conviviality; companionship; cooking with others; conversations during and after mealtime; “making a moment” of the dinner time; talking about daily experiences; sharing the food; sharing the day; interacting with others; and having a chat.

3.3 Discussion

We used a digital food diary study to address our research question *RQ4 How do solo diners perceive the practice of eating alone?* and gain an understanding of the experience of solo diners. The results indicate that most participants experienced eating alone very or somewhat satisfying, and one participant found it very unsatisfying. This might seem unexpected as many studies indicate a negative perception of solo dining [5, 6, 14, 20, 59], and just a few indicate that people occasionally enjoy this way of eating [14, 45, 57].

The food diary and survey response indicate that not all features pointed out in the literature were relevant to the participants. For example, while participants frequently mentioned technological distraction (e.g., watching TV during cooking and eating) as positive, the aspect of social connectedness was deemed irrelevant. This might seem surprising as an established assumption appears to be that solo diners miss some social interaction. We also found three additional themes and eleven codes, including positive aspects when eating alone that were not mentioned as part of the literature we had scoped. We outline the mentioned advantages and potential design considerations below.

3.3.1 Freedom. Food diary study: Low agreement / Survey: High agreement Participants enjoyed both the freedom to choose what to eat and time freedom as they all strongly agreed with this aspect as part of the final survey. This confirms previous findings [45, 68]. Furthermore, the diary entries suggest that participants connect the freedom of choice and time since they frequently mentioned they like to cook with what they have at hand and want to be quick while cooking. An option to include such an aspect in an HCI project could be to support solo diners in creating spontaneous and effortless dishes.

3.3.2 Relaxation. Food diary study: High agreement / Survey: Low agreement Four of six participants disagreed with the statement, “I enjoy eating alone because it is more relaxing than eating with others”. However, in the diaries, comments related to relaxation were frequently mentioned. A potential explanation might be that participants felt relaxed during their solo dining experience but still perceived eating with others as more joyful than eating alone, as indicated by Nicolau i Torra et al. [57]. In the context of relaxation, enjoying the environment seems to play a role. Participants frequently mentioned enjoying an environment that was “quiet”

and provided an “relaxed” atmosphere. A possible HCI design could include features that evoke an intrinsic relaxation in the user (e.g., through sound, smell or visual effects) or develop a multi-sensory experience in which the user can immerse in and feel relaxed.

3.3.3 Decreased normative pressure. Food diary study: High agreement / Survey: Low agreement Four out of six participants disagreed with the statement that an advantage of eating alone is “Not having to worry about etiquette or manners”. However, contrary to these statements, the respondents’ photographs indicate an informal eating setting. For example, some respondents liked to eat in front of the TV or while sitting on the couch and covering their legs with a blanket. Earlier studies suggest that a lack of normative pressure is appreciated by people eating alone [68] and informal eating settings such as eating in front of the TV seem to be more casual and fun [63]. An HCI solution could incorporate such findings by creating a food environment that encourages the user to find an eating position or overall context of eating which feels comfortable to them rather than being based on established food-related norms.

3.3.4 Solo dining as me-time. Food diary study: Low agreement / Survey: No agreement The perception of solo dining as a moment to have time for oneself was only mentioned as part of the food diary, but not the surveys. However, this aspect of eating alone was pointed out previously to be a positive feature of eating alone [44, 59, 68]. A potential way to facilitate the “me-time” experience could be to allow participants to personalise the eating space.

3.3.5 Pastime activities. Food diary study: High agreement / Survey: High agreement The most frequently mentioned aspects that participants named in the food diary to improve the solo dining experience related to pastime activities. This indicates that solo diners combine their solo eating experience with distracting or entertaining activities confirming earlier studies [45, 57]. The most frequently mentioned code in this context was watching TV or Netflix. However, one respondent also stated that they did not enjoy having any distractions while eating and preferred to focus exclusively on their food. An aspect also mentioned in the study by Lemke and Schifferstein [45]. HCI design solutions should aim to minimise a distracting negative influence on the dinner while creating an entertaining environment. For example, by creating solutions that augment the food (e.g., projections to enhance the multisensory experience) rather than compete with it.

