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Utilising an integrated approach to developing liking for and consumption of vegetables in children.

Chawner LR and Hetherington MM

Corresponding author: L.R.Chawner@leeds.ac.uk

School of Psychology, University of Leeds, Leeds, LS2 9JT, UK

Abstract

Children eat too few vegetables and this is attributed to disliked flavours and texture as well as low energy density. Vegetables confer selective health benefits over other foods and so children are encouraged to eat them. Parents and caregivers face a challenge in incorporating vegetables into their child's habitual diet. However, liking and intake may be increased through different forms of learning. Children learn about vegetables across development from exposure to some vegetable flavours *in utero*, through breastmilk, complementary feeding and transitioning to family diets. Infants aged between 5-7m are most amenable to accepting vegetables. However, a range of biological, social, environmental and individual factors may act independently and in tandem to reduce the appeal of eating vegetables. By applying aspects of learning theory, including social learning, liking and intake of vegetables can be increased. We propose taking an integrated and individualised approach to child feeding in order to achieve optimal learning in the early years. Simple techniques such as repeated exposure, modelling, social praise and creating social norms for eating vegetables can contribute to positive feeding experiences which in turn, contributes to increased acceptance of vegetables. However, there is a mismatch between experimental studies and the ways that children eat vegetables in real world settings. Therefore, current knowledge of the best strategies to increase vegetable liking and intake gained from experimental studies must be adapted and integrated for application to home and care settings, while responding to individual differences.

Keywords: Vegetables, experiential learning, feeding behaviour, food acceptance, child development.

1 Introduction

The World Health Organisation (WHO) advocates consumption of at least 400g of fruits and vegetables each day, to prevent non-communicable diseases (NCDs) (WHO, 2003). This is often translated by public health agencies around the world into a healthy eating message to consume 5-a-day (or more) portions of fruits and vegetables. Added to this encouragement to eat more fruits and vegetables (F&V) are pressures to improve human health and at the same time, support the environmental sustainability of our food supply (Willett et al., 2019). At a population level, we are transitioning towards including more F&V, wholegrains and plant proteins into our diet. At an individual level we must learn to like these foods especially vegetables, since these have selective benefits to health, produce fewer greenhouse gases and can be grown locally in more communities than animal-based food sources.

1.1 Why eat more vegetables?

Advice to eat more F&V is based on epidemiological evidence demonstrating that diets high in plant-based foods reduce the risk of cardiovascular disease, stroke, diabetes, stomach and colorectal cancers (Aune et al., 2017; Boeing et al., 2012; Hartley et al., 2013; Lee, Shin, Oh, & Kim, 2017; Wang et al., 2014; WHO, 2014). Where evidence has been aggregated to examine a dose-response relationship between F&V intakes and relative risk of various NCDs, consuming double the WHO minimum reduced risk of cardiovascular disease, and premature deaths (Aune et al., 2017). Phytochemical and antioxidant actions from F&V protect health through preventing carcinogen formation at the cellular level, also dietary fibre content of plant-based foods improves gut health (Liu, 2003; Slavin & Lloyd, 2012). There are specific benefits of consuming vegetables compared to fruits (Blekkenhorst et al., 2018; Carter, Gray, Troughton, Khunti, & Davies, 2010; Liu, 2003; Slavin & Lloyd, 2012). Selective promotion of vegetables may improve health and reduce premature mortality (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2014).

Despite advocacy of increased vegetable intakes at the population level, few countries around the world report that they achieve the WHO recommended intakes, even in affluent nations (Tennant, Davidson, & Day, 2014). Increasing vegetable intake at an individual level is more challenging than increasing fruit intake (Osborne & Forestell, 2012). Children consistently have low intakes of vegetables, despite being amenable to accepting them at the time of complementary feeding (Harris & Mason, 2017). This early period, between complementary feeding and early childhood, is an ideal time to introduce vegetables, since as they get older, children are more resistant to acquiring a liking for vegetables. This is illustrated by a systematic review with meta-analysis by Evans, Christian, Cleghorn, Greenwood, and Cade (2012) who reported that school-based interventions improved intakes of fruits but not vegetables. Therefore, after school age it appears to be a challenge to encourage children to like and to eat vegetables even with intervention. Current evidence suggests that acquiring a preference for vegetable flavours and establishing regular consumption of vegetables requires frequent and consistent experience with these foods over time. However, routinely providing opportunities for vegetable consumption is neither the default nor the norm in modern obesogenic environments.

