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Abstract

Social media encourage the rapid spreading of food-related information and potentially act as a policy measure to improve food literacy, healthy eating and well-being. However, some authors warn about the lack of control over the quality of the shared information and the risks of knowledge distortion. The aim of this research is to understand how food literacy is co-constructed on social media and to identify the potential sources of bias, which lead to knowledge distortion. We use a netnographic approach (i.e. analysis of behavioral secondary data from social media and semi-structured interviews) to study both phenomena. Findings indicate that food literacy can be positively or negatively co-constructed in a social environment. Consumers can contribute to the construction of food literacy directly or indirectly on three levels (i.e. evaluation, adaptation suggestions and procedural critiques), which vary in depth and breadth of contribution. We further identify four types of biases, which risk affecting the quality of the co-constructed food literacy online, namely vividness, mindset, socio-cultural and cognitive dissonance bias. Findings help food policy makers to better understand how food literacy is developed outside of their control, and to identify the potential sources of knowledge distortion and how they can reduce these biases.

Key words: food literacy, co-construction, knowledge distortion, social media

1. Introduction

Food is an integral part of our daily lives which ensures our health, well-being and longevity (Block et al., 2011; McCarthy et al., 2017). Food specialists increasingly rely on food education to educate consumers towards healthy eating behaviors (Barreiro-Hurlé, Gracia and de-Magistris, 2010; Shimokawa, 2013; Tobey and Manore, 2014). This education consists in disseminating cooking literacy, nutrition literacy, health and food literacy (Benn, 2014; Nutbeam, 2000; St Leger, 2001; Vileisis, 2008). While disseminating nutrition- and health-related literacy depends largely on scientific advances, food literacy is socially shaped outside of the control of professionals. It is defined as inter-related knowledge, skills and behaviors required to plan, manage, select, prepare and eat food to meet needs and determined intakes (Vidgen and Gallegos, 2014). Literacy has become a major concern for previous researchers, who recommended that online services should be designed in a way to improve consumers' nutritional welfare (Anderson et al., 2013; Ostrom et al., 2010; Ostrom et al., 2015).

Nowadays, social media (e.g., Facebook, Twitter, Instagram) are increasingly used to search for recipes, nutritional information, cooking inspiration and a variety of cooking videos (Nour, Rouf and Allman-Farinelli, 2018). These practices are related to the emerging concept of "social food", which we define as all online techniques designed for creating, sharing, commenting and evaluating food-related information using social media.

Some studies highlighted the benefits of using social media for collecting and sharing food literacy when the aim is to promote positive health behaviors (Cavallo et al., 2016; Heaney and Israel, 2008; Orji, Vassileva, and Mandryk, 2013). They were considered as a great opportunity for nutritional education specialists in their quest to improve healthy eating behaviors and practices (Colatruglio and Slater, 2014; Glasson, Chapman, James, 2011; Nour et al., 2018). Social media presented strength of speed, accessibility and interaction in the

communication of food risk and benefits (Rutsaert et al., 2014). However, consumers reported lacking appropriate information to be more informed consumers able to take adequate decisions regarding different aspects of food-related choices (Bernal-Jurado et al., 2017; Jaffe and Gertler, 2006; Lang and Caraher, 2001). Some researchers mentioned the risks of communicating food-related information through social media (Covello and Sandman, 2001; Rollin, Kennedy and Wills, 2011; Rutsaert et al., 2014; Stevens et al., 2018). More specifically, in contrast with traditional means of offline food education, information disseminated through social media cannot fully be controlled by nutritional specialists and policy makers since any Internet user can spread culinary and nutritional knowledge (Deighton and Kornfeld, 2009; Golub and Jackson, 2010). The risks of knowledge distortion online are thus high. Knowledge distortion happens through false information sharing and/or Internet users' naïve learning based on information shared through social media (Deighton and Kornfeld, 2009; Golub and Jackson, 2010). The type of knowledge shared online is not only difficult to control, but also difficult to predict, and represents therefore a concern to policy makers as it influences the public opinion and policy (Stevens et al., 2018). Based on these insights, we perceive an ambiguous role of social media for food literacy construction, and thus for food education. While social media helps accelerating the construction, development and spreading of food-related information in a social environment, in which all Internet users can access and contribute to food literacy (knowledge co-construction), it also increases the risks of wrong information sharing given that there is no control over the accessing and sharing process (knowledge distortion). Given this paradox, we aim at understanding the conditions under which both phenomena happen, that is knowledge co-construction and knowledge distortion, to provide policy measures and guidelines to food education organizations on how to benefit from social media for citizens' education towards healthy eating. The results of this research contribute to a major food policy challenge as the

2018 Global Nutrition Report warns that malnutrition is unacceptably high and affects every country in the world (Fan, 2019).

The paper is organized as follows. First, we present the extant literature on food literacy and information sharing on social media. Second, we use a netnographic approach (Heinonen and Medberg, 2018), i.e. analysis of behavioral secondary data from social media and semi-structured interviews, to analyze extant social food videos and consumers' attitude, behaviors and reactions. This methodological approach helps us to identify how food knowledge construction occurs on social media and under which conditions knowledge distortion emerges based on real data. Finally, results are highlighted and discussed as well as the theoretical contributions of the present study.

2. Theoretical framework

2.1 Tenets of food literacy

Food education can be perceived as all teaching of knowledge and skills that help people "eat right", including topics such as nutrition, meals, growing and cooking. It does thus not only cover nutritional science and individuals' ability to understand food labels, but includes also topics such as cooking or culinary culture (Kimura, 2011). Food literacy is one aim of food education, others being kitchen-cooking literacy, nutrition literacy or health literacy (Benn, 2014; Nutbeam, 2000; St Leger, 2001; Vileisis, 2008). While education towards food is embedded in cultural settings (Benn, 2014), literacy is defined as the "ability to interpret and communicate meaning through socially constructed symbols and texts" (Anderson and Viswanathan, 2009). More specifically, food literacy is a consumer empowering process, in which individuals collect inter-related knowledge, skills and behaviors required to plan, manage, select, prepare and eat food to meet needs and determined intakes (Vidgen and Gallegos, 2014). Encouraging food literacy aims the creation of tighter relationships between

food, people and well-being (Colatruglio and Slater. 2014). Viswanathan et al. (2009) suggest providing literacy by sharing "know-how" and "know-why" to contribute to more informed consumers.

Having high levels of food literacy means being able making feasible food decisions which balance food needs using available resources. It also means being able to judge the quality of food and how it affects well-being (Schnögl et al., 2006; Vidgen and Gallegos, 2014). More specifically, Slater (2013) identifies three pillars of food literacy:

- **Functional food literacy**: credible, evidence-based food and nutrition information, including the assessment, understanding and evaluation of information;

- **Interactive food literacy**: personal skills regarding food and nutrition issues to improve individual health and well-being;

- **Critical food literacy**: understanding the wider context of food and health, including the respect of cultural, family and spiritual beliefs regarding food and nutrition.

Desjardins (2013) adds that food literacy can be measured in terms of consumers' food skills (techniques, planning, knowledge), self-efficacy, ability to improvise and problem-solve, and ability to find and use social and other types of supports. Food literacy varies depending on consumers' socio-economic status (Palumbo et al., 2019).

Even though some authors claim that the online dissemination of food-related communication contributes to food literacy (e.g., Wang, Van Fleet and Van Fleet, 2014), the latter cannot be dissociated from its social and environmental context (Cullen et al., 2015). Like in most online communities, the interactive environment allows any consumer to share knowledge with other consumers outside of the control of policy makers, and thus also nutritionists (Deighton and Kornfeld, 2009). Opening the boundaries to any social information source tackles the issue of the quality of food literacy delivered online.

Previous researchers have highlighted the need to consider food literacy (rather than nutrition literacy or similar concepts) as a lever towards behavioral change (Smith, 2009).This research analyzes food literacy construction outside of the control of nutrition specialists, namely in an online and social environment. In particular, while nutrition literacy is dependent on scientific advances and comprised of mainly valid information, food literacy depends on consumers' individual perceptions and social influence (Ferreira, 2006) and risks reflecting subjective information.

2.2 Social co-construction mechanism of food literacy and its limitations

Thanks to its interactivity, the digital age has changed the culture of food and has accelerated the exchange of information and knowledge about food (Lee, Samdanis and Gkiousou, 2014; Wang, Van Fleet and Van Fleet, 2014). Food information is created by mixing, assembling and combining different sources (e.g. videos, photographs) and different ideas (ex. recipes) (Hartley, 2002). The Internet not only provides access to information to cooking professionals, but also to non-professional consumers who seek to develop suitable culinary skills thanks to the accessibility of online information (Harbich and Hassenzahl, 2011; Lee, Samdanis and Gkiousou, 2014). Knowledge (what?) as well as skills (how?) can be shared or acquired online (Viswanathan et al., 2009). In particular, Tobey and Manore (2014) encourage the use of social media to disseminate nutritional and culinary information and enhance Internet users' engagement. Unlike traditional media, social networks not only incorporate visual information and applications, but also increase consumer engagement and reduce the distance between information sender and receiver (Shan et al., 2015). Social networks also make it possible to diversify the choice of food by giving access to a variety of recipes presented in a distracting fashion (Vaterlaus et al., 2015).

Thus, the Internet allows moving from one-way to many-to-many information sharing (Hoffman and Novak, 1996) and generates mechanisms of knowledge co-construction. Co-constructing knowledge is a result of social learning (Jayanti and Singh, 2010) and can result from a combination of different levels of consumer engagement, such as lurking (passive reading), contributing (sharing and stimulating discussions), or creating (knowledge creation) (Dawley, 2009). Social interaction helps consumers aligning their existing suggestions and expertise to create understanding and meaning (Jayanti and Singh, 2010). However, due to the lack of control over the information sharing process in online environments (Deighton and Kornfeld, 2009) some authors warn that information disseminated via social networks tends to increase the risk of "naïve" learning or distortion of knowledge and skills because of the possibility of not only sharing true, but also false knowledge (Golub and Jackson, 2010). However, even though correct learning outcomes can emerge over time as a result of a social consensus process, i.e. updating of old information towards improved versions of an information (De Groot, 1974), Golub and Jackson (2010) show that the existence of opinion leaders, who receive a substantial amount of attention, biases or even destroys efficient learning. These authors tend to conclude that fully rational learning through social networks becomes infeasible.