3.3.6 Cooking experience. Food diary study: High agreement / Survey: High agreement In the context of solo dining, food-related qualities and the cooking experience seem to be essential components. For example, some respondents prepared their favourite grandmother’s dish to evoke positive memories while consuming the meal. This is in line with research indicating that food categories such as “comfort food” can carry significant meaning and elevate one’s mood [46, 64]. Participants also mentioned an appreciation for the nutritional value of the food when eating alone, which is in line with results by Takeda and Melby [68]. They also expressed a sense of practicality by using ingredients available to them and often sticking to established habits and routines. Cooking appeared to be a relaxing or enjoyable activity for most of the participants and was, at times, the perfect prelude to an enjoyable

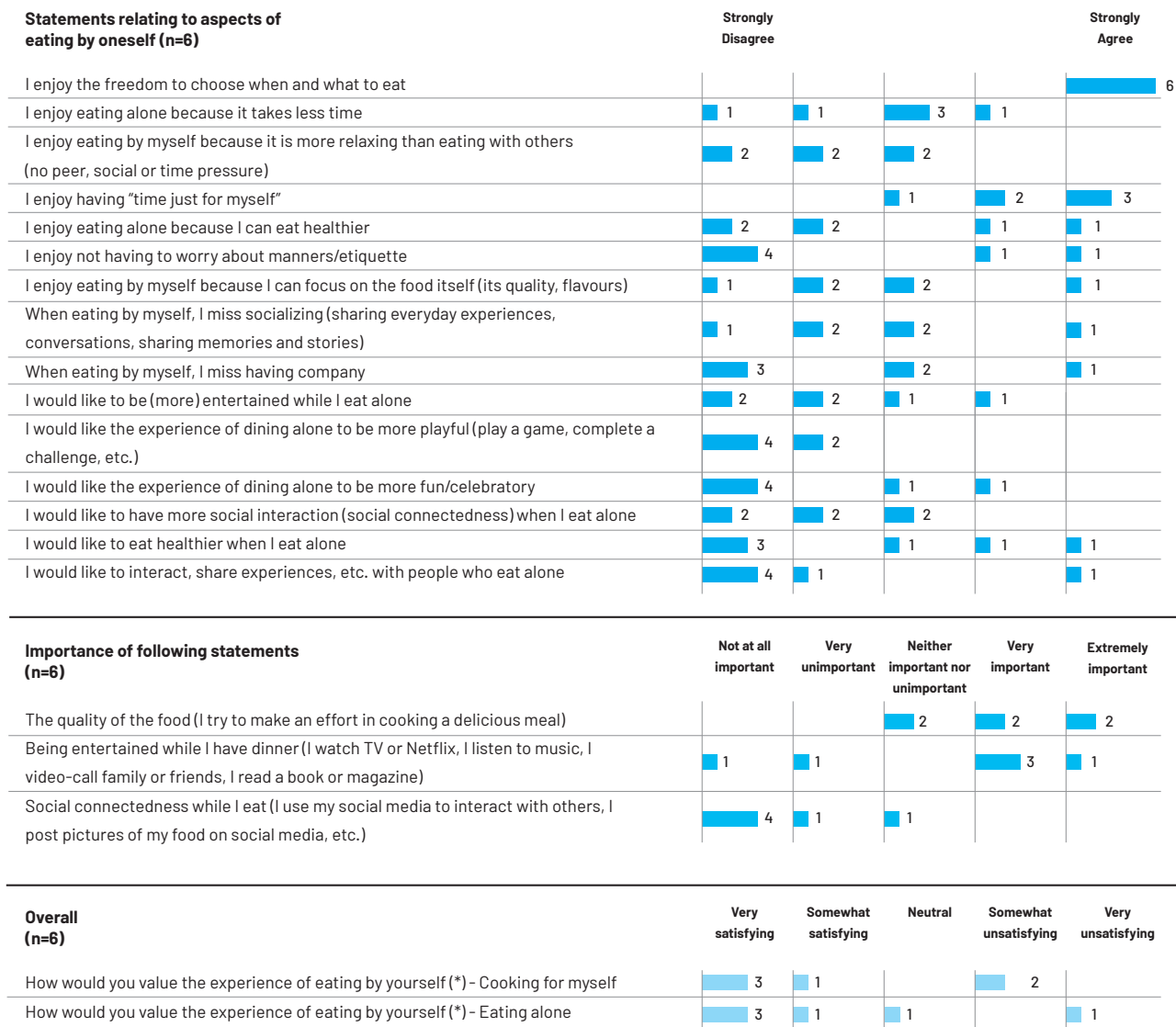


Figure 2: Participants were asked to rate the following aspects as part of the online food diary

solo dining experience. This aspect was also mentioned in previous studies [45, 57]. An HCI design aiming to enhance the eating experience could take a holistic perspective by focusing on the eating and the cooking experience. Furthermore, the solo diner seems to value dishes that are easy and quick to prepare.

3.3.7 *Self-nurturing. Food diary study: High agreement / Survey: No agreement* The food diaries suggest that solo diners can experience the solitary eating experience as a moment of self-nurturing. For example, participants indicated "putting some extra additives next to the food; it is like you are treating yourself to something special." A design could contribute to the experience as

a way to look-after-oneself. However, the survey results indicate that most participants are not looking for a more celebratory or fun occasion. Designs that aim to contribute to aspects of self-nurturing need to consider that the need to evoke such "special" moments when eating alone might not be a constant requirement but rather occur occasionally.

4 LIMITATIONS

There are several limitations regarding the presented research. We used an interpretivist paradigm that rarely focuses on generating generalizable results [7]. In addition, our small sample consisted

of West-European participants and focused on just four dinner occasions. The results of this study should, therefore, be interpreted with regard to the present research context and sample. For example, it should be considered that cultures (e.g., individualistic vs collectivistic) can value food and its consumption differently. Furthermore, the characteristics of dining companions (e.g., friend vs stranger) might play a role as they can influence the eating experience and amount that is eaten [11]. It also needs to be considered that we focused on the home environment rather than public solo dining, which people report experiencing as discomforting and stigmatizing [5, 59]. Future studies could also consider gathering further user details, for example, about their personality (e.g., being an extrovert or introvert), which might play a role in the solo dining experience.