Set out below, is a proposal for a more integrated and individualised approach to increasing liking and intake of vegetables. There are many systematic reviews (Appleton, Hemingway, Rajska, & Hartwell, 2018; Holley, Farrow, & Haycraft, 2017; Nekitsing, Blundell-Birtill, Cockroft, & Hetherington, 2018) and narrative reviews (Anzman-Frasca, Ventura, Ehrenberg, & Myers, 2018; Ventura & Worobey, 2013; Wadhera, Phillips, & Wilkie, 2015) on the topic of learning to eat vegetables. However, these reviews focus on a particular facet of experiences with vegetables or a particular age range, and so there is a need to integrate these evidence-based approaches to provide an overarching view of vegetable learning in children. The present approach is built on behavioural studies where learning facilitates the transition towards acquiring and establishing acceptance of vegetables leading to increased intakes. The specific focus is on how exposures, experience and environment shape liking and intake of vegetables in early life and how this can be applied to real life eating contexts.

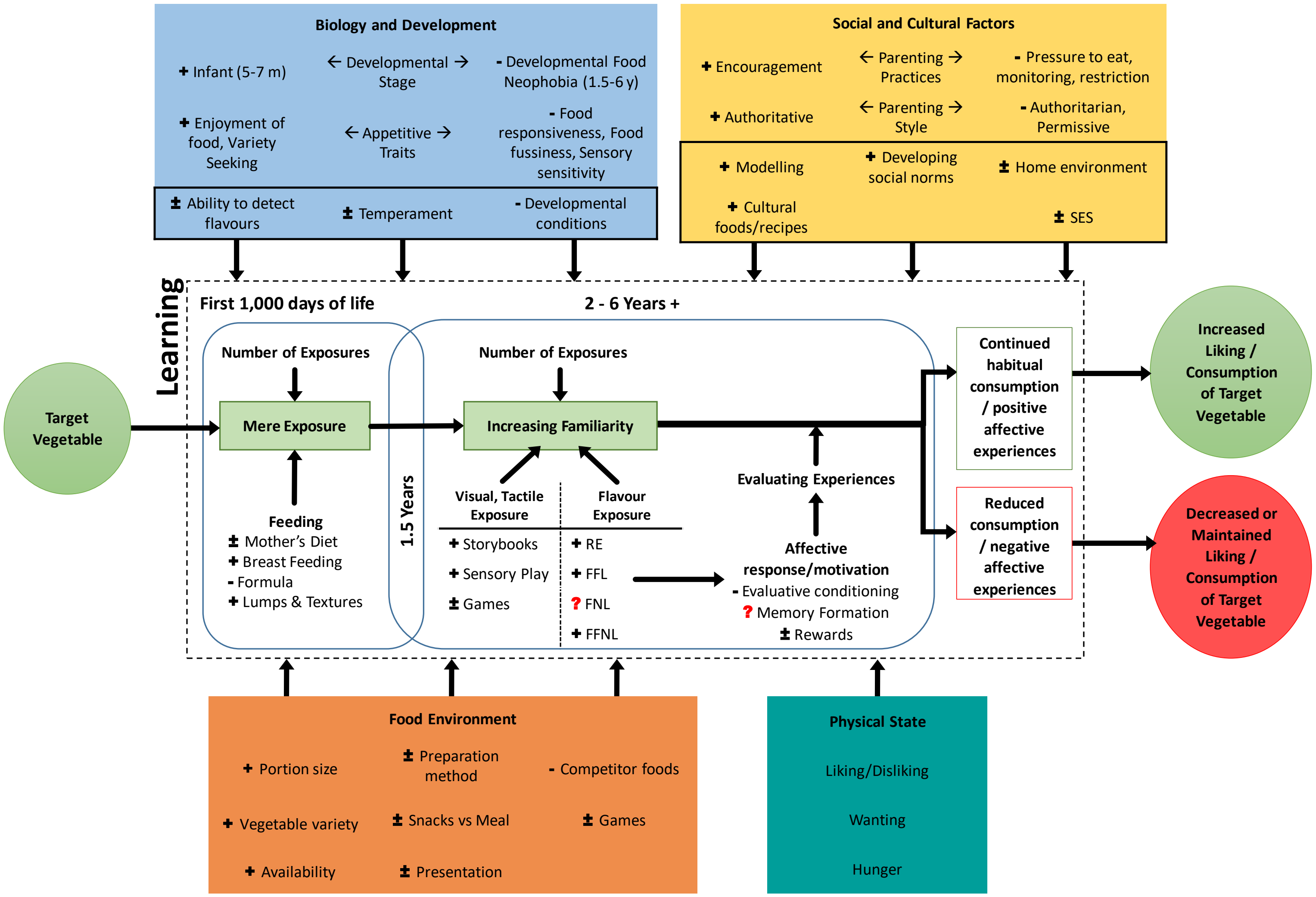
1.2 An integrated approach

Encouraging children to eat vegetables and incorporate them into their habitual diet is a multi-faceted and complex problem. Eating habits and experiences with vegetables, along with numerous biological, social and environmental factors, guide familiarity, liking and consumption of vegetables. Therefore, we propose adopting an integrated and personalised (individual) approach to feeding children in order to increase habitual vegetable consumption in infancy and early childhood (**Figure 1.**). Integrating the current available evidence from systematic reviews and elsewhere in the literature is essential to understand the complex eating environments that children experience, and personalised approaches are required to increase the potential for children with different individual needs to expand vegetable variety and intake. Typically, techniques designed to increase vegetable intake are studied in isolation by controlled experiments. However in children's eating environments, there are many factors impacting simultaneously on liking and intake. Therefore, there is potential for enhanced real-world impact if interventions are multi-faceted and more ecologically valid, resembling how vegetables are typically consumed. There are additional possibilities of additive effects if approaches are combined, complementing and building on positive effects from single techniques. Furthermore, building interventions around individual differences in child development, temperament, appetitive traits and potential responses to intervention could further improve outcomes for individuals. This approach is evidenced in the developmental disorder literature (although mostly case studies), where it is common practice to use multi-component interventions to increase food acceptance when a single technique fails (Chawner, Blundell-Birtill, & Hetherington, 2019).

The model presented in **Figure 1.** builds upon that developed by Johnson (2016), incorporating a wider range of influences on child learning, proposing directional associations between factors and their impact on learning (whether beneficial or detrimental to vegetable liking and consumption) and acknowledging that a ***decrease*** in consumption of vegetables after learning is also possible. This model is not comprehensive but identifies the major influences on learning to eat vegetables. Learning is dynamic, impacting on biological (e.g. appetitive traits), social (e.g. how parents encourage their child to eat) and environmental (e.g. availability/purchasing of vegetables) factors over time. However, examining all of these bidirectional relationships is beyond the scope of this review and we will only consider the effects of these factors on learning and not vice-versa.

The following sections will illustrate the main influences on children's learning to eat vegetables, compare how studies are typically conducted with how vegetables are typically consumed, link findings to individual differences where possible and offer practical applications of the model along with potential for future research.

Figure 1. An integrated (biopsychosocial) model illustrating how biological, social and cultural and environmental factors influence learning to eat a target vegetable in both infancy and throughout childhood.



+ Positive effect on vegetable learning and liking/consumption; - Negative effect on vegetable learning and liking/consumption; ± The effect of the factor on vegetable learning is variable depending on more specific sub factors (e.g. rewards + non-food rewards, - food rewards); ? The effect or association is not yet known or fully understood.

2 Biological and developmental considerations to learning

2.1 Exposure and learning begin in utero

Across species, including humans, flavour learning occurs *in utero, a*nd prior exposure to the flavour components of the maternal diet predict later liking and intake of these flavours by their offspring. It has been suggested that this is adaptive since foods consumed by the mother are likely a safe source of energy and nutrients, therefore programming preferences for these flavours in early life serves to guide infants towards a suitable diet (Hepper, 1996).

Whilst food intake is driven by an innate, biological need for energy, early life food preferences and selection are shaped by experiential learning (**Figure 1.**). Maternal diet and food choices during pregnancy and lactation contribute to the chemical continuity of flavour experience from food-based volatiles *in utero* to the sensory/nutrient profiles of breastmilk then complementary foods (Beauchamp & Mennella, 2009; Mennella, Johnson, & Beauchamp, 1995). The foetal programming hypothesis predicts that early life exposure to plant-based foods, during pregnancy, lactation and complementary feeding will amplify flavour learning and help to establish preferences for vegetables (Beauchamp & Mennella, 2011).

2.2 Early exposures in infancy (0-2y)

Throughout development, children are exposed to diverse vegetable flavours and textures in a variety of ways. Whilst F&V flavours are not present in Breast Milk Substitutes (BMS), they are in breastmilk (Beauchamp & Mennella, 2011). Experience with vegetable flavours, especially in breastfed babies whose mothers consume vegetables, may have potentially long-lasting effects on infant preferences and intake (Beckerman, Slade, &

Ventura, 2020; Hausner, Bredie, Mølgaard, Petersen, & Møller, 2008; Mennella, Jagnow, & Beauchamp, 2001; Moss, Dobson, Tooth, & Mishra, 2020).

During complementary feeding (CF) at 5-7 months, babies' reactions to new foods are mostly positive and even bitter tasting foods are easily accepted (Schwartz, Chabanet, Lange, Issanchou, & Nicklaus, 2011). This suggests a sensitive period where infants are amenable to a wide range of foods. Introducing different food textures during CF (lumps vs purée) is important between 6-9 months (Coulthard, Harris, & Emmett, 2009) for the child's later tolerance and preference for complex textures in food and a variety of food groups. Late introduction of lumpy foods (after 9m) predicts higher levels of picky eating in childhood (Emmett, Hays, & Taylor, 2018). Children may also become over-responsive to tactile sensations and therefore eat less vegetables if they are introduced to solid foods later in the CF period (Coulthard, Harris, & Fogel, 2016). A balance needs to be struck between introducing solid foods too early (before 4-6 months), and too late (6-9 months).

2.3 Early exposures in childhood (2-6y+)

Beyond the CF period, as toddlers begin to move around independently, children may develop food neophobia (see Dovey, Staples, Gibson, & Halford, 2008 for a review). This is where novel and sometimes previously accepted foods, are refused (**Figure 1.**). Between the ages of 2-6y, feeding becomes more difficult and may require additional support or intervention to increase familiarity and encourage acceptance of vegetables. Vegetable intake tends to plateau at 2y (Duffy et al., 2019) and this may be due to children being offered fewer vegetables as they get older (Eldridge, Catellier, Hampton, Dwyer, & Bailey, 2019). Another potential reason for small intakes in childhood is that children's growth velocity slows until puberty (Haymond et al., 2013), with the potential for appetite to fluctuate as energy demand changes. Neophobia and periods of lower appetite compound reluctance to consume vegetables.

During interventions where children are exposed to and are encouraged to try new foods, sensory exploratory behaviours (e.g. spitting, licking) decrease over time (between 4-7y) with maturity and familiarity. A reduction in sensory exploratory behaviours was associated with increased acceptance of new foods (Moding, Bellows, Grimm, & Johnson, 2020). Overall, early life food preferences and intake are shaped by experiential learning through sensory exposure and familiarisation.

2.4 Exposures in later childhood (7-12y)

Learning to consume vegetables in older children (7-12y) is comparatively understudied. In this review, we do not offer specific guidance for this age group, but limited research with older children is used to illustrate learning throughout childhood.

2.5 Genetics and taste

Genetic factors influence food preferences in early childhood, with preferences for vegetables more heritable than preferences for other food groups (Fildes, van Jaarsveld, Llewellyn, et al., 2014). The specific genes underpinning preferences are not known and so heritability measures encompass multiple candidate genes which influence eating behaviours. One aspect of eating that is genetically determined is the degree to which certain tastes are perceived and then liked.

Substances such as phenylthiocarbamide (PTC) and 6-n-propylthiouracil (PROP) are perceived as bitter. Although not present in foods, similar bitter tasting compounds are found in Brassica vegetables, with potential to affect children’s dietary outcomes. There is variability in the degree to which these tastes are perceived between individuals (see Keller

& Adise, 2016 for a review) and whether they are perceived as strongly bitter, mildly bitter or tasteless is determined by an individual's TAS2R38 receptor gene (see Mennella & Bobowski, 2015; Ventura & Worobey, 2013 for reviews). The potential for sensitivity to bitter tastes to affect eating habits is disputed. Some evidence suggests that bitter tasters consume fewer bitter green vegetables than non-tasters (Bell & Tepper, 2006), but this has not been replicated elsewhere (O'Brien, Feeney, Scannell, Markey, & Gibney, 2013).

For bitter-sensitive children, using dips/dressings can enhance intake of raw broccoli (Fisher et al., 2012). This may be due to masking bitterness with a familiar and palatable dip or dressing, or due to the salt content of the dip which dampens the bitter quality of raw broccoli (Fisher et al., 2012). Evidence is emerging that children who are sensitive to bitter tastes will consume more vegetables compared with non-tasters when herbs and spices manipulate or mask the bitter taste (Carney et al., 2018). Flavour manipulation may be needed for some bitter tasters, but others may respond well to repeated exposure learning to increase intake of vegetables such as turnip (Nor, Houston-Price, Harvey, & Methven, 2018).

2.6 Temperamental and appetitive traits

A further role of heritability is observed within children's temperament and eating traits that underpin interactions with food (**Figure 1.**). Temperament is a relatively stable group of traits describing characteristics of the child such as reactivity, self-regulation and emotionality (Sanson, Hemphill, & Smart, 2004; Stifter & Moding, 2019). Children characterised as high in emotionality and internalising (anxious/dependent) consume fewer vegetables and more foods high in energy density daily, than those with low emotionality and internalising temperaments (Vollrath, Stene-Larsen, Tonstad, Rothbart, & Hampson, 2012). Similarly, low sociability, high emotionality and negative affectivity may predict the ineffectiveness of school-based interventions and parental practices to increase acceptance of vegetables (Holley, Farrow, & Haycraft, 2016; Holley, Haycraft, & Farrow, 2020; Kidwell, Kozikowski, Roth, Lundahl, & Nelson, 2018). However, negative affectivity has not consistently been linked to changes in vegetable consumption, and further temperament traits such as surgency (high activity level, extraversion, enjoyment of high intensity activities) and effortful control (high attention capacity, inhibitory control, ability to self-regulate) may be better linked to vegetable consumption and specific vegetable feeding practices used by parents (Kaukonen et al., 2019). For parental practices in particular, parents who perceive their child as fussy or with a difficult temperament may offer less structured mealtimes (Searle, Harris, Thorpe, & Jansen, 2020). Thus, temperament may moderate the impact of parent feeding and learning paradigms, as well as invoking different feeding practices by the caregiver.

Children also exhibit specific appetitive traits that are highly heritable and that contribute to determining children's eating behaviours, such as fussy eating (Smith et al., 2017). Food fussy children tend to have a limited diet and are unwilling to consume novel or disliked foods (Dovey et al., 2008). Children with tactile defensiveness (Smith, Roux, Naidoo, & Venter, 2005) and sensory sensitivity more generally (Farrow & Coulthard, 2018) tend to display fussy/selective eating and food refusal. Tactile defensiveness and food refusal due to texture are often associated with developmental disorders including learning disability and Autism Spectrum Disorders (ASD) (although not limited to this population) (Seiverling, Towle, Hendy, & Pantelides, 2018; Smith, Rogers, Blissett, & Ludlow, 2020) and many children will only eat a handful of foods, usually from a limited variety of food groups (Ledford & Gast, 2006; Sharp & Postorino, 2017).

In contrast, children with an avid appetite (Cooke, Gibson, Sapochnik, Sheiham, & Lawson, 2004) and/or those that seek variety when eating (Nicklaus, Boggio, Chabanet, & Issanchou, 2005) may enjoy eating vegetables. Others that are food responsive, or external eaters, may have reduced preference for vegetables according to parental report data (Russell & Worsley, 2016). However, there is little evidence to support this claim through measured food intake. Some research suggests that food responsive children tend to eat large amounts of any foods offered, but this does not generalise to eating more vegetables when portion sizes were doubled (Smethers et al., 2019). For food responsive children, avidity of appetite for foods may depend on their palatability. However, enhancing palatability (added butter and salt) did not result in increased consumption of broccoli and sweetcorn (Diktas, Roe, Keller, Sanchez, & Rolls, 2021).

2.7 The importance of individual differences

With the range of individual differences described and incorporated into our model, it would be unreasonable to assume that single intervention techniques (those that are typically implemented) would have the same effect for all children's vegetable liking and intake (**Figure 1.**). Children's responses vary within the same exposures/interventions, and these experiences may continue to affect eating practices throughout development. This amplifies the need for more personalised interventions to take account of temperamental and/or appetitive traits. Many studies control for these differences between children, but few actively design interventions for them (apart from fussy eating, which receives more attention). An alternative approach may be utilising multi-component interventions, as they may include techniques that work at some level for most children. This approach builds on existing learning literature, incorporating different mechanisms of learning.

3 Mechanisms for learning to eat vegetables

3.1 Repeated Exposure

Learned safety through exposure to, and familiarity with new foods teaches children to approach and accept these foods (Birch, 1999). Increased familiarity results in increased liking and preference towards the novel food (Birch & Marlin, 1982; Pliner, 1982). Learned safety requires Repeated Exposure (RE) to a food stimulus. RE is a very simple and effective learning technique to increase vegetable intake (Holley et al., 2017; Nekitsing et al., 2018).

RE is most effective when used with infants during CF (Barends, de Vries, Mojet, & de Graaf, 2014; Hetherