

Fostering food waste reduction through food practice temporalities

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Abstract:
This article examines how recommendations for preventing food waste are implemented, based on the practice theories framework and more specifically on Southerton's framework in which practices are performed according to temporal dispositions (What practice to carry out at a given time and how culturally derived orientations influence the allocation of practice over time?), temporal procedures (When to carry out this practice and its expected temporal demand?) and temporal sequences (How does the material and infrastructural environment affect this practice at this time?). This work is based on a two-step qualitative study combining a projective method coupled with semi-directive interviews with 23 participants, and observations with 11 of these 23 participants which helps identifying the temporalities and actions involved in implementing recommendations to reduce food waste at home. Results also lead to a complementary step based on the evaluation of a device (a "leftovers zone" in the fridge) by a group of 10 consumers. This article contributes to understanding the temporalities of daily food practices to reduce FW.

Manuscript File

FOSTERING FOOD WASTE REDUCTION THROUGH FOOD PRACTICE TEMPORALITIES

1. Introduction

Reducing food waste is one of the most challenging goals facing our food system, due to its environmental and economic impacts and for ethical reasons.[1] States are continually fostering programs, actions or campaigns to target consumer practices and encourage behavior change towards more sustainable food systems. The literature covering social marketing, sociology, and social psychology provides a good understanding of the drivers of food waste (FW) at consumer level. It has been demonstrated that FW depends on education, knowledge and attitude regarding food waste, personal norms, planning, shopping and leftover reuse routines (Secondi et al., 2015; Visschers et al., 2016; Stancu et al., 2016; Romani et al, 2018). On the basis of this knowledge, recommendations can be formulated to reduce food waste, mostly targeting social norms, knowledge and material aspects of food storage and consumption with interventions such as communication, cooking classes, fridge cameras, information on date labelling, and education to improve meal planning skills (Aschemann-Witzel, 2015; Reynolds et al., 2019; Romani et al., 2018).

Since food waste is the result of different daily practices, the reduction of food waste depends on the possibility to change practices resulting in food waste or assist anti-waste practices. Time is an important dimension of practices (Plessz and Etilé, 2019). Southerton developed a theoretical framework based on temporalities to study the much needed progression towards more sustainable consumption practices/ arrangements (Southerton, 2013). This includes the temporal dispositions (nature of the practice to carry out at a given time), the temporal procedures (moment to carry the practice), and the temporal sequences (influence of the material and infrastructural environment). This framework appeared to be relevant to study the changes towards more sustainable consumption practices/arrangements, and studying the temporalities of practices related to food waste seems relevant in order to reduce it. In addition, Southerton et al. (2012) point out that instruments to change food practices should take into account the temporalities of these and related practices. However, the temporal organization of daily practices has been under-estimated as a lever for action to reduce FW, although several studies have demonstrated that FW depends on temporal drivers (Watson and Meah, 2012, Nikolaus et al., 2018).

In order to fill this theoretical gap, this study aims at showing that researching the temporalities of practices is relevant to reduce FW. More precisely, based on Southerton's (2013) work on temporalities, we will study the temporal dispositions, the temporal procedures and the temporal sequences associated to household's actions to reduce food waste.

From a social marketing perspective, we must take into account reciprocal relationships between practices and temporality to ensure not only that households adopt the recommendations against FW, but also that this will result in a real reduction in FW. The expected output of this study is thus to support consumers in the reduction of food waste, by considering temporal settings of food consumption.

After a review of the literature, the conceptual framework of the article is detailed, before presenting the qualitative study, which analyzes how food practices related to the reduction of food waste derive from and are integrated into the temporal ordering of daily life through normative, skills-dependent material and infrastructural orders. Results also lead to a

[1] http://www.fao.org/food-loss-and-food-waste/en/ accessed 02/20/2020

complementary step based on the evaluation of a device (a “leftovers zone” in the fridge) by a group of 10 consumers. This study was carried out in France, however, the development of the conceptual framework and its implementation can be applied to other cultural contexts. Similarly, factors that lead to an increase in waste in countries other than France (Stancu et al, 2016; Romani et al, 2018) indicate that the “leftovers zone” in the fridge would also be useful in these contexts.

2. Literature review

Practice theories advocate an alternative approach to consumer studies which is not based on consumers’ rationality but focuses on practices rather than on individuals (Halkier and Jensen, 2011). Individuals are considered as practice carriers rather than decision makers. This theory considers the context of daily routine and how individuals co-construct practices by performing them (Evans et al., 2012; Warde, 2005). Practice theories analyze the “elements” that constitute practices (meaning, competence, material) (Hargreaves, 2011; Shove et al., 2012), and how practices are interconnected (Warde, 2005). Schatzki (2005), who describes practices as a set of actions, invites us to study the arrangements of actions in their spatiotemporal dimensions, which respond to the specificity of domestic life, consisting of a set of coordinated actions that form what can be called the daily routine of consumers (Wahlen, 2011).