In addition, it has been mentioned that solo diners use digital technology to share the experience with people digitally when eating alone. For example, diners text, send photos of the food, make video calls or listen to something to “break the silence” and avoid feeling alone [45, 57]. Furthermore, social phenomena such as Mukbang allow solo diners to experience a digital shared dining experience by watching others eat [27, 37]. The use of technology for these purposes was not explicitly explored as part of this research but could provide further insights.

5 CONCLUSION

Eating a meal can carry significant symbolic meaning and influence how food is eaten and perceived. While commensality is often regarded as the ideal form of food consumption, solo dining is perceived with scepticism. This research, consisting of two phases, explored the experience of solo diners and outlined insights that can be taken as a source of guidance and inspiration for future research. In the first phase, we performed a scoping review to get an idea of the benefits and drawbacks of commensality and solo dining and how to enhance the solo dining experience. Our scoping review indicated that enhancing solo dining is primarily viewed in the context of commensality-related aspects while missing out on factors unique to the solitary dining experience.

In the second phase, we focused on the in situ solo dining experience through a diary study. The results indicate that solo diners enjoy multiple aspects relating to the solitary eating experience. One way of encapsulating this is that participants seem to try to find the joy or “reverie” in the solo eating experience [40]. The need for social connectedness and wish to connect with other solo diners was rated low by the current study participants. It appears that, for our participants, the solo dining experience is unrelated to the commensal dining experience. Focusing on the mentioned positive solitary dining aspects as part of HCI design projects could potentially strengthen and improve the eating experience over and above focusing on a commensal experience. Overall, this research highlights that the experience of eating alone is not necessarily dependent on or related to commensality; it is standalone. It does not revolve around the absence of aspects of commensality; it revolves around the experience of eating alone. One way we could think about it is as “reverie” in the eating experience [40], not the joy of being alone, but the joy of eating alone — reverie in eating.

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