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Parental Perceptions and Practices Regarding Sugar Intake by School-Aged Children: A Qualitative Study with Portuguese Parents

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Abstract

Excessive sugar intake is one of the factors contributing to the alarming rates of childhood obesity and overweight in Portugal. Children's preferences and food consumption patterns are largely determined by the foods that are more familiar to them. Parents and caregivers are responsible for shaping children's eating habits since they are the ones who choose the food available in the household. The present study explores parental perceptions about sugar and sugar intake and its consequences on children's health. Moreover, we also examined the practices they used to regulate their children's diet, namely to promote the consumption of desired foods (e.g., vegetables) and to limit the intake of undesired food (e.g., sweets), and the perceived barriers and facilitators of sugar intake regulation. To this end, 42 interviews were conducted with parents of school-aged children (ages 6–10 years). A thematic analysis revealed that parents perceive sugar as highly negative (e.g., "evil", "poison", "addiction") and its consumption as harmful (e.g., hyperactivity; overweight). Nonetheless, the view that sugary food consumption is not necessarily problematic was also common. Indeed, most parents considered that sugar intake should be regulated, but not forbidden. To control the intake of sugary foods (e.g., sodas, cookies), they reported using strategies such as restriction, explanation, or negotiation. Several barriers to sugar intake regulation were identified (e.g., birthday parties, parents' lack of knowledge), but also a few facilitators (e.g., bringing food from home to school). Our findings may inform the development of interventions or policies aiming to promote healthier eating habits in school-age children.

Keywords: Sugar intake; Parental perceptions; Children; Strategies; Barriers

1. Introduction

Child obesity is currently recognized as a severe public health concern worldwide (Lobstein & Jackson-Leach, 2016). For example, about one in every five children or adolescents in Taiwan (Kuo et al., 2014), the USA (Hales et al., 2017), or Latin America (Corvalán et al., 2017) are overweight or obese. Portugal is not an exception. According to recent data from the Childhood Obesity Surveillance Initiative (COSI, 2019), almost one-third of Portuguese children between 6 and 8 are overweight or obese. Although these numbers have been decreasing – from 37.9% in 2008 to 29.6% in 2019 (COSI, 2019) – obesity prevalence remains worrying, being one of the highest in the OECD countries (WHO, 2015).

A poor diet, including excessive sugar intake, is one of the most impacting factors for the prevalence of obesity and other chronic non-communicable diseases (WHO, 2015). Besides overweight, high sugar intake is associated with multiple adverse health outcomes, including cardiovascular disease risk (Vos et al., 2017), as well as oral health problems (WHO, 2015), pancreas (Larsson et al., 2006), and breast cancer (Jiang et al., 2016). The WHO currently recommends that children and adults' intake of free sugars (i.e., "monosaccharides and disaccharides added to foods and beverages by the manufacturer, the cook or the consumer, and sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates", p. 4), should be less than 10% of the total energy intake (WHO, 2015). Critically, recent estimates suggest that, in Portugal, 40.7% of children and 48.7% of adolescents do not comply with these guidelines (Lopes et al., 2017).

It is thus relevant to examine the factors that contribute to such high sugar consumption among children. A recent literature review by Scaglioni et al. (2018) revealed that children's eating behaviors are influenced by a myriad of factors, including contextual (e.g., obesogenic environment; family environment) or individual (e.g., food preferences) factors. For instance, children seem to experience taste differently from adults (Ventura &

Mennella, 2011), with children and adolescents preferring foods/drinks with higher levels of sugar (e.g., sucrose, Bobowski & Mennella, 2017; Drewnowski et al., 2012; Petty et al., 2020). Children's diets may also be influenced by general contextual factors, namely conditions and life opportunities that promote obesity (i.e., the obesogenic environment), such as proximity to supermarkets and fast-food restaurants (Mei et al., 2020), and media exposure, such as unhealthy food advertising on TV (Russell et al., 2019). Still, a significant determinant of children's eating habits is the family environment. Children's preferences and food consumption patterns are determined mainly by their parents' dietary practices (Bassul et al., 2020). Caregivers are the ones who choose the food and the amount of food available at home and to their children (e.g., Savage et al., 2007; Wood et al., 2020). For example, the availability of fruits and vegetables at home correlates positively with their intake by children (e.g., Draxten et al., 2014; Vaughn et al., 2018). Consumption of fruits and vegetables has also been positively associated with mothers' education level (e.g., Wen et al., 2014). Overall diet quality is also predicted by the family meals frequency (Larson et al., 2007). Indeed, it is during family meals that dietary rules are defined (Scaglioni et al., 2018).

The promotion of healthy eating at home is mostly dependent on feeding practices/strategies that parents implement to limit or encourage the intake of certain foods by their children (e.g., Hughes et al., 2013). These strategies aim to regulate what, when and how much their children eat, namely food and beverages with high sugar content (Blissett, 2011; Scaglioni et al., 2018; Ventura & Birch, 2008; for reviews, see Shloim et al., 2015; Wood et al., 2020). Studies have also concluded that restricting access to such foods effectively decreases the preference for sweets in children (e.g., Woo & Lee, 2019), but excessive control may have the opposite effect (e.g., Vollmer & Mobley, 2013).