In the context of this study, the practice approach is relevant because recent work on food waste (Alexander et al. 2013) shows that it is above all essential to understand the activities around food and to understand the social in a more global way. While there is almost unanimous recognition that most food waste is produced at the end of the food chain, little is known about household practices (Evans, 2014). Food waste is the result of a combination of actions and non-actions (Le Borgne, 2015), which means that looking at waste through the prism of individual rationality would only provide a partial answer to understanding this complex practice, which is rooted in temporality and the constraints of daily life. This is notably the work undertaken by Evans (2011), who stresses that recommendations regarding food should be made not by considering food as a behavior, but as a social practice, including food waste. Using a practice-based approach, he shows that the passage from 'food' to 'waste' arises as a consequence of the ways in which domestic practices are socially and materially organized (Evans, 2011b). In the same vein, Devaney and Davies (2017) show that with the same material contexts, recruitment to sustainable practices depend on social relations and dynamics in households. The refrigerator has a specific role in these dynamics: it can both contribute to the food devaluation as highlighted by Evans (2012) and to the implementation of more sustainable practices (Devaney and Davies, 2017). To understand this role and ability, it is however necessary to consider refrigeration and ridding practices as material negotiations within the household, and take into account the influence of individual reactions, family power dynamics and households routines (Waitt and Phillips, 2016).

Food waste is also associated with the question of time (Watson and Meah, 2012, Cappellini and Parsons, 2012): not consuming products, means giving them *time* to spoil; anticipating the right amounts to buy and cook, means taking into account *the timetables* of members of the household, etc. Mattila et al. (2019) tackled the issue of food waste from the perspective of everyday temporality. Their study identifies four bundles of practices that organize temporality: scheduling, pausing, stretching and synchronizing and which can thus be used to categorize actions to reduce waste according to the action they apply to time.

According to practice theories, it is accepted that time is a critical parameter/dimension (Plessz and Etilé, 2019), but the definitions and uses are not standardized. For example, some see it as

an allocated resource, and investigate practices through time use surveys (Plessz and Wahlen, 2020; Shove 2009), while others are interested in subjective time perceived when certain practices are performed (Woermann, 2015).

3. Conceptual framework: temporalities

Following on from practice theories studies, Southerton (2013) suggests an alternative to dominant behaviorist models of habits and routines, after observing that mainstream trends usually define them according to the individual's degree of awareness and reflexivity (Wood et al., 2002; Verplanken et al., 2005). Specifically, Southerton points out that there are three commonalities between habits and routines: non-reflexivity, recurrence and predictability, and the fact that they are culturally shared across social groups. Southerton therefore proposes a conceptual move so that habits and routines can be considered according to the temporal ordering of everyday life. He recalls that, according to the theory of practice approach of Warde and Southerton (2012), actions depend on dispositions towards, and procedures and sequences of, the performance of practices: dispositions are the tendency to perform practices according to culturally derived orientations; procedures are tacit knowledge and embodied skills, and sequences are the ordered performance of practices through material, infrastructural and institutional forms. At the same time, Southerton (2013) suggests that three dimensions of time should be considered: time as a resource, practices as configuring temporalities, and temporal rhythms. The first temporal dimension reflects the idea that practices compete for the use of time, and that time imposes certain practices rather than others. The second temporal dimension expresses the fact that practices produce their own temporal demands based upon the degree to which they require coordination (or synchronization) with other people or practices (Southerton, 2006). More generally, the temporal demands of practices can be described by considering also the temporal dimensions of duration, tempo, sequence and periodicity. Southerton (2006) thus explains that practices that require a high degree of coordination with others, or that respond to a strong obligation, or that are subject to a high degree of personal commitment, generally have fixed positions in the timetable and are carried out with a particular tempo and duration. The coexistence of practices with high demands on time and practices that are more malleable thus contributes to the construction of the temporal rhythms of everyday life. The third temporal dimension is the idea that collective time and time that is institutionalized or constrained by infrastructure impose temporal rhythms of consumption.

In order to provide a framework within which habits and routines can be studied empirically, Southerton establishes links between dispositions, procedures, sequences and the three temporal dimensions that have just been defined.

First, dispositions can be found in the rules setting out which practices should be prioritized for a given social group. In addition, dispositions can also influence the temporal needs of practices in relation to their expected performance. For example, dispositions that promote self-actualization can lead to a strong increase in the temporal needs of the practice, as in the example of gastronomy evoked by Southerton (2013). In this, dispositions apply the first temporal dimension (time as a resource).

Based on the work of Zerubavel, Southerton (2013) next shows that temporal regularities constitute tacit knowledge and skills that frame procedures for the performance of practices. Temporal regularities include four elements: a rigid sequential time structure since most events take place before or after other events, tacit knowledge of what would be the expected duration of action, a standardized temporal location for many practices (e.g. drinking coffee), and a uniform rate of recurrence for many of them (e.g. eating). This reflects the fact that practices

produce their own temporal demand. Procedures can therefore be associated from a temporal point of view with the second dimension (practices as configuring temporalities). Depending on the type of practices and the degree of personal commitment, the temporal requirements of the practices will be more or less important. As a higher degree of commitment leads to stronger temporal requirements, such as increased frequency of practice or a fixed position in the calendar (Southerton, 2006), temporal procedures depend on the degree of individual commitment to the practice.

Third, sequences refer to material, infrastructural and institutional orders of practice. Material objects may create a sequence with predefined actions, as for instance educational speed cameras that slow down road traffic at a given location. Different forms of infrastructure define sequences of actions, such as successive actions in a laundromat, or the institutionalization of moments dedicated to certain activities (such as shopping on the way from work). In this, sequences coordinate collective times, and thus generate temporal rhythms. Using this framework, it is possible to account for the temporal aspects of the performance of practices. To facilitate the application of this framework, we express its three facets by the questions it poses empirically (Table 1).

Table 1: Summary of the three temporalities

	Definition	Associated temporality dimension	Aspect of consumption informed by each temporality
Dispositions	Culturally derived orientation	Time as a resource	What practice to carry out at a given time? How do culturally derived orientations influence the allocation of practice over time?
Procedures	Tacit knowledge and embodied skills	Practices as configuring temporalities	When to carry out this practice and its expected temporal demand?
Sequences	Material, infrastructural and institutional ordering	Temporal rhythms	How does the material and infrastructural environment affect this practice at this time?

This framework was designed to demonstrate the change in consumer behavior towards more sustainability (Southerton, 2013), but has not been applied to the case of food waste. We therefore intend to study practices to encourage the reduction of food waste in the home as habits and routines, as defined by Southerton. The aim of this research is to understand the temporalities of practices to reduce FW: temporal dispositions (How culturally derived orientations influence the allocation of practice over time?), temporal procedures (When to carry out this practice and its expected temporal demand?), and temporal sequences (How does the material and infrastructural environment affect this practice at this time?) (Table 1).

We adopt a comprehensive approach, and conducted a qualitative study with (1) a two-step qualitative data collection: semi-directive interviews conducted with a projective collage construction technique aimed at describing food practices, and observations of shopping, storing and cooking practices and (2) an evaluation of an intervention with consumers through a focus group.

4. Study of practices and their temporalities

4.1 Main study: Qualitative data collection related to food practices

The sample was developed to generate as much variability as possible in practices related to FW: varied age, gender, and household size. Such a sample is well adapted to the objectives of this study because it guarantees the presence of varied food practices in terms of product management, relation to food and social context. The participants were told only that the study was dealing with food practices. The interviewees were always in charge of feeding the household, at least partially, i.e. they were shopping or cooking regularly. The sample is composed of 23 participants (Appendix 1). Participants were asked to create a collage based on their food practices, through the following instructions:

"Create a poster representing your food practices, from shopping to eating, and represent what drives your organization of these practices".

Participants had magazines (women's topics, decoration, multimedia, agricultural world, travel) and drawing materials at their disposal. The collages in themselves took 40 minutes on average. After that, we conducted semi-directive interviews based on the collages (Figure 1).

Projective method of collage allows, "like any projective method, [...] to attenuate consumers' psychic defence mechanisms and to reveal the representations, the imaginary, the evocations associated with a concept" (Cottet et al., 2008). Thus, it is used because it is conducive to the expression of representations in a pictorial manner, which can reduce the barriers to expression among certain audiences (less educated) or certain types of character (more introverted) (Valette-Florence and de Barnier, 2009). In addition to this, collage aims to facilitate the structuring of the knowledge that individuals have of the flow of their actions, this knowledge being one of the barriers to the empirical study of routines (Warde, 2016). We coupled the collages with semi-directive interviews as projective techniques are rarely used exclusively in a given study, they are typically included with other questions in focus group or individual interviewing (Rook, 2006). Thus, the collages were not analyzed per se, they were the medium of the interview.

The interviews lasted 1 hour and 15 minutes on average. They were then fully transcribed. The collages were very useful tools for the interviewer, as they provide a kind of interview guide and a source of data. This really helps to direct the interview as reference can be made to individuals' own structuring of ideas.



Figure 1: Example of a collage (Paola)

One year after the collages, participant observations of shopping, cooking and eating-at-home practices provided information about participants' social interactions within the household. This was also an opportunity to carry out a new wave of interviews. Observations and

interviews lasted 1 hour on average for the shopping practices and 2 hours on average for the cooking and eating-at-home practices. During this step, the aim was to obtain complementary information on the progress of actions and how they were performed. Eleven of the 23 participants recruited for the collages/interviews agreed to participate in this step of the methodology, which was potentially more intrusive and more constraining (Appendix 1).

Data analysis is in two steps:

A) First, we used the French *AntiGaspi* Campaign (Anti-Food Waste) as a framework to identify practices associated with FW limitation. Since 2014, this campaign has been promoting concrete behaviors rather than sensitizing people to the environmental, ethical or financial effects of food waste. It relies on 10 anti-food waste behaviors:

1) When buying and cooking, anticipate the quantities necessary
2) Buy fresh food last
3) Respect the cold chain
4) Rely on the date label "best before…" and "use before…"
5) Stock products logically in the fridge
6) Freeze products to keep them longer
7) Use up and/or reuse food leftovers
8) Do not overestimate your hunger when serving products
9) Share your products with others when they are about to perish
10) At the end of the meal, only throw away products that cannot be re-used

Through this framework of ten anti-food waste practices, we identified in the data the practices related to food waste reduction (e.g. making a shopping list or using tips when cooking, in order to "anticipate the quantities necessary"; accommodate leftovers, etc.).

B) Secondly, after identifying these recommendations within the consumers' description of their food practices, we identified all terms relating to the description of the temporality of these recommendations. The temporal dimensions give information about: when is the practice performed? how long does it take? how frequently is it performed? with which other practices does it have to be coordinated? This analysis leads to an inventory of the temporal *actions* on which the food waste reduction practices rely. Based on this analysis and on Southerton's conceptual framework, we classified the temporal *actions* according to the three temporal dimensions (temporal dispositions, temporal sequences and temporal procedures).

4.2 Findings

Figure 2 presents a summary diagram of the actions needed to implement recommendations to tackle the type of food waste that the respondents spoke of spontaneously. Based on the results from the main study, this summary positions the actions (in italics in Figure 2 and in the text) of individuals according to whether they make reference to one or more of the temporalities (at the poles of the triangle in Figure 2). Actions can be located at one of the three poles or along the axes connecting the poles. With a view to promoting the introduction of recommendations to reduce food waste, each pole is associated with types of intervention, depending on the actions it is able to influence. As a reminder: dispositions are the tendency to perform practices according to culturally derived orientations; procedures are tacit knowledge and embodied skills, and sequences are the ordered performance of practices through material, infrastructural and institutional settings. In this way, at the "temporal dispositions" pole, which asks the question "what practice to carry out at a given time?" or "How culturally derived orientations influence the allocation of practice? (Table 1), interventions targeting norms (culturally derived orientation) can be envisaged. At the "temporal procedures" pole, which asks the question "when to carry out this practice and its temporal demand?" (Table 1), interventions targeting

the modalities of day-to-day organization and people's knowledge (tacit knowledge and embodied skills) can be devised. At the "temporal sequences" pole, which asks the question "how does the material and infrastructural environment affect this practice at this time?" (Table 1), interventions targeting equipment and infrastructure (material, infrastructural and institutional settings) can be envisaged. This is in accordance with and echoes Shove and colleagues' (2012) framework in which a practice emerges from the congruence of meanings (norms), material (equipment and infrastructures) and competences (day-to-day organization and people's knowledge). The following sections use examples from the data to illustrate how the actions were positioned on the diagram. Each side of the triangle is covered in a separate section: the side between the temporal procedures pole and the temporal dispositions pole, the side between the temporal procedures pole and the temporal sequences pole, and the side between the temporal dispositions pole and the temporal sequences pole.

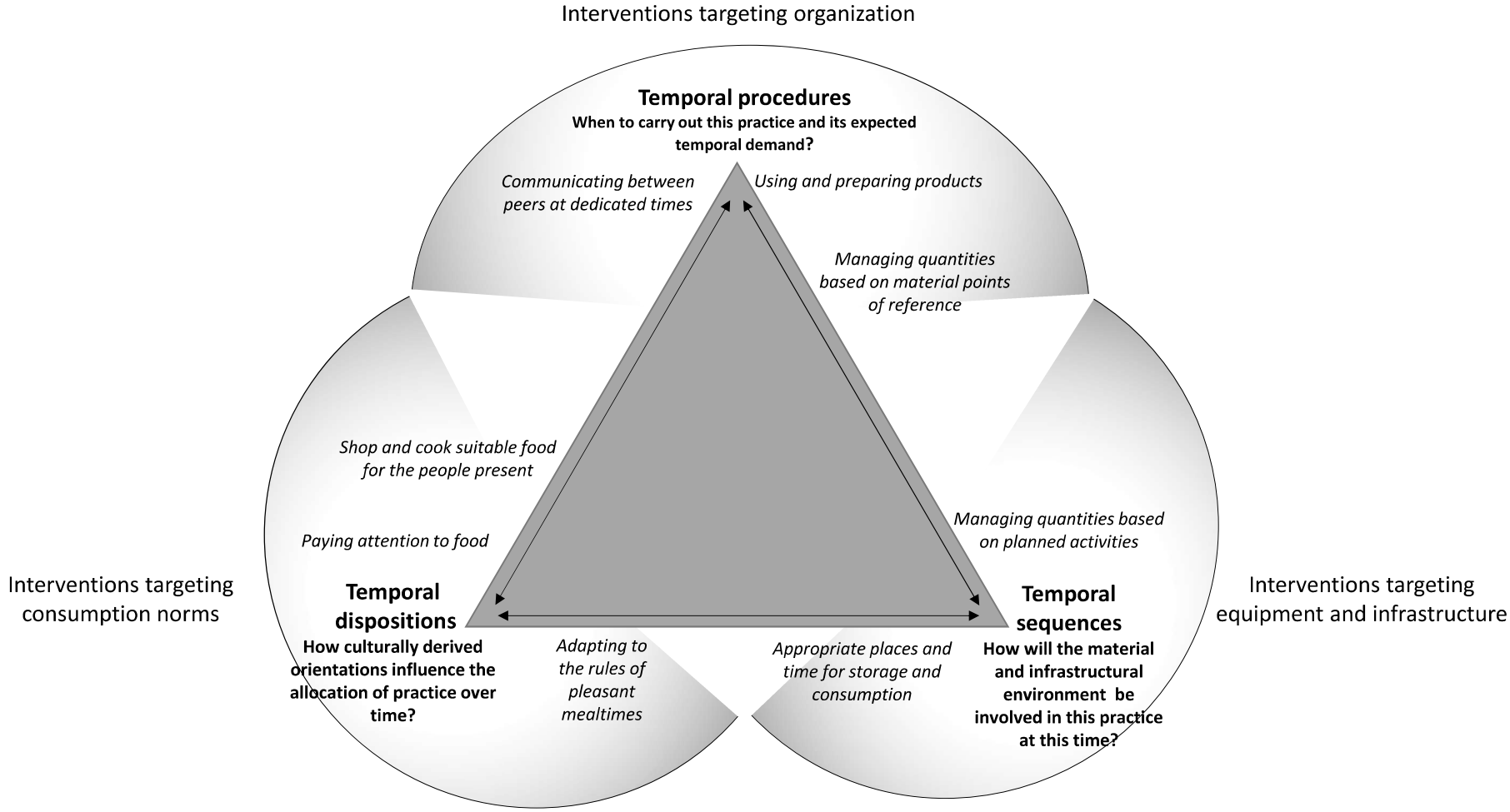


Figure 2: Summary diagram: temporalities of practices in the reduction of food waste

4.2.1 Between temporal procedures and temporal dispositions

The actions identified on this side of the triangle concern anti-waste practices such as "make sure your eyes are not bigger than your belly", "using up leftovers", and "buying and cooking appropriate amounts".

4.2.1.1 Communicate between peers at dedicated times

Closest to the "temporal procedures" pole, *communicating between peers at dedicated times* refers to setting aside time together to compile a shopping list, for instance, or to consult with household members about compiling menus, and updating everyone's schedules so that the person(s) responsible for food can adapt what they buy or cook to the activities and desires of their peers. Noémie (26 years old), who is in charge of food in the household that she shares with her mother, explains how she compiles the menus and the shopping list:

> *"So the program goes like this: I choose my recipes, I write them down and I pass them to Mum if she has time, "Here you are, Mum, is this OK, do you fancy this", usually she says, "Yes, but in any case you're in charge, and what you make is always fine […] that's Mum and when she needs something else, she puts it on the list for Carrefour, we always have notepads everywhere so usually there are four lists that have been started and I bring them together and make a proper list."*

Prior to discussions on menu choices, exchanges can take place to plan purchases, as illustrated by Camille (21 years old), who devotes time to draw up a shopping list with her roommate:

> *"Well then, yeah, sometimes, as we did this morning before you arrived, we sit a little with the coffee on the terrace and then we say well, well, what do we want to eat and yes, we take a little bit of cooking books, we look for some ideas and then we enjoy it and then we go to the store...".*

These types of exchanges take place between members of the household (e.g. Max (40 years old) with his two children about the menu), or outside the household (e.g. Berengère (29 years old) who communicates with her mother to meet at the marketplace).

Introducing times like this for discussion helps to implement the recommendations mentioned above. Adapting quantities also depends on how meals are served up. Marie (32) explains that the first helping is the "basic" portion, practically the same amount for herself and her husband, and by leaving the dish on the table they can both come back for a second helping if they wish:

> ***"And you serve the same amount for yourself and your boyfriend?***
> *Pretty much, yeah. But yeah … pretty much, yeah, but now that I'm pregnant even more than before, yes, after, he has another helping and I don't, but sometimes it's the other way round*
> ***And if you want more, you get up, you go and get something, or you bring it to the table, you serve yourself then bring it back?***
> *Well, it depends… yes, when it's a cheesy bake, we leave it on the table and help ourselves directly … or for other things, we tend to take a good helping and we don't usually go back for more, it's just that the cheesy bake is tempting because it's good [laughs]"*

Other respondents confirmed this distinction between products which are served "non-stop" and where the dish is on the table for everyone to take another helping, and other products that are unitary (a fish, a piece of meat, etc.). For this type of product, everyone estimates the amount they need to satisfy their hunger according to the various components of the meal. Roxane (33) describes this:

> *"Everyone helps themselves, yeah, unless it's something that's a bit tricky, so then we serve it here [on the work top], but otherwise everyone takes it in the order they want because there's some that want salad like that and others don't want it… everything's on the table and we help ourselves."*

4.2.1.2 *Shop and cook suitable food for the people present*

As we move away from the "temporal procedures" pole towards the "temporal dispositions" pole, *shop and cook suitable food for the people present* mainly corresponds to the preparation and consumption of leftover food. Some time may be spent on this food, and in particular, it is necessary to identify with whom and under what circumstances it is acceptable to eat it. Noémie explains that between the dishes that she has planned and checked with her mother, they also keep a time specifically for eating leftovers. She explains how she decides this with her mother and how she prepares the products:

> *"so, yeah 'so this evening it's 'operation leftovers'? – Yeah, fine!", so 'operation leftovers' is a dish… so there'll be a few carrots left over, some turnip, so I'll make something tasty and if I can see that there's not enough, I cook some pasta or rice, or if I see that there's lots of turnips left over, I might think "well, what can I do with these turnips? well, I can make a stir-fry if there's some carrots left over", this is what I usually do with what's left over, I make another dish.*

Valerie (43 years old) also explains that she cooks meals "that will please" when friends of her children come to the house, she talks about "what works". Similarly, Marion (33 years old) describes that she knows how to adapt the menus according to whom she receives at home, and according to the circumstances of the meal: sometimes the food is at the heart of the moment spent together, while sometimes the food eaten is secondary:

"*there are some people you're going to put pressure on yourself, you're going to try to do things that are out of the ordinary, really good but here you see, the other day it's been a long time since I've seen Marion, I offered her to come and eat at home in the evening and she ate what was there, maybe I made a little more effort I didn't serve the "leftovers leftovers" but here it is* "In these cases, shopping and cooking food that is suitable for the people present refers both to procedures (knowing how to present and prepare the right food at the right time for the right people), and dispositions (in relation to food consumption norms).

4.2.1.3 *Paying attention*

Moving towards once again towards the "temporal dispositions" pole, *paying attention* makes it easier to be sure that your eyes are not bigger than your belly. Cédric (37) explains that the fact that he eats in front of his screen or while reading documents means for him that he pays less attention to the amounts he needs. More broadly speaking, this outcome refers to the fact that paying attention to one's food decreases the propensity to throw anything away. This is what Amélie (42) explains when she says:

> *"Before, I was much less bothered about food waste, but since I've been with Mathieu, yes I do pay attention"*, which she explains by the fact that her new companion "*is someone who is very, very thoughtful and who eats, who enjoys eating, but he is quiet […] he is very calm and takes time to choose, so now I also enjoy choosing what vegetables to cook".*

These quotes show that attaching importance to food, particularly by associating a pleasure value and dedicating time to it, are at the service of greater prevention of food waste. In addition, Amélie explains that this greater attention translates into skills at the time of purchase, and the ability to project the choice of vegetables into particular recipes. Thus, placing importance on food here can result in linking the purchase to future uses of the products, i.e., making the products part of the routine.

4.2.2 *Between temporal procedures and temporal sequences*

4.2.2.1 *Using and preparing food products*

Moving from the "temporal procedures" pole towards the "temporal sequences" pole, *using and preparing food products* contributes to the implementation of practices to reduce food waste, such as "using up leftovers", "freezing products to keep them longer", and "sharing products

with peers to avoid throwing them away". The case of Marion (33), who generally uses up her leftovers, shows that a knowledge of the products means that she knows when (and until what date) she can use them, and how she can combine them for a recipe based on leftovers:

> *"the other day there was nothing left to eat, but I had kept some radish tops and there was a tiny bit of cream and some disgusting dregs of something like cream cheese, so I made… oh yes, and there was a potato lying around, that was all there was, but I made a thing, it was really good, I made some soup with the radish tops, I whipped the cream with the cheese with some herbs from the garden, it was really good".*

Bérengère (29) also explains that she made the most of all that's left from a recipe like a stew. In this way, the dish can stretch out for a long time according to each person's cooking knowledge. Others like Esther (67 years old) adapt their way of preparing food by using household appliances:

> "*so when I do the shopping sometimes, the next day, vegetables for example, the next day I'll start cooking I'll do the whole quantity and there for example I bought two bunches of asparagus, I prepared both of them when for example I do what I call "sun vegetables", the quantity I bought I cook the whole quantity but I freeze it*".

Thus, these examples demonstrate that using and preparing food products rely on a set of skills and material supports embodying temporal procedures and sequences.

4.2.2.2 Managing quantities based on material points of reference and *Managing quantities based on planned activities*

Moving towards the "temporal sequences" pole in Figure 2, we see actions for *managing quantities based on material points of reference* and *managing quantities based on planned activities*. These actions are linked with anti-waste practices, such as "estimating quantities well", "only throwing away what cannot be reused", "freezing products to preserve them better", and "using up leftovers". These actions complement the action described above under *using and preparing products*, and as we move towards the "temporal sequences" pole another form of temporality is highlighted, which is involved in implementing these actions: actions based on/dependent on equipment and infrastructure (freezer). This is what Esther (67) and Sylvie (30) told us, as both of them buy large quantities of fruit and vegetables and then, to ensure that they do not go off, they freeze them to be used in recipes later on.

Noémie (26) explains that she uses equipment to assess her hunger in the course of the meal, based on a technique that she had learned from a nutritionist whom she consulted:

> *"It's in stages, so I started by having to judge how much my stomach could hold, and that's how I know what my serving portion is. So the principle is that… he explained that you have a plate. You start by filling a quarter of the plate with food, then you take a five-minute break, once you have eaten the quarter and if you are still hungry you eat a second quarter, then when you've finished you take another five-minute break, and if you are still hungry you eat a third quarter, and if you are still hungry, you eat the whole plateful".*

Noémie now regularly uses this technique to control the quantities she ingests. It is also a technique that Sylvie (30 years old) uses to prepare her lunch:

> "*Well, for lunch I have a Tupperware and it's the Tupperware that will dose the food… this comes from when I was on a diet*".

Thus before and in the course of the meal, material elements become an essential piece of equipment that the respondent needs in order to assess feelings of hunger. On a larger scale than that of the freezer and the dishes, infrastructure has a part to play in implementing practices to reduce food waste. Noémie (26) is used to shopping weekly in a supermarket, except for fresh produce (meat, fish, fruit, vegetables and bread) which she buys more frequently to prevent them from perishing. For these products, she calls her mother at work to ask her to *"buy some meat, bread or fruit on her way home"*. In this way, Noémie and her mother adjust amounts from day to day as this arrangement is made possible logistically by the location of her mother's workplace and the shops selling fresh produce. Because of the location of the places people

frequent, products can be shared between peers. This is what Sabrina (23) explains, as she regularly receives products purchased by her mother at the market, when her mother has a surplus. This also means Sabrina doesn't have to go shopping They are able to make this exchange when they meet up when Sabrina is on the way back from the dance class:.

> ***"****when she's spent Sunday going to the market and on Monday she comes by car, then she brings me things[…]. So I go to my Zumba class and […] we meet up, yeah, as in fact we live in the same area".*

Thus the implementation of practices to reduce food waste depends on the organization of practices according to the time they require (temporal procedures) and the infrastructure that makes them possible (temporal sequences).

4.2.3 Between temporal dispositions and temporal sequences

This side of the triangle shows actions based on prescriptions of what is appropriate to do at a given time (temporal dispositions) and based on the infrastructure or equipment needed at a given time (temporal sequence). It is essentially the consumption of food leftovers that is concerned by these two temporalities.

4.2.3.1 Appropriate places and time for storage and consumption

People who are able to eat at work or at home the next day will be more likely to use up these leftovers. As it is often the case that there is less time available for eating and the food is uncomplicated, the cooking aspect is not so important. Valérie (48), who goes home at midday as her workplace is close to her home, explains:

> *"At midday, I eat alone, sometimes my husband is there but we each get our own food, we know we don't have much time so we heat something up quickly and often its leftovers from the day before or some ravioli that's quite quick, some local ravioli*
>
> ***So it's not part of the way that you cook, you don't say, "I'll leave some for tomorrow"?***
>
> *oh no! Or perhaps unconsciously I may say to myself, "well, tonight, if I do rice, I'll make a little bit extra and then I'll have some for tomorrow", usually… or we have fried eggs, we just do fairly quick things at midday then I always have lettuce that I've washed which is ready in bags, or I always have… or tomatoes, I always have something that can be got ready".*

Thus in this case we see that the midday meal at home is a time for eating leftovers and in this way, there is no need to use them up in family meals. The location of Valerie's home allows her to consume leftovers for lunch; usually the day after the dish was prepared. Other respondents indicated other places for the consumption of leftovers, which are taken outside the home, while the meals shared in the home are made from freshly cooked products (Cédric 37 years old, Myriam 42 years old). For others, leftovers can be consumed in the home, but not from one meal to the next. To space out identical meals, some freeze leftovers (Roxane, 33 years old) while others consume them a few days later having stored them in the refrigerator (Thibaut, 32 years old). Thus, the moment of consumption of leftovers (at lunchtime, the next day or a few days after the dish has been cooked) is related to the fact of knowing which place (at home, outside) is suitable for the consumption of leftovers.

4.2.3.2 Adapting to the rules of pleasant mealtimes

Eating leftovers involves having a dedicated place and time, such as lunch at work, and knowing how to offer leftovers at the right time and to the right people. If we move towards the "temporal dispositions" pole, we find the action "adapting to the rules of pleasant mealtimes". Roxane (33) explains that she brings leftovers for her lunch at work, because she and her boyfriend do not eat leftovers for dinner:

> "*We rarely eat the same thing for dinner several nights running, it happens but…you know, for lunch we eat quickly, so for dinner we enjoy a relaxing time together*".

This case shows that eating leftovers is about finding the right place and time to do it, with the appropriate dining companions. In the same way, Marion (31) explains:

> "*I have recently begun to eat leftovers for lunch since friends of mine told me about coffee shops where you can eat your own food if you buy at least one drink*".

These places thus offer a dedicated place to eat leftovers, and in this way other dishes can be reserved for family meals where the atmosphere is more relaxed.

As a conclusion of this study, the implementation of recommendations to reduce food waste involves the three temporal dimensions (temporal procedures, sequences and dispositions). In a transversal way, the actions related to the implementation of the recommendations can be described as communication actions (Communicate between peers at dedicated times), product management actions (Paying attention, Using and preparing food products, Managing quantities based on material point of reference), organizational actions (Appropriate places and time for storage and consumption), and peer consideration actions (Shop and cook suitable food for the people present, Adapting the rules of pleasant mealtimes).

In order to support some of these actions, we have devised a device whose objective would be to facilitate communication (verbal or not) between the members of a household, and which would support the management of products. This device is the object of a complementary step of the study, which is exploratory.

4.3 Complementary step: Evaluation of a "leftovers zone" in the fridge

4.3.1 Method

Based on the results of the main study, we devised a hypothetical "leftovers zone" for the fridge, which is adjustable in size (Figure 3).Through a focus group, the aim is to see if our intuitions are confirmed: does this device encourage to dedicate time for *communication between peers at dedicated times* (procedures and dispositions)? Does it help to an *appropriate place and time for storage and consumption* (dispositions and sequences)? Does it help *using and preparing food products*, *managing quantities based on material point of reference*, and *managing quantities based on planned activities* (procedures and sequences)? We organized a focus group with 10 participants (different participants from the 23 in the main study). As in the main study, the composition of the sample had to guarantee the presence of various food practices and various temporal settings: varied age, gender, and household size (Appendix 2). Participants did not know each other, and they were told only that the study dealt with food practices.

Participants' opinions were collected by introducing the moving debate technique. In a moving debate, participants are standing in a free space so that they can move around freely. The moving debate is a way of organizing the debate, starting from a statement chosen in advance (in this case, "this device is useful"). The advantage of this facilitation technique is that it encourages dialogue due to the explicit positioning of the participants. This animation technique is also a means of smoothing out the power plays in a group (due to different temperaments) since everyone is invited to position themselves and speak. When faced with a question or statement, two camps are defined spatially in the room: those who "agree" go to the left, those who "do not agree" go to the right. After participants have positioned themselves in the space, each one explains his/her position.



Figure 3: "Leftovers zone" in the fridge

4.3.2 Results

Regarding legitimizing the storage of leftovers, one participant stresses that, in his case, "*It could be an incentive to keep leftovers, knowing that there is a space specifically for that and that could be an incentive not to force oneself to clear one's plate"* (Adrien, 31). There seems to be a fairly good consensus between consumers on this point. On the other hand, concerning the consumption of leftovers, opinions were mixed. Some participants point out that this device could provide them and their relatives a "*non-verbal communication channel*" (Sonia, 44), and that monitoring food leftovers can be managed collectively, as Isabelle (40) explains:

> *"I completely agree because I live in a shared flat, and we have spaces for each person, more or less, on different shelves, and if we had a space like that and we could say, 'well, I won't be here this weekend, so whoever wants this can have it', well I think that would be great."*

In this way, this dedicated space could be an "easy option" for cooking, by directing people straight to the leftovers. However, some participants question such a use of the device, given their own experience. Based on his own experience, one person explains that this could "*dilute personal responsibility*" (Antoine, 21), as there is a risk that, instead of everybody taking responsibility for the leftovers, no one would do it. Another respondent was skeptical about the ability of such a device to change her habits: "*even if leftovers are more visible, this will not make people more inclined to eat them*" (Félicie, 28), under the pretext, for example, of not wanting to eat the same meal for several days in succession.

The solutions imagined when developing this device were thus confirmed in part by the discussion in the focus group. In relation to the actions listed in Figure 2, it is indeed possible to state that: a) this device encourages *communication between peers,* it helps to know when *to use and prepare products,* and it makes *using and preparing products* easier; b) it helps in *shopping and cooking suitable food for the people present* and legitimizes the presence/consumption of leftovers; c) it provides an *appropriate place for storage and consumption*. Following on from these results, the device needs to be tested in a real situation, in order to identify potential unexpected effects (positive or negative) and to observe these effects over time: after using this device for several weeks, would it encourage consumers to plan fewer recipes for the week in order to have some leeway for preparing a "leftover meal"? Would this enable consumers to estimate quantities better because the leftovers are arranged so that they are visible in the fridge?

5. Discussion and conclusion

This study uses the conceptual framework proposed by Southerton (2013) to assess the temporal dimension of recommendations to reduce food waste in the home. This framework differentiates temporal dispositions (How culturally derived orientations influence the

allocation of practice over time?), temporal procedures (When to carry out this practice and its expected temporal demand?) and temporal sequences (How does the material and infrastructural environment affect this practice at this time?). Through this qualitative study, we show that the recommendations to reduce waste are based on actions that belong to these three types of temporality, and accordingly we devised activities to promote the reduction of food waste. At the point where the three temporal dimensions intersect, we propose a device, a "leftovers zone" in the fridge, adjustable in size, which may enable members of the same household to manage the consumption of leftovers collectively. This device was subjected to scrutiny by 10 consumers during a focus group. Overall, respondents believe that this device could make it easier to store and consume leftovers, but that its presence alone would not be sufficient to motivate people to consume leftovers. This result confirms that interventions that focus on one element alone (here, the device) are not sufficient to change practices (Devaney and Davies, 2017). One possibility as a result of this step would be to test the device in lived settings with an in-home experiment to be able to study householder reactions to this intervention. This test would consist of an implementation of the device in the households in order to study (through a longitudinal study) how it would be anchored in the daily dynamics. The objective would therefore not be to measure the effect of this atomized product, but to see how it takes part in routine actions through competences, norms, etc. (Sahakian and Wilhite, 2014). Indeed, the reactions and impacts of socio-technical interventions may be diverse depending on different social contexts (Devaney and Davies, 2017). Moreover, such a study could complement existing work on the use of the refrigerator, and help to better understand its (controversial) role in reducing food waste: if it can be an ally in preserving and storing food, it can also be considered as a device facilitating waste (Evans, 2012, Waitt and Phillips, 2016).

The theoretical framework developed by Southerton and used in this study was devised by Southerton to study and promote behavior that would encourage more sustainable consumption. Southerton's work (but not this theoretical framework specifically) has been used above all to study the topics of transport and electricity use. Southerton himself and Yates (2014) have worked on food waste, but did not use this framework and did not discuss temporalities. To our knowledge, therefore, this framework had never previously been applied in the case of food waste. Mattila et al. (2019) tackled the issue of food waste from the perspective of everyday temporality by identifying four bundles of practices that organize temporality. But if they describe and analyze how practices modify the temporality for reducing FW, their research does not analyze how temporalities influence and constrain these practices. To complement this, our study explains what creates the links between temporalities and practices: norms (dispositions), knowledge (procedures) and infrastructure (sequences). Added to this, our approach makes it possible to take into account the fact that anti-waste practices, although they consist of food-related tasks, are also influenced and structured by external activities (configuration of the workplace, location of shops in relation to children's school, etc.) (Wills et al. 2015). With this change in perspective, our study complements existing work and suggests a managerial approach with the adjustable "leftovers zone" for the fridge. In this way, this study contributes to our understanding of how food waste is linked to contemporary lifestyles and consumers' relationships with food.

Ultimately, what emerges from this study is that skills, norms and equipment/infrastructure underpin the structuring of time. The framework proposed by Shove et al. (2012) constitutes the simplest and the most commonly used form of theories of practice. However, Shove essentially sees time as a resource for which practices compete. To complement this, the framework used in this study, which makes time the focus of the analysis, will be an invaluable tool for future studies hoping to understand the question of routines and everyday organization. Issues surrounding sustainability (e.g. food waste, consumption in short circuits), health (e.g.

playing sport several times a week, cooking and eating fresh produce), and well-being (e.g. enjoying time spent sharing food) can therefore also be understood by looking more closely at the reality experienced by consumers in relation to time. In addition, time squeeze and the temporal disorganization are important elements to be taken into account in the analysis of practices in relation to sustainability, and in the proposal of instruments to promote sustainable behaviours (Southerton, 2006, 2013). Future research on the temporality of sustainable practices should thus add these elements to the analytical framework used in this article.

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