More generally, the concepts of knowledge construction and distortion in social environments can be linked to the theory of value co-creation and value co-destruction, which provides an underlying framework for our study. In this theory, value co-creation is described as a joint process during which value is created reciprocally for each of the actors (individuals, organizations or networks). These actors are engaged in the process by interacting and exchanging their resources, integrating the resources of others, and potentially develop new resources through a learning process (Leclercq, Hammedi and Poncin, 2016). Adapted to our research context, value (i.e. knowledge) is co-created as a result of interactions and

information exchange online. Value co-destruction (in our context: knowledge distortion) is not considered as an opposite process of value co-creation, but rather defined as all practices that lead to a decrease in value for at least one of the actors (Plé and Chumpitaz Caceres, 2010). Value co-destruction can happen at any stage of the consumption process and results from accidental or intentional practices (Leclercq, Hammedi and Poncin, 2016; Plé and Chumpitaz Caceres, 2010).

Due to the importance of adequate food literacy construction to individuals' well-being, this research aims to address the issue of food literacy co-construction and food literacy distortion through social media. As previous studies do not inform about how consumers contribute to food literacy co-construction online, and also how distortion of knowledge occurs, our research responds to a managerially relevant gap in the literature. Even though previous literature highlighted a paradox in using social media for citizens' efficient food education, insufficient research has tempted to understand both sides of the paradox and provide guidelines on how to use social media for the beneficial development of food-related knowledge.

Based on the extant literature, two research questions arise and aim to investigate the overall paradox of using social media as a food education tool to access and share food-related knowledge online:

> *RQ1:* How does food literacy co-construction occurs on social media, and consequently contributes to food education?

> *RQ1:* Under which conditions does food literacy distortion occur?

3. Method

To investigate the research questions, we first needed to understand how social network users contribute to knowledge co-construction and distortion. Given that literacy can be of different types (Slater, 2013), we examined the nature of Internet users' contributions by analyzing their real reactions and comments to social food videos. Also, given the complexity of the process of value co-creation and co-destruction and the numerous personal traits affecting both processes (Leclercq, Hammedi and Poncin, 2016), in-depth interviews were conducted additionally to understand consumers' underlying reasoning for their attitudes and reactions.

Consequently, we conducted a netnography, which is the recommended methodological approach to study online communities and informal sites of consumer education based on ethnographic techniques (Heinonen and Medberg, 2018; Sandlin, 2007). In contrast with quantitative or laboratory techniques, the netnographic approach draws conclusions based on real data observations and integrates analysis depth by involving consumers in the interpretation of their observed reactions and behaviors. Due to its naturalistic and unobtrusive nature, netnography contributes to deeply understanding consumption patterns and meanings (Kozinets, 2002). As recommended by the methodology, we triangulated different data sources and methods to reach a multi-perspective understanding, namely (1) the analysis of existing Facebook content (i.e., posts, reactions and comments) combined with their nutritional value, and (2) in-depth interviews.

3.1 Analysis of field data

First, we built a database of social food videos coming from a popular online network site for social food. According to Newship.com, a social analytics platform providing predictive intelligence, *Buzzfeed Tasty*, including *Proper Tasty*, *Tasty Vegetarian* and *Tasty Junior* has been valued as the most important and influencing social food page (Boland, newswhip.com,

2017). Tasty has driven over 85 million Facebook engagements, and over 100 million views (newship.com, 2017). Alternative networks such as *Delish* or *Food Network* also publish similar videos, but they may include persons and even celebrity endorser. To focus our analysis solely on the content itself, we decided to focus on the leader of social food videos, and avoid potential biases of non-content or video format-related information (Kriegstein and Giraud, 2006). The content of these videos (posted between 2017 and 2018), reactions and comments constituted our database. All videos, reactions and comments were freely and publicly available on Facebook. They were manually extracted from the Facebook pages and completed by published reactions (likes and other reactions) and comments with the characteristics of the video (type of dish and length of the video). This approach has been used previously in similar study contexts (e.g., Tobey and Manore, 2014). The final sample was composed of 138 social food videos, which had an average duration of 1min. 29sec. (min. 29sec; max. 3min. 11sec.). They totalized on average 34 303.15 shares (SD= 86 239.02) and 25 437.63 reactions (SD= 49 556.15). 45.6% of the videos contained main dish recipes such as scalloped potato rolls or stuffed cauliflowers, 38.2% desserts like pancakes or chocolate cakes, and 16.1% other types (i.e., snacks, appetizers or beverages). Furthermore, comments were extracted using an online software and analyzed qualitatively using open and axial coding (Silverman, 2016). In particular, we first separated comments that related to literacy construction from those related to distortion. We then grouped all quotes into mutually exclusive categories (Silverman, 2016), leading to 3 types of contributions to food literacy (knowledge construction), and 4 sources of knowledge distortion. This first data set helped us to understand how Internet users react to food related literacy on social media and how they attempt to contribute to this literacy by reacting qualitatively to these videos (e.g. through de- or constructive comments).

To complete this dataset, we used *My Fitness Pal* to collect nutritional data on each recipe that was presented in a social food video. This manipulation helped us to understand into more depth how Internet users co-construct or distort knowledge depending on the characteristics of the initial food-related information. The *My Fitness Pal* dataset contains information on the total calorie intake, amount of lipids, sodium, glucides, fiber and proteins. Other nutritional values (e.g., saturated fat) were not retained as they were not available for all dishes. A limitation to this methodology is that the estimated calorie intakes were given in different units (grams, liters, ounces, cups, slices, etc.), which made dishes more difficult to compare. We tried to keep the value for an average portion for each dish. We systematically excluded videos that presented more than 1 recipe in the same video, as well as 14 recipe-videos because the corresponding nutritional information was not available on *My Fitness Pal*. Table 1 presents an excerpt of the complete dataset presenting the type of data that was collected for each video.

Recipename	Source Site	Type	Duration	Shares	Total Reactions	Likes	Loves	Surprise	Laugh	Sad	Angry	Estimated calories	Total lipids	Sodium	Glucides	Fiber	Proteines
Pea Buddha Bowl	ProperTasty	Main	00:01:35	2802	11034	10198	690	127	10	4	5	398	10	0	45	0	32
Tarte Tatin	ProperTasty	Dessert	00:01:24	6798	17410	15738	1315	323	18	6	10	120	6	0	15	1	2
Vegan Pancakes	TastyVegetarian	Dessert	00:00:48	1249	7217	6603	499	92	13	0	10	609	13	1364	74	11	52
Tiramisu Cheesecake	ProperTasty	Dessert	00:01:29	7552	23051	20542	2000	463	27	10	9	523	30	142	50	0	5
StuffedCauliflower	ProperTasty	Dessert	00:02:18	5365	12235	11153	730	304	33	6	9	308	12	0	48	0	8
Croque Monsieur	ProperTasty	Main	00:01:46	4361	19108	17097	1544	433	24	4	6	370	8	695	69	43	8
ChoclateCheescake	ProperTasty	Dessert	00:01:46	5229	23863	21352	1828	657	14	6	6	207	2	289	25	4	26
EggplantLasagna Roll-Ups	TastyVegetarian	Main	00:00:57	34133	24889	22737	1806	307	27	5	6	465	24	942	52	18	18
Lentils and Rice with Caramelized Onions	TastyVegetarian	Main	00:01:04	31376	22296	20376	1623	244	29	7	13	370	2	160	72	16	18
Vegan Cookie and Cream Cheesecake	TastyVegetarian	Dessert	00:01:26	37239	36242	31129	4090	912	47	18	29	420	25	240	40	0	7
Easy&HealthyFriedRice	Tasty Junior	Main	00:00:41	73092	20319	19047	1073	173	16	6	3	531	22	707	56	6	35

Table 1: Sample from the first data collection set

3.2 In-depth interviews with members of social food communities

Second, we conducted 17 in-depth interviews to understand more deeply consumers' general opinion about social food-videos, their attitude and behavior towards food-related knowledge that is shared on social media, and their own information sharing behaviors, including knowledge co-construction and distortion activities. The interview guide is available in the appendix A2. A sample of 17 informants was recruited using convenience sampling techniques and completed by snowball sampling. More particularly, sampling criteria included whether they had at least seen one social food video on Facebook during the last six months, but with varying degrees of familiarity, that is to say consumers who were very familiar with social food videos and those who were less. We then asked them contact details about social food fans for further interviews. Considering sample diversity helped us understanding the phenomena of knowledge construction and distortion from different angles. The final qualitative sample included 4 men and 13 women (average age of 37.05) and two nationalities (Belgian and French consumers). Social food videos are particularly attractive to the French-speaking community and a successful component of a powerful entertainment network in which each social food video reaches on average 1.6 billion French people (Press Release, 2016). In order to respect the diversity principle of a qualitative research (Silverman, 2016), the sample was composed of different household situations (single household, large families, etc.) and different employment situations (students, retired, etc.). Appendix A1 presents the sample of informants used in this study. The interviews were conducted between July and September 2018. Interviews helped us to overcome the limitations of behavioral data by providing more in-depth understanding on the investigated paradox.

A triangulation of these data sources made it thus possible to complete Internet users' real behaviors on social networks (increasing external validity) with in-depth understanding on the underlying motivations of their behavior through face-to-face interviews. In particular, using

different sources of data helped to shed additional light on the content that is missing in another type of data by showing that independent data sources converge, or at least, do not oppose each other (Denzin, 1978). In our case, including real behavioral data helped to verify respondents' sayings, while these interviews helped understanding and interpreting behavioral patterns observed in the social media data. Results presented in the upcoming sections were found to be consisted among the different data sources, and are thus presented accordingly.

4. Results

The aim of this research was to investigate the paradox of using social media as a food education tool to access and share food-related knowledge online by understanding how food literacy co-construction occurs on social media and under which conditions social media leads to knowledge distortion. Consequently, results are presented in the same order. First, findings reveal the observed practices in terms of food literacy co-construction on social networks such as Facebook. Second, conditions and sources of knowledge distortion are presented. Results are summarized in the upcoming sections.

4.1 Co-construction of food literacy on social media

All extracted Facebook comments were analyzed using open coding. Open-coding was applied in two rounds. In round 1, the researchers assigned codes to the types of co-construction techniques by reading through all Facebook comments. In round 2, all emerging codes were grouped into larger categories, which were homogenous and mutually exclusive. Using this procedure, three categories of knowledge co-construction techniques could be identified, namely (1) evaluation, (2) adaptation suggestions and (3) procedural critiques. Table 2 characterizes the three co-construction activities and provides empirical evidence for

each category. The following paragraphs describe and analyze these categories from a theoretical angle.

Category	Co-construction of food literacy	Type of food literacy concerned (Slater, 2013)	Evidence from analyzed comments
Evaluation (of taste and ingredients)	*Indirect .*Consumers contribute to food-literacy by providing feed-back on the suggested recipe. Evaluation does not provide any improvement suggestion, but indicates potential strengths and flaws of each recipe.	Functional food literacy (evidence based)	- *It was a little overly salty for me, even with the low-sodium soy sauce.* - *A deep-friend blooming onion may be delicious but high in calories and fat.*
Adaptation suggestions	*Direct (breadth).* In contrast with the first category, the second type of contribution to food literacy is superior in that consumers actively suggest ideas about the recipe by providing additional or alternative ideas.	Interactive food literacy (contribution based on personal skills and experience)	-*You should try the same thing with pecan nuts. Replace the candy for unsalted bits of pecan nuts delishous!* 👌 -*Oven roasted sweet potato would be good.* -*Anyone have a suggestion for a substitute for the peas? Everything else looks amazing:* *Reply: Edamamebeans, Chickpeas+ 19 other replies*
Procedural critiques	*Direct (depth).*The last contribution type to food literacy suggests	Interactive and critical food literacy (based on personal skills/experience and	- *Your doing it wrong, the first part needs to be two square in opposite direction one place*

	improvements on the recipe procedure rather than its ingredients. In contrast with the two former categories, the latter requires expert knowledge and previous experience with the shown recipe.	understanding of the wider context)	*like a square and the other one place like a losange. So there is no overlaps of dough.* *- Steaming the potatoes gives the gnocchi a lighter texture compared to just boiling it which makes it denser*

Table 2: Categories of food literacy co-construction on social media

Knowledge is co-constructed in a joint process in which different actors (individuals, organizations or networks) interact and exchange resources (Leclercq, Hammedi and Poncin, 2016). While networks provide a first video-format information resource, Internet users contribute by furthering this knowledge thanks to their own experience or opinion.

In particular, the results characterize food literacy co-construction by identifying three levels of contributions to food literacy. Without taking into account the passive approval of a recipe (lurking; Dawley, 2009), the first level of active contribution groups together comments that evaluate the taste or ingredients of a recipe. This feed-back contributes to the development of knowledge in its simplest form. Second, providing specific suggestions for altering or improving the recipes refers to the second set of comments, which do not simply approve or reject a recipe, but reflect on it at a higher mental level by formulating alternative ingredients or recipes. Finally, the last category comments not only the ingredients, but the techniques used in the recipe. The latter requires considerably more cooking skills and constitutes the highest level of food literacy co-construction. Based on De Groot's (1974) framework, it is the combination of all contributions, which, in the long run, help reaching a consensus on the

true knowledge (recipe). This mechanism requires different steps of reflecting on and integrating existing knowledge (Jayanti and Singh, 2010) to create new insights or tackle unsolved problems. While *procedural critiques* contribute to significantly advance food literacy as to their nutritional quality (**depth**), *adaptation suggestions* make recipes more widely accessible to the population without tackling the fundamentals of a recipe (**breath**). However, contributing in terms of depth and breadth is accessible only to a smaller population of social media users (sufficient skills and knowledge are required). In contrast with both of these food literacy contribution types, *taste and ingredient evaluation* is accessible to the majority of social media users without having experienced similar recipes before. They do not advance food literacy *directly*, but constitute an *indirect* mechanism of validating (or not) extant food literacy contributions, which may have aimed information depth or breadth. If we compare the numbers of comments of each type, this last category is largely over-represented in the analyzed comments, which supports the wider accessibility of this type of contribution.

4.2 Sources and conditions of food literacy distortion

Investigating value co-creation also requires studying value co-destruction, defined as all practices that lead to a decrease in value for at least one of the actors (Plé and Chumpitaz Caceres, 2010). Our data helped us identifying the sources of knowledge distortion, thus a decrease in value, which may hamper the quality of food literacy.

Analyzing the content and informants' sayings reports that consumers react to social food videos not only using the conscious judgments they form based on previous and similar experiences, but they also seem to be biased in their judgment, consciously or unconsciously. The vivid and socio-cultural environment, as well as social media users' psychological mindset seem to affect the extent to which they react and contribute to food literacy

disseminated through social media. As information exchange happens outside of the control of nutritional specialists, the quality of food literacy has thus to face 4 types of biases, leading to knowledge distortion and thus value co-destruction. These biases appeared after using the same open-coding analysis approach as in the first section of the results:

1. Vividness bias

2. Mindset bias

3. Socio-cultural bias

4. Cognitive dissonance bias

4.2.1. Vividness bias

Social food videos are highly visual and create arousal through their vividness. They use arousal-awaking techniques such as close-ups, slow-motion and saturated images to appeal to consumers' senses and shape their reactions. They are thereby generating an even greater vivid experience, which seems to tease consumers' appetite and affect their judgment:

> *"I like this kind of videos to give me ideas, to inspire [...] It makes you want it. What I see there, it really makes you wanting it"* (*Adele*)

> *"I feel that these videos are mistaken us. In these videos, it looks like it is easy to do, but in reality I find that it's not that easy ... it looks good but at the same time there's a lot of fat"* (*Debora*)

Consumers' physical and psychological well-being seems thus to affect consumers' *propensity* to contribute, but also the *nature* of their contribution to food literacy. First, they seem to provide more feed-back or reactions on the basic level, i.e., evaluation of taste and ingredients, and second their critical judgment (and thus superior contribution to food literacy) is biased by the vivid and arousal-awaking video techniques, as shown in the following quotes

"Oh my god so easy to make and loooks so colorful and delicious 😍 *"*(Comment from a Facebook post)

"These look very cute, but I'd make these just for show-off/decoration though... my baby and I won't be actually eating these cookies, entirely too much sugar. 😂 *"*(Comment from a Facebook post)

"That's a huge amount of ingredients and effort for five pain au chocolat! Won't deny they look amazing, but still......" (Comment from a Facebook post)

From these and similar transcription quotes, we observe that social media users may be more or less aware of the techniques used by social food video producers to make recipes look easy and appetizing. Depending on how conscious they are about these techniques, consumers seem to comment positively but potentially biased (*reducing* the quality of food literacy) or comment more critically, sometimes even aggressively, as they become aware of these techniques (potentially *increasing* the quality of food literacy).

4.2.3. Mindset bias

Another interesting observation consists in the valence of the comments. It seems that some social food videos result in more indulgent reactions and comments, and others in more aggressive critiques. From our data, we observe that sweet recipes have a tendency to face more positive reactions, for example "shares", when compared with more healthy recipes. Unhealthy food (e.g., containing high amounts of glucides) generates thus greater word-of-mouth, even though its negative effects on health is commonly known. As an example, a correlation analysis shows that the higher the amount of glucides of a recipe, the higher the number of total reactions (likes, loves, etc.) and the higher the number of shares (cf. Table 3).

Correlations

		Shares	Total Reactions
Glucides	Pearson Correlation	,681**	,888**
	Sig. (2-tailed)	,000	,000
	N	138	138

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Higher sharing and reactions rates for highly glucides-containing recipes

If we analyze the comments of sweet social food recipes only, we observe that the latter receive more comments of positive valence, when compared to other recipes (cf. socio-cultural bias).When asking interviewees about potential reasons to this observation, they explain the following:

"It's because of my desire to eat crap or because I needed it morally" (Jeanne).

"It happens that I feel bad because I left in the morning with good intentions. I told myself, I'm going to eat well and uh ... here ... I gave up. So maybe a little regret, but I quickly forget it [laughing]" (Sabine).

Sweet recipes are often also tightly linked to positive experiences and memories as described by Adele:

"It's the cake for which you shouldn't feel guilty. There are 200gr of butter, 200gr of sugar, 200gr of chocolate, but it is the perfect cake. It is my childhood memory. In fact, it was the birthday cake of my childhood, and every year I had the same chocolate cake made by my mother, so it's the one I'm doing for my son and my guests, too " (Adele)

Consequently, we observe that consumers' psychological and physical mindset (e.g. positive memories, hunger, stress) affect how critically and objectively they evaluate social food videos (and thus contribute to food literacy). Their propensity and nature of contribution is

thus affected by this subjective evaluation. However, contributing qualitatively to food literacy construction requires an objective and distant critique of the nutritional value and steps of processing. Due to the important correlation found in Table 3, it appears that this bias seems to be the most weighted one in the decision and nature of food literacy co-construction.

4.2.3. Socio-cultural bias

Finally, when coding the comments to Facebook posts, there is an important set of critiques, which do neither come from the video techniques that are used nor based on consumers' mindset. Due to the importance of these comments, we address this bias in a separate category, called "socio-cultural bias". More specifically, we observe systematically more aggressive comments when the food videos tackle issues that concern a specific community, namely:

- National dishes (e.g., *"As a Swiss person I feel offended you call that fondue. Also don't put apple in fondue. Please.")*

- Vegan/vegetarian food (e.g., *"This is not vegan at all, it is just to give illusion eating meat")*

- Food for children (e.g., *"Nutella has palm oil in it. Not healthy. Use real chocolate.")*

- Gluten-free recipes (e.g., *"Gluten turns to sugar in the body. What's the difference of these with all that refined sugar that the body has a hard time processing and isn't good for you in the first place?")*

Being part of a specific community means defending a set of values and having higher expectations when searching for recipe-videos in line with the community's values. For generic website like *Tasty*, sharing recipe-videos for these specific communities belongs to their strategy of creating proximity with different types of communities. However, whenever the food-related standards of a specific community are not met, the reactions seem even more

"violent" as compared to more "traditional" recipes. Whether this category of contributions bias is of positive or negative valence is unclear, but they nurture the discussion and thereby advance the food literacy of a specific community.

4.2.2. Cognitive dissonance bias

A final category of bias source refers to an inner psychological tension felt by social media users between knowing what is "good" for them (their common belief) and what they are feeling at the moment of watching the video (contradicting attitude), which, in psychology is known as the phenomenon of cognitive dissonance (Ong et al., 2017). Findings indicate that social media users seem to react and comment differently depending on the extent to which they perceive a cognitive dissonance (cf. quotes below).

> *"As I study medicine, I'm becoming more and more aware of the importance of healthy eating ... I try to eat more fruits and vegetables ... but this kind of video, even if there is a lot of cream, it just seems so good"(Elise)*

> *"With my boy-friend we pay attention to what we eat ... even if it remains rare, yes I sometimes put a "like" to the recipes that I find good and especially healthy" (Debora)*

> *"I love chocolate and I am a gourmet so this kind of cake does not bother me, but I would not recommend it to people who are on a diet because I find it too sweet and I know that sugar is not healthy"(Aline)*

From these and similar transcription quotes, we observe that the extent to which consumers feel cognitive dissonance seems to affect the strength and valence of their contribution. However, in contrast with previous biases, this last tendency seems to counterbalance the risks of food distortion. More precisely, as shown in the last quote, if cognitive dissonance seems high and consciously perceived, social media users will turn their comment into the most acceptable (healthy) comment even if they personally do not take it into consideration.

However, if they do not dissociate both states of the cognitive dissonance, the contribution to food literacy seems to be biased again.

5. Discussion

Online platforms like social networks encourage users to exchange resources of all types and interact with each other. This interaction can either create or destroy value (Leclercq, Hammedi and Poncin, 2016). In contrast with other forms of value that have been studied in the previous literature (brand attachment, inspiration, etc.), the exchange of food-related information, and thus the co-construction of food literacy not only creates value (i.e., food-related knowledge) for different actors (individuals, organizations or networks), but determines the quality of food literacy shared worldwide. Understanding the quality of food literacy and how users (vs. nutrition specialists) contribute to it is relevant as this literacy impacts consumers' healthy eating behaviors (Barreiro-Hurlé, Gracia and de-Magistris, 2010; Shimokawa, 2013; Tobey and Manore, 2014).

In contrast with the previous literature on co-creation, there is much more at stake (namely consumers' food attitude, eating habits, and overall well-being) when studying the construction and distortion of knowledge online in the context of food. This research contributes to this debate and health-related issues by investigating how food literacy is co-constructed, and under which conditions food literacy is distorted.

Results indicate that social media encourage the co-construction of food-related information directly and indirectly. We observe that consumers' contribution to food literacy can be classified into three categories, which vary in their direct and indirect, and depth or breadth of contribution, namely: evaluation, adaptation suggestions and procedural critiques. These results extend Dawley (2009)'s typology by nuancing the types of knowledge creation

activities social media users can engage in. More precisely, besides simply contributing passively or actively (Dawley, 2009), we observe that consumers can contribute qualitatively at three various degrees. These co-construction practices not only develop a specific type of skill or knowledge, but help developing each of Slater's (2013) three pillars of food-related education (i.e., functional, interactive and critical food literacy). In particular, we observe that all three types of literacy are co-constructed on social media. Moreover, we can even explain how these three types of literacy are constructed (e.g., exchange of procedural techniques) and through which mechanisms (e.g., direct and in-depth contribution).

Furthermore, while most previous studies analyzed formal food-related education attempts to improve food literacy (e.g., Burton, Riddell, and Worsley, 2018), our research contributes by providing a critical view on food literacy construction in a social environment, in which information sharing falls outside of the control of nutrition specialists and policy makers. In particular, our findings provide evidence that all food literacy constructed by consumers is not always qualitative because consumers may be potentially biased when contributing to food literacy in social networks. As value can not only be co-created, but also destroyed (Leclercq, Hammedi and Poncin, 2016), we identify the potential sources of knowledge distortion. In the context of food education, false information sharing can be particularly harmful and lead to naïve learning (Deighton and Kornfeld, 2009; Golub and Jackson, 2010). The identification of potential biases in the co-construction of knowledge helps better understanding and thus anticipating and managing food literacy construction to some extent.

More generally, our research contributes to enrich the food policy literature which calls to investigate factors influencing consumers' healthy eating behavior, and thus overall well-being. Our results explain that the commonly-cited importance of food literacy depends on the quality of this food-related knowledge, which can be positively or negatively affected or co-constructed in a social environment.

To be generalizable, the results of this study need to be tested quantitatively by identifying and quantifying the importance of each type of distortion bias and its real impact on food literacy co-construction. Future research could also study this phenomenon in other domains than food to identify similarities and differences in co-construction practices and their impact on well-being (sports practices, body care, etc.).

6. Policy implications

From a managerial point of view, our results help food education organizations and policy makers to better understand the types and conditions under which food literacy co-construction but also distortion occurs on social media. They can thereby adjust their communication on the form and the content. In particular, our results find that Internet users contribute to food literacy by evaluating (likes, reactions), but also through suggestions and critiques (comments). As the choice of the platform has shown to be central for interaction and value co-creation (Leclercq, Hammedi and Poncin, 2016), organizations should prefer networks that include reaction and comment options. For example, Facebook and YouTube are therefore preferred over blogs, in which interactions are less obvious. To increase interaction, organizations can also directly encourage consumers to participate in food knowledge construction (asking for feed-back or opinion, allowing for critiques, etc.).

Rather than perceiving social media as a threat, the Internet can help improving the quality of disseminated food knowledge if correctly managed. To avoid food knowledge distortion, nutritional specialists should anticipate and integrate potential sources of bias in the design of food-related knowledge means. Given the potential sources of bias identified in this study (i.e., vividness, mindset, socio-cultural or cognitive dissonance bias), the content must be well-thought. For example, socio-cultural biases can be reduced by consulting with members

of a specific community when designing social food videos (e.g., the vegan community). Vividness biases can be reduced by intelligently using video-animation techniques. Using cinematographic techniques to make food more attractive (e.g., zoom-in, slow-motion) should be preferred for the promotion of healthy recipes rather than caloric desserts. Even though the cognitive dissonance and mindset bias are more difficult to manage externally, video producers can influence consumers' judgment by promoting the "better" recipes (healthy rather than unhealthy videos) using, again, advanced cinematographic techniques.

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Appendix:

A1: Qualitative study sample

First name	Gender	Nationality	Age	Situation
Alexandre	M	Belgian	22	Student, living in a student apartment
Julie	F	Belgian	25	Psychologist, single, living alone
Marie	F	Belgian	52	Mother with husband and 2 children
Monyse	F	Belgian	47	Mother of a large family
Louise	F	Belgian	76	Retired, in a relationship
Thibault	M	Belgian	21	Student, living in collocation
Méghane	F	Belgian	27	Works in an NGO, lives in a collocation
Sabine	F	Belgian	47	Housewife, mother of 3 children
Quentin	M	Belgian	55	Independent reseller, living alone father
Jeanne	F	Belgian	74	Retired English professor, living with husband
Adele	F	French	36	Employed at primary school, single, 1 child
Elise	F	Belgian	20	Student, living in a student apartmentandat her parents' home during the week-end
Arnaud	M	Belgian	21	Student, living in a student apartment and at her parents' home during the week-end
Fidan	F	French	29	PhD student, living with his wife and 1 child
Roula	F	French	36	Assistant professor, single, living alone
Sophie	F	Belgian	20	Student, living in a student apartment and at her parents' home during the week-end
Sophia	F	French	22	Assistant, living with her mother

A2: Interview guide

1) Introduction
- Why do you search for cooking recipes on the Internet?
- What type of information are you interested in? What do you expect?
- How do you use social media for finding food-related information and inspiration? And why?
- What type of food-related information to you find on social media?

2) Social food videos

- What do you think about recipe-videos shared on social networks like Facebook?
- What do you like and dislike about these recipe videos?
- What is special about recipe-video on Facebook compared to other recipe-videos?
- Have you tried these recipes at home? Why? Why not? Tell me about it.

3) Comments and reactions

- How do you personally react to social food videos? Why?
- Do you sometimes react (e.g. like / share) or even comment on a recipe?
  • What kind of comments do you leave?
  • What kind of comment would you leave for this type of videos?
- What do you think about comments posted by other users?
- Do you take other people's comments into account when judging a recipe? How?

4) Perception of the value of the recipes shared on social networks

- What do you think a nutritionist would say about these videos?
  - Do you think these videos could encourage people to eat more/less healthily?
  - What do you think of sweet recipes (like chocolate cake recipes) on Facebook? Do you think that Internet users appreciate? Why?
  - Do you react to comments that are favorable or unfavorable to people's health? Why (not)?

5) Wrap-up