Overall, parents, as well as children, tend to report negative attitudes and beliefs regarding sugar intake (accurate or not) and perceive sugar as harmful to health (e.g., weight

gain, oral health problems, hyperactivity; Eck et al., 2018). Hence, parents seem to recognize the importance of limiting sugar intake (e.g., SSB consumption) and to adopt some strategies in this direction (Eck et al., 2018). Still, they also identify some barriers that hamper their efforts. For instance, according to a recent study, the main barriers faced by parents to control sugar intake are a) the lack of time due to everyday tasks; b) the excessive tolerance of sugary treats; c) the pressure felt due to other parents allowing their children to consume sugary foods; d) the availability of foods with high levels of sugar in supermarkets and schools; and e) the wide variety of different types of sugar (Bradley et al., 2020). In addition, Martin-Biggers et al. (2015) reported that parents also perceive as barriers to the restriction of sugar intake, specifically of SSB, the availability of this type of drinks, the scarcity of healthy alternatives, and their low cost. Other barriers identified by parents include the presence in the media (e.g., the advertising of foods and beverages with high sugar content) and the lack of parental knowledge to choose the healthiest alternatives (i.e., low sugar, Swift et al., 2018), as well as children's food preferences, particularly the greater desire for foods with high sugar, salt and fat content (Goldthorpe et al., 2018).

In sum, eating habits emerge in childhood, with parents having a major influence on the process. Food preparation and supply, control, and/or food incentive strategies, the effects of modeling, and general practices in the domestic environment have a major impact on children's food choices and habits. Previous research on parental perceptions about barriers and strategies regarding schoolchildren's eating behaviors has mainly focused on general eating habits (e.g., breakfast, vegetables, fruits, and SSBs consumption; Alsharairi & Somerset, 2014; Bolter et al., 2019; Eck et al., 2019). To the best of our knowledge, research is yet to explore parents' specific perceptions about sugar intake and the different strategies they use to regulate this intake by children. Considering the wide range of foods with high portions of sugar that children consume more frequently than recommended (e.g., soft drinks,

nectars, cookies, breakfast cereals; Lopes et al., 2017), the current study aimed to explore parents' perceptions about sugar, the strategies used to regulate sugar intake by their children, and perceived barriers in promoting healthy eating for children.

2. Method

2.1 Participants

The sample included 44 parents [1] (31 women, M_{age} = 40.89; *SD* = 4.82) of at least one child attending the elementary school (aged between 6 and 10 years). Each participant received a 10€ commercial voucher for their collaboration. All participants were of Portuguese nationality except one, whose nationality was Spanish (but living in Portugal for several years and fluent in Portuguese). The majority of parents reported having higher education (52.27%). More than half (59.5%) of the sample indicated they were solely responsible for deciding their children's meals, while 35.7% reported sharing this responsibility with the child's grandparents. Most interviewed parents (61.9%) had two children, 26.2% had only one child, and 11.9% had three children. Although some of the interviewed parents had more than one child, based on this study's objectives, only the responses referring to children aged between 6 and 10 were considered (*n* = 47; 21 girls; M_{age} = 7.94; *DP* = 1.23). Additionally, based on parents reports of child height and weight, we found that only 20 children (out of 47) were within normal weight (42.6%), whereas 12 had low weight (25.5%) and 15 were overweight (31.9%). Table 1 presents the body mass index, the type of diet, and parents' and children's health conditions.

Table 1

Sociodemographic Data and Diet-Related Characterization of Parents and Children

	Parents [a]	Children [b]
	Frequency (%)	Frequency (%)
BMI		
Low weight	0	12 (25.5%)
Normal weight	23 (52.3%)	20 (42.6%)

[1] Forty-two interviews were conducted, 40 were individual (i.e., with the child's mother or father) and two with both parents. In these last two cases, only one questionnaire was filled in.

Overweight	21 (47.7%)	15 (31.9%)
Food Style		
Omnivore (no restrictions)	39 (88.6%)	43 (91.5%)
Flexitarian	0	1 (2.1%)
Fried foods and sugar restriction	1 (2.3%)	2 (4.3%)
Weight loss diet	3 (6.8%)	0
Carbohydrate restriction	1 (2.3%)	0
Lactose-Free	0	1 (2.1%)
Health conditions		
None	35 (79.6%)	39 (83.0%)
Gluten and/or lactose intolerance	7 (15.9%)	5 (10.6%)
Other conditions (e.g., asthma; rhinitis)	2 (4.5%)	3 (6.4%)

[a]According to WHO categorizations (2000), for adults, a BMI value (weight/height^2) < 18.5 indicates low weight; a value between 18.5 and 24.99 indicates normal weight; a value > 24.99 indicates overweight or obesity.

[b]Children's BMI percentile was calculated according to the child sex (WHO, 2007a, 2007b). For children, BMI values (weight / height^2 by age) < 15th percentile indicates underweight, and values > 85 percentile indicate overweight (e.g., Mei et al., 2002).

2.2 Instruments

Data were collected with a semi-structured interview and a questionnaire on sociodemographic variables (e.g., nationality, age, weight, height, etc.).

A semi-structured interview guide was developed for this study. First, participants were invited to present themselves and their families and answer some questions regarding their general eating habits. Parents were also asked about their children's eating habits at home and school (e.g., "could you tell me about your children's typical daily eating habits, namely what is included in each meal and where it takes place?") and about food purchases specifically for the children ("when you go shopping, can you think about any food products that you buy exclusively for your child(ren)? If so, can you provide examples of such products and why do you choose them?). Moreover, we also explored the possibility of changes in the participants' eating habits after becoming a parent (e.g., "To what extent did your eating habits change after becoming a mother/father? If so, in what ways?).

In the first part of the interview, we also included some questions aimed to explore parental strategies regarding food intake in general (e.g., "In your home, is there any type of food that is "forbidden" or "controlled" [e.g., only allowed on special days]?; "Is there any foods that your child doesn't like, and you feel that they should eat? How do you promote the

intake of such foods?"). These general questions allowed to characterize children's food habits in the context of their family and school environments, as well as opportunities for aspects related to sugar intake to emerge.

Subsequently, the questions focused specifically on sugar-related information. We explored parents' perceptions about the sugar content in products (e.g., "What type of food and drinks do you immediately associate to sugar?, "In general, do you think that food products marketed to children contain a low or high sugar content?") and sugar intake in children (e.g., "What is your opinion about sugar intake in children? Do you think it is good/bad, necessary/unnecessary, healthy/unhealthy?", "Have you ever searched for information about this issue? If so, what sources have you used [e.g., social media, news, health professionals]?"). We also included questions to specifically examine whether parents regulate sugar intake, and, if so, what type of strategies they use and what are perceived barriers and facilitators (e.g., "Do you think it is easy or difficult to regulate the amount of sugar ingested by your child/children? Why?"; "If you regulate sugar intake, what type of strategies have you used?"). Lastly, participants were given the opportunity to comment or share other information that was not addressed during the interview.

2.3 Procedure

This study was approved by the Research Ethics Committees of the [Blind for Review]. Participants were recruited through a snowball sampling method, mainly through the contact networks of the research team. During the first contact, parents were informed about the study's purpose and procedures, and those interested in participating scheduled an interview. The two researchers that conducted the interviews (each interviewed half of the participants) were trained regarding all phases of the data collection process. The interviews took place at the participants' homes or their children's school, sports, or leisure centers. Before starting the interview, participants were informed about the goals of the study, the

expected duration of the session, and that the interview (audio) would be recorded. Ethical considerations were also explained (benefits and voluntary nature of participation, anonymity, confidentiality, and that they could end the interview at any time). After written informed consent was obtained, the interview lasted for approximately 30-45 minutes, and, in the end, participants responded to the sociodemographic questionnaire.

2.3.1 Analytic Strategy

All interviews were transcribed verbatim, and the data were analyzed through thematic analysis using the NVivo program (V12). The encoding process was mostly data-driven (i.e., an essentially inductive approach). However, a few codes – those related to the determinants of eating – were anchored on the COM-B model, which identifies three main types of behavioral (B) determinants – i.e., Capability (C), Opportunity (O) and Motivation (M)(Michie et al., 2011). After coding all the initial information, broader themes and sub-themes were defined in line with the study objectives. The coding tree was refined through the discussion among team members familiar with the data, resulting in a thematic map with all themes and sub-themes definitions and one or two examples of each. Two researchers used this map to independently code 10% of the material in two subsequent rounds (agreement between coders in round 1 was 71.58% and 84.61% in round 2). All disagreements were resolved by consensus and further refinements to the thematic map. Next, we present the product of this analysis, focusing on the themes related to perceptions about sugar and sugar intake in children and strategies to regulate children's food intake, particularly sugar. To identify participants' contributions, for each quote, we indicate participant number, and whether the participant was the mother or the father, and their child(ren) age (e.g., "4#Mom:10years" identifies a quote by participant number four, a mother of a 10-year-old child). Specific brands were redacted.

2. Results

3.1 Children's Eating Habits

More than half of the participants reported that their children "ate well", which meant they ate healthy (e.g., soup, vegetables, fruit, grilled/steamed fish) or varied foods. Although less frequently, many parents mentioned that their children were "picky eaters", rejecting various foods or food groups. Almost all parents mentioned specific foods that were preferred by their children, namely fruits (e.g., apple, banana, pear, mango, and strawberry), fish (boiled and grilled), beverages (e.g., iced tea, cola, fruit nectars), and less frequently, sweets and salad. Frequent least liked foods included vegetables (e.g., broccoli, carrots, and onions), soup, sweets, and cheese.

Most parents referred that usually, children have four or five daily meals (i.e., breakfast, lunch, one or two snacks, and dinner). Nearly all children have lunch at the school cafeteria (except two that bring their lunch from home). Most parents had a favorable opinion about the food provided by their children's schools, and some mentioned that the menus were planned by healthcare professionals (e.g., nutritionists). Those who had an unfavorable opinion cited reasons such as an excessive offer of fried and processed food (e.g., fish sticks, meat croquettes) or overall poor food quality. For example, one mother stated: "*I think the fish is always fried. It can be prepared in the oven, but it is fish sticks - that processed thing that is not real fish. So, I am not very happy* [with food quality], *especially because I think that it is a good school...*" (22#Mom:7years).

Most children bring food from home, either a full snack or a complement to the one offered at school (e.g., sandwiches with butter, cheese, ham or jam, fruits, cookies, plain or chocolate milk and juices). Nearly half the schools had some guidelines about the type of snacks allowed, usually defined by the classroom teacher. These guidelines mainly encouraged the consumption of fruits and discouraged processed foods' consumption (e.g., chocolate bars, chips, cookies, doughnuts, buns filled with chocolate cream). As expressed by

one of the parents: "*Usually… there are always warnings, whether from the principal or the teacher, because there are too many parents who send processed things …, for example, those things with chocolate in the middle…*[brand x]…*There are parents who send this every day, and the teacher is always freaking out with them, she doesn't mention any names but says "Parents should pay attention, those who send snacks, don't send* [brand x]*… it is only harmful to the children…"* (10#Dad:9years).

Parents also mentioned that they buy some food products exclusively for their children, such as specific types of milk (chocolate, lactose-free, and semi-skimmed), yogurts, breakfast cereals, cookies, and fruit juices. When asked about the reasons for choosing these products, parents mainly indicated their children's preference or some intolerance (e.g., to lactose), with convenience also having some influence: *"Milk packages, whether chocolate or plain, or juice, are handy to bring to school for snacks"* (41#Mom:8years).

3.2 Parents perceptions regarding sugar and their children's sugar intake

Figure 1 systematizes the themes that emerged related to parents' understanding of sugar and their perceptions of children's sugar intake.

[INSERT FIGURE 1 ABOUT HERE]

3.2.1 Identification of products according to their sugar content

We examined parents' perceptions about the sugar content of food products developed and marketed specifically to children. Overall, parents considered that these products contain high quantities of sugar. Indeed, parents expressed difficulty in providing examples of such products with low sugar content, except for fruit either fresh or pureed (pots and pouches). For instance: "*…those pouches … in the package states that is 100% fruit and nothing more*" (28#Mom:9years).

The products with high sugar content more frequently mentioned were sodas (e.g., cola, iced-tea): "[Cola brand], *which I love…I try to drink the* [variety with no calories/sugar],

but I am yet to figure out if that has sugar or not because the taste is so similar to the regular version. But I believe it is loaded with sugar…" (16#Mom:7years). Many parents also referred to fruit juices and nectars, but it was not consensual as a few parents defined these drinks as low in sugar. One parent stated - "…*I also associate that* [fruit nectar brand] *to sugar, it contains lots of sugar. I think it is as bad as sodas. The difference is that sodas are carbonated, but regarding sugar, I think it is the same"* (14#Mom:8years) – whereas others argued, "*I think juice is good, that* [same fruit nectar brand] *juice is good. It is low in sugars and… But flavor-wise … okay, it's terrible*" (21#Dad:8years). Cookies (e.g., Marie biscuits, cream-filled chocolate cookies) and breakfast cereals were also frequently mentioned as examples of high sugar products. Opinions regarding the latter were more divergent, with a few parents saying that some cereal varieties include less sugar (e.g., cornflakes). For example: "…*although a few kinds of cereal are high in sugar, I think we already have a few good options… we have the "Bio"* [organic version of a well-known children's chocolate cereal brand]*, it includes cartoons that appeal to children*…" (23#Mom:9years/twins). Other examples of high-sugar products were chocolates and children's yogurts (e.g., fromage frais, split-pot yogurts).

3.2.2 Perceptions about Children's Sugar Intake

None of the parents expressed a positive attitude toward sugar intake. The majority mentioned that sugar intake should be regulated, and that balance is essential. Some of these parents are against sugar intake in general but consider that it is harmless as long as it is occasionally consumed, being mentioned that forbidding access may be actually worse. For example: "…*I believe that sugar is not actually good. Still, I believe that nothing in life should be completely forbidden because… If we prohibit everything, then it is even worse because then children won't know how to regulate themselves. Therefore, I think that finding*

a balance is the ideal solution, knowing what the rule is and what is the exception… [sweets] *are something that one can try on a party and, even so, with boundaries*." (42#Mom:7years)

Other parents revealed a more extreme posture against sugar, not mentioning any situation in which sugar consumption by children is acceptable: "[Sugar is] *Terrible, horrible, horrible…it is at the core of many diseases and, ok, even if not immediately it ends up there* [in disease]. *For children, for adults, for all. Terrible. I hate sugar*" (38#Mom:9years).

It was also widespread the view that sugar and sugary foods create an addiction. The following quotes illustrate this view, with the first comparing sugar intake to smoking and the second referring to withdrawal symptoms:

"*It is bad… no, no, sugar is this century's poison. I think that it works because it is addictive…It's an addiction, I smoked, and tobacco was addictive. I believe that sugar works the same way; it is addictive*" (1#Mom:10 years).

"*…I think it is very unhealthful and that it creates addiction and that is the problem with* [sugary] *food, after creating the addition it is hard to eliminate it. Because when we provide lots of sugar, the body keeps asking for more, and then it is hard to change those habits. And they* [the children] *suffer; I really think that when we restrict children that have always had an unhealthy diet, they suffer. To eliminate sugar drastically is very complicated for them*" (23#Mom:9years/twins).

Moreover, the view that sugar is all-pervading and unescapable was also prevalent: *"It is awful because sugar is everywhere ... And it* [sugar] *is evil, it is the evil of this century…And all they* [children] *ask for, all they desire, all of they reach for are gummies, chocolates, lollipops, chewing gums… all that is loaded with sugar and the excess happens. It is tough to escape all of that*" (22#Mom:7years).

Still, some parents referred that, although children ingest a high sugar quantity, this intake is not as problematic (compared to adults) because their metabolism and activity levels

help them to eliminate sugar from their bodies. For example: "…*children are more active and seem to burn out everything they eat quicker… It seems that the body does not absorb sugar as much*…" (8#Mom:7years).

3.2.3 Sources of Information about Sugar

Only a few parents responded that they did not search for information about sugar or sugar consumption. Those who mentioned actively searching for this type of information relied mainly on the internet. However, this source was also identified as confusing "*We can do a quick search, it is fast and easy, but it has a lot of information and sometimes I cannot disentangle what is good or bad*" (16#Mom:7years). Other sources included: health professionals (e.g., pediatricians, nutritionists), news, courses, scientific or instructive materials. For example, one mother explained, "… *I used to consult with a nutritionist since the twins were 2 years old. Afterward, I started looking up information online. I follow a lot of blogs and search for trustworthy information to understand what is good and what is bad for you*…" (23#Mom:9years/twins).

Other parents mentioned that they did not feel the need to search for information regarding sugar intake because the topic is frequently addressed in the media (e.g., tv news, magazines): "*I think that, more or less, I am an informed person. I do not search for it* [information about sugar]*; it comes to me through magazines, lifestyle webpages… So, I don't actually read scientific papers about the topic, just what is already broken down by the media*" (30#Mom:9years). Some other sources included the internet, healthcare professionals, or informal conversations with colleagues, friends, or family members working in healthcare: "*No* [I don't search for information]. *I know what comes up; I have many family members in healthcare, I used to work in the area. The information comes to me*" (6#Dad:7years).

3.2.4 Consequences of Sugar Intake

Underlying the negative views about sugar and sugar intake were the ideas that calories from sugary foods are "empty", not nourishing, and without vitamins. Parents also mentioned the consequences of sugar intake (both short and long-term), particularly agitation or hyperactivity. Specifically, many parents believed that ingesting sugar or sugary foods is a stimulant, inducing a spike in children's energy that can even lead to inattention, which, in turn, hinders school performance.

"*… excessive sugar intake leads to states of hyperactivity…we all know that sometimes there are sugar shocks and then children can't stop*" (10#Dad:9years).

"*After ingesting foods with high sugar content, I believe that children become a bit restless. That is not good because they may have a few moments of high energy after eating… but then, perhaps, it breaks down, and there is a lack of focus*…" (18#Mom:9years).

Still, one of the parents challenged this association between sugar intake and changes in the habitual behavior, arguing that, in the case of parties, children become agitated due to the whole social context, instead of resulting from sugar intake: "… [in parties] *she becomes more agitated, more electric, but maybe this happens because of all the people present and not so much because she ate too much sugar*" (38#Mom:9years).

Many parents also mentioned overweight and obesity as potential consequences: "*Nowadays we hear much more about sugar than salt. Maybe due to obesity, that is already quite high in children as well, right*?" (3#Mom:8years). Other consequences frequently mentioned were diabetes – "*…to develop diabetes and become insulin-dependent, that worries any normal person*" (6#Dad:7years) – and oral health issues, namely dental caries: "*…you see it right away in the teeth…Once she* [daughter] *got one cavity and we realized that, perhaps, it had to do with the excessive amount of sugar she was eating and to not brushing her teeth adequately…*" (34#Dad:9years).

Some parents also mentioned cardiovascular (e.g., high cholesterol, hypertension) and oncologic conditions. For instance: "*It is increasingly present in the news that more children have cholesterol, little ones, right*?" (1#Mom:10years); "*It has been shown that sugar feeds cancer …. Everything that is bad feeds on sugar*" (2#Mom:6years).

3.3 Parental strategies to regulate children's food intake

Parents mentioned different strategies they use to regulate their children's food intake, which were categorized into strategies to promote or limit the intake of specific foods (i.e., incentive and control strategies, see Figure 2).

[INSERT FIGURE 2 ABOUT HERE]

3.3.1 Strategies to promote the intake of healthy foods

Almost all participants reported having defined strategies to encourage the consumption of the food they consider healthy or necessary in their children's diet (i.e., desired foods, such as vegetables), namely:

a) Explaining (i.e., informing children about the benefits and importance of consuming the desired foods): "*It is again 'indoctrination', explaining that vegetables are essential*" (34#Dad:9years).

b) Repeating the exposure (i.e., asking children repeatedly to eat desired food(s) and continuing to expose them to such foods, even if they disliked it in previous occasions): *"If I offer him green beans, it will be very difficult for him to eat … I've tried… And the two of us, what we insist on is "So, if you don't like it, you only have to eat a little bit". We keep waiting for hours, insisting that he eats a little"* (42#Mom:7years).

c) Disguising the food (i.e., disguise the desired food, such as mashing the vegetables in the soup or adding fruit to pancakes).

d) Compelling to eat (i.e., establishing clear rules about what are foods deemed essential and therefore non-negotiable): *"It is mandatory: they have to eat the soup, if they*

don't eat the soup, they don't get to eat the rest the other courses. And then for breakfast, on the next day, they have the soup they did not eat at dinner. It is a bit radical, but it's the attitude we have at home, so they get used to not skipping [disliked foods] *... At our home, the rule is that the meal includes soup, the main course and then fruit ... it is not negotiable*" (33#Dad:9years).

e) Negotiating (i.e., trying to get children to eat desired foods by reaching a compromise): "*Generally, when he says – 'Ah, I don't like this soup', I say "Ok, you can eat less, but you still have to eat some". And then we negotiate the total number of spoons. I say 20, he says 10, and then we get to 15, and he eats 15 tablespoons*" (42#Mom:7years).

3.3.2 Strategies to limit the intake of unhealthy foods

Almost all parents identified strategies used to regulate the consumption of undesired foods, including sugary (e.g., chocolates, sweets, cookies, gummies, cereals, soft drinks, and juices) or non-sugary unhealthy foods (e.g., fast food, chips, and fried foods in general):

a) Restricting (i.e., the intake of undesired foods is only allowed on specific occasions, such as parties, weekends, every other day, or in limited quantities): *"Normally they ask for French fries* [as a side dish] *and then we say ... 'Yesterday we already had French fries, so do you prefer pasta or rice?' And they choose something else"* (10#Dad:9years). Regarding sugar intake, parents often reported that they stored the sugary foods in a place children could not access (only making it available from time to time) or to allow their consumption on special occasions (e.g., at parties, on weekends, or when eating out): *"They now had two parties in a row, and I said – ...'You have to interspace the days you eat candies or save some for the next weekend'. I always try that they only eat sugar on such festive days..."* (41#Mom:8years).

b) Forbidding (i.e., not allowing the consumption or purchase of undesired types of food): *"I say 'no' and it is final. If they insist, the father gives them 'the look' and its final."* (20#Mom:7years).

c) Negotiating (i.e., trying to reach an agreement with the child, presenting them with conditions or other options that make their choice less harmful): *"The other day, for example, he chose to go to restaurant X* [fast food]*. So, we negotiated: 'Okay, so you can eat at X, but without the French fries'…"* (42#Mom:7years).

d) Explaining (i.e., explaining the harmful health consequences of ingesting some foods and the benefits of a healthy diet, aiming to provide information so that children can make better choices): *"I try to explain to them that it is bad for them. At this point, I think they are already able to identify what carbohydrates are…"* (23#Mom:9years/twins).

Additionally, parents also reported controlling sugar intake by raising awareness of their children: *"I explain to him, I say no. Or because it has too much chocolate, or because it has too much sugar, he knows what he should not eat…"* (26#Mom:6years).

e) Reducing availability (i.e., not buying or not storing certain foods at home): *"We try, for our children, not to allow sweets, that's what we call 'the grandparents' department'. Sweets are not allowed in our house."* (33#Dad:9years).

f) Substituting (i.e., the substitution of a food considered unhealthy by one considered as healthier): *"Sometimes, it's trying to fill him up with other things and then, at the end give him what I know he wanted, but in less quantity, because he has already eaten other things."* (22#Mom:7years); *"When we feel like eating sweets, we sometimes eat walnuts. While we eat that, we're not eating sweets."* (4#Mom:10years)

g) Selecting options with less sugar (i.e., choosing products of the same type but with lower sugar content): *"…we are careful when choosing chocolate powder … we chose the one that has less sugar, and we think it is less harmful"* (21#Dad:8years).

3.4 Barriers and Facilitators of Children's Sugar Intake Regulation

Regarding the regulation of children's sugar intake, more parents mentioned it to be relatively easy, with only a few expressing it was difficult. Some factors were identified as supporting or hindering these efforts (see Figure 3). Noteworthy, only a couple of comments referred to the impact of parents' behavior on children's eating habits. Specifically, "…*kids learn better from example, than from what you tell them*" (32#Mom:7years) and "*I wish that my daughter was like that [did not enjoy sweets], but I am also not like that and they imitate what they see"* (9#Mom:9years). Therefore, modeling factors did not emerge as an independent category.

[INSERT FIGURE 3 ABOUT HERE]

3.3.1 Barriers

a) Birthday parties. These events were the most frequently mentioned barrier, making too many sweets and unhealthy foods available to children, who end up consuming too much sugar. For instance, *"Whenever we go to a kid's party, there isn't a single healthy thing on the table. They could even put there something like grapes or strawberries just out of shame and to show "Oh, I am also healthy!" But no, it is just junk from one end of the table to the other."* (22#Mom:7years); *"At birthday parties, … they* [other parents] *give out those goodies' bags* [with sweets], *and I'm a bit against it."* (9#Mom:9years).

b) Children's preference. Another often-cited barrier was the children's own tastes and their search for sugary foods: *"It's difficult. What makes it difficult are their choices and what they like to eat.*" (2#Mom:6years).

c) **Peer Influence/Sharing.** Because children spend several hours away at school makes them prone to influences from peers: *"If their classmates take snacks from home too, filled with sugar, they will start looking to the side and begin to realize 'So, I have this while he/she has those… Eating those seem to be a lot more fun'"* (33#Dad:9years). Indeed, sharing

snacks with colleagues without parental consent was also mentioned by parents as a barrier: *"It's difficult because, at school, they share snacks, right? ... they might share the cookies. So, it's a little difficult..."* (19#Mom:6/9years).

d) **Grandparents' behavior**. According to the interviewed parents, grandparents tend to offer their grandchildren many sugary foods to show affection. Parents positioned themselves in two ways in the face of this. Some expressed acceptance, saying that this was a way of fostering the relationship between grandparents and grandchildren: *"For example, we have the case of grandparents, who give them sweets, but we ended up allowing it. I pretend that I don't know about it because I know that grandparents like it. It's their role; I think parents' role is to educate and prepare children, the role of grandparents is not the same, they have already educated us, now their role is to spoil grandchildren with treats. And we let it happen. We know that it is not good for their health, but it is good for them, good for the relationship they have with their grandparents because there is a complicity there..."* (33#Dad:9years). In contrast, many parents expressed their disapproval: *"I may be a bit lucky because their grandparents are not here and it's the grandparents who normally* [give children sweets] *... One of their grandmothers sometimes wants to show her love and brings treats. And I always - ever since they were little - was upset with this because, instead of bringing fruit - that also has sugar but more natural - people like to give sugar in chocolates, gummies and sweet popcorn, and all of that"* (31#Mom:8years).

e) Parent's lack of knowledge about sugar. Another barrier referred to regulating children's sugar intake was the difficulty parents felt in identifying sugar in food. This was due to difficulties in understanding nutritional information in food labeling, unawareness regarding the sugar content of certain products, or because certain foods are marketed as a healthier option when they actually include significant sugar content. As stated by one of the mothers: *"We have practically to be scientists to start analyzing the labels. I remember, for*

example, that once I bought a granulated tea for newborns. And that had those things that we don't know right away if it's sugar: dextrose, maltose, and I don't know what else. Because we think… That is sold in pharmacies, it says to be proper for newborns, but then we realize that there is sugar in it" (30#Mom:9years).

f) Food offer at schools: Some participants also perceived the food available at school cafeterias as a barrier, considering that children have access to high-sugar snacks and products: *"There was a time when they took a bit of money to go to the cafeteria…Parents had to intervene to raise awareness so that the cafeteria had options besides sweets"* (15#Dad:10years).

3.3.2 Facilitators

Although participants identified many barriers, they also identified some facilitators to regulate sugar intake, namely:

a) Children's preference. Children's taste and demand for sugary foods were often referred to as facilitators of sugar intake regulation, even more than as a barrier. Several parents stated that, as their children were not used to eating sweets and did not ask for them, they ended up not having to impose such strict rules: *"It´s a battle I don't have to fight, because mine* [children] *don't ask for it."* (23#Mom:7years/twins). Many parents also referred that creating the habit of excluding sugar from children's diets is an important facilitator. Because children who were not used to having sugar did not need nor asked for sugar: *"The sugar itself – like adding sugar to milk, tea, yogurt… No, that is easy* [to control] *because she is already used to it* [not adding sugar] *so, she doesn't ask for it"* (38#Mom:9years).

b) Bringing food from home. Parents also mentioned that the fact that their children ate at home or took home-made food to school facilitated their ability to control the consumption of sugary foods, as it allowed parents to know what they ate during the day. *"It*

is easy – at school, he does not have access to, only if he takes it from home. And if he does, it is either me or his mother who decides… So, we are in control." (39#Dad:10years).

c) **Food offer at schools:** Although to a lesser extent, some parents identified the school offer as a facilitator, as they perceived foods made available by the school as healthy and low in sugar: *"At school, they cut back on a lot of sweets and desserts. Most desserts are now fruit, only fruit, and they have also stopped serving French fries ... But talking about sugars, they have a policy there to try to eliminate sugar as much as possible"* (21#Dad:8years).

3. Discussion

Eating habits have a significant impact on health, and a poor diet contributes to a decrease in quality of life. In Portugal, eating habits are far from ideal, and the prevalence of overweight in children is higher than the average of OECD countries (Ministério da Saúde, 2018). The percentage of Portuguese children whose consumption of free sugars exceeds the value recommended by the WHO is also very high. Considering that parents are central agents in the development of their children's eating habits, it is essential to study their perceptions about sugar and children's sugar intake as well as their practices in this regard. In the present study, we interviewed parents of school-aged children to comprehensively explore the strategies used to regulate their children's sugar intake and the perceived facilitators and barriers to this intake. A qualitative methodology is important to understand the children's domestic environment, thus contextualizing parents' perceptions and practices.

Overall, our results revealed that most parents considered that their children eat well, for example, mentioning healthful options as the preferred foods (e.g., fruits). Still, it was noticeable that preferred foods also included soft drinks and sweets in general, whereas vegetables and soup were often cited as the least liked foods. Despite reporting that they buy some food products specifically for children (e.g., breakfast cereals, cookies, juices), in

general, parents perceived food products marketed to children as having high sugar content. The products more associated with sugar included sodas, cookies, and breakfast cereals, while fruit-based products were the only examples of lower sugar options (e.g., Prada et al., 2021). It is noteworthy that the products parents identified as having higher sugar content, overlap with the most frequently consumed by Portuguese children (Lopes et al., 2017).

Negative attitudes toward sugar were ubiquitous. Expressions used to describe sugar included "terrible", "evil", "this century's poison," and "addiction". Still, many parents considered that a regulated consumption of sugary foods (e.g., allowed in specific contexts) is not necessarily problematic. This is in line with a recent qualitative study focused on parents' discourses about sugar in social media, showing that ingesting sugar is simultaneously viewed as sinful and delightful (i.e., "sugar dilemma", Moura & Aschemann-Witzel, 2021). Parents often associated behavioral alterations as a consequence of excessive sugar intake, namely agitation, and hyperactivity. This belief is quite prevalent, despite the absence of supporting evidence (e.g., Del-Ponte et al., 2018; for a review, see Flora & Polenick, 2013). Other mentioned consequences were overweight and obesity, diabetes, dental caries, and cardiovascular conditions (e.g., hypertension or high cholesterol).

Considering the negative perceptions about sugar intake and its consequences, it is not surprising that sugary foods emerged as one of the targets of parental regulation strategies. These strategies (also implemented for non-sugary foods, such as fried foods) included restriction, explanation, negotiation, and inaccessibility. Interestingly, parents did not endorse a full restriction – as stated by one mother, forbidding may actually be worse. Indeed, sometimes, restriction leads to an increase in food's desirability, leading to excessive consumption when available (e.g., Ventura & Birch, 2008). Explanation and negotiation emerged as general strategies to regulate food consumption, whereas, as in other studies, parents reported using it to control their children's insistence on unhealthy food (e.g., Nepper

& Chai, 2016). Parents also mentioned using incentive strategies (i.e., explaining, repeating the exposure, disguising the food, compelling to eat, and negotiation) to promote the consumption of desired foods, particularly vegetables.

In light of the view that sugar is highly prevalent, it is somewhat unexpected that many parents stated that regulating children's sugar intake is relatively easy. The main facilitators of such regulation were food preparation at home and children's habits, whereas the main barriers to their children's sugar intake were birthday parties, influence from classmates, grandparents' behavior, and hidden sugars in foods. Children's motivation and school context were factors that emerged both as barriers and facilitators.

Parents considered their children's preferences a barrier to regulating unhealthy food consumption (e.g., Nepper & Chai, 2016). But preferences can also be a facilitator: several participants stated that their children do not like or do not ask for sugary foods because they are not used to eating or because they have been educated not to consume sugar (e.g., Petrunoff et al., 2012).

In general, parents had a favorable opinion of their children's school food policies (e.g., encouraging fruit consumption and avoiding taking sugary snacks). It is well documented that the existence of some type of nutritional policy in schools has beneficial consequences on children's eating behaviors (e.g., Paes et al., 2015). For example, the WHO has long emphasized the schools' role in the prevention of adverse effects of poor eating habits prioritizing the implementation of food and nutrition policies in this context (WHO, 2006). However, in our study, a significant number of parents referred that school cafeterias continue to have foods considered unhealthy available (e.g., high sugary foods). Given this heterogeneity of opinions, it is not surprising that the food offer at school emerged both as a barrier and a facilitator of children's sugar intake regulation. This may also be related to the

fact that some initiatives such as the "Fruit School Scheme" still only reach about half of the elementary school students in Portugal (Santos et al., 2018).

Birthday parties often emerged as the main barrier to restrict sugar intake. Parents mentioned that it is difficult to limit the access to sugary foods in this context (e.g., Petrunoff et al., 2012) but, because these are special occasions, the intake is not problematic. Social influence as a barrier was related to birthday parties and the snacks of children's classmates. For example, the comparison and sharing of snacks that children make without parental supervision also promote a desire for unhealthy foods and sugar intake (e.g., Petrunoff et al., 2012). Also, participants often associated grandparents with permissiveness regarding treats (e.g., even if a particular food is not allowed at home, grandparents made it available). Of the parents who mentioned grandparents' behavior as a barrier, some disapproved this provision of sugary foods and warned them against it, while others understood it as a way of nourishing the relationship between grandchildren and grandparents. Still, parties and receiving treats from the grandparents are both events that do not occur daily and thus are unlikely to justify the high rates of sugar consumption. Perhaps this reflects the possibility that it is easier for parents to identify external factors influencing children's diets. Interestingly, Jongenelis et al. (2020) interviewed grandparents showing that they share this view that grandparents are supposed to be fun (and not overcontrolling the access to treats). However, grandparents also mentioned that parents are a primary source of unhealthy foods (e.g., fast food). It is also noteworthy that, in our study, references to the parents' own eating habits and how these may impact their children's preferences and behaviors were not prevalent. Given the association between children's' diet and parents' modeling of healthy eating (Vaugh et al., 2018), this theme should be explicitly explored in future research.

The perception that some foods have hidden sugar was another barrier identified by parents and several expressed difficulties in the interpretation of food labeling. Indeed,

understanding the sources and amounts of sugars in food is not easy, as there are many sugar nomenclatures (Bernstein et al., 2016). A recent study with Portuguese participants showed that knowledge about sugar sources is still relatively low, even among individuals with higher education (Prada et al., 2020a). Indeed, Dallacker et al. (2018) showed that parents underestimate most foods and beverages' sugar content, which was associated with a higher risk of their child being overweight or obese.

In our study, according to the BMI reported, half of the children were not within the normal weight range (higher prevalence of overweight). Still, most of the parents perceived their children to be within the average weight. These perceptions may be due to the parents' lack of knowledge of children's actual weight/height or their tendency to characterize them in the most favorable way possible - social desirability bias (Rodrigues et al., 2020). For example, a recent study showed that, although most parents considered their children to eat healthily, the consumption of fruits and vegetables was below the recommended amount, whereas the intake of added sugars exceeded guidelines (Eliason et al., 2020). Hence, social desirability (e.g., Börnhorst et al., 2013; King & Bruner, 2000; Rodrigues et al., 2020) may be contributing to our results. Moreover, given that more permissive parenting styles are in turn often associated with higher child BMI (e.g., Olvera & Power, 2010; for a review, see Shloim et al., 2015), it would be interesting to examine how parents' perceptions and practices related to sugar intake influence child's weight status. Ideally, such research should include the assessment of anthropometric data to guarantee the accuracy in BMI calculation, and use a quantitative methodology (e.g., survey with larger sample).

The small sample size, the convenience sampling method and the methodology used limit the generalization of our results. Therefore, the evidence should not be interpreted as representative of Portuguese parents' perceptions and beliefs regarding sugar intake. Another potential limitation is the higher prevalence of mothers and their higher education level

(52.27% vs. 25% in the Portuguese population in general; OECD, 2019). Previous research has shown that mothers and fathers may present differences regarding their children's eating behaviors (e.g., monitoring SSBs intake; Branscum & Housely, 2018), and that parental education can play an important role in their children dietary quality (e.g., Ayine et al., 2021, 2020; Saxton et al., 2009). Hence, future research should seek to achieve a more balanced sample regarding gender and education level. Future studies could also include instruments such as the Parental Feeding Style Questionnaire (Portuguese version – Pimenta et al., 2019) to explore parental practices on sugar intake regulation further. Finally, it would also be of the highest importance to consider children's perceptions about this topic and their reactions to parental sugar regulation strategies.

To address the excessive sugar intake in Portugal, several governmental measures have been recently implemented in recent years (e.g., increased taxation for sugary beverages, for a review, see Prada et al., 2020b). For example, restrictions on the advertising of foods and beverages with high energy value, salt, or sugar content targeting children were also legislated (Law Nº 30, Diário da República Portuguesa, 1ª série – Nº79. 23 Abril 2019).Besides this type of intervention, and in line with previous studies (e.g., Dallacker et al., 2018; Prada et al., 2020b), our results suggest that improving knowledge about sugar (e.g., identification of sugar in products) is crucial. Parents valued online resources, but some were overwhelmed by the amount of information, mentioning that it is hard to identify what information is reliable. Online tools such as the "Sugar Check" promoted by the Liverpool City Council as a part of the "Save Kids from Sugar" Campaign (https://savekidsfromsugar.co.uk/sugar-check/) are particularly useful, allowing parents to easily diagnose their child average daily sugar intake, providing simple information about which products constitute healthier alternatives. Our findings may contribute to the development of this type of tools as we identified several misconceptions about sugar. For

example, we identified the need to clarify that, in contrast to the beliefs of some parents, fruit nectars are not advisable as low-sugar options. In addition, our findings also underline that it is important that parents acknowledge their pivotal role in shaping their children's eating habits, besides the influence of other people (e.g., grandparents, peers), contexts (e.g., school) and their children's own preferences. It is essential that they understand that children's food preferences, namely for sweet tasting foods, are shaped not only by innate biological dispositions but – to a large extent - by the type of foods they are exposed to from an early age and by the social environment, where feeding parental practices and parents' own food choices are key (Ventura & Worobey, 2013).

By extending the knowledge about parents' perceptions regarding sugar and sugar intake, as well as the strategies they implement to regulate sugar intake, the current study stresses some future avenues for the development of interventions and policies aiming to promote healthier eating habits in children.

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Author Contributions

All authors conceptualized and designed the study. MP and CAG supervised the data collection; BT and BC collected the data, CAG and BT analyzed the data. MP, MS, and MVG wrote the first draft of the manuscript. All authors have reviewed, edited and approved the final manuscript.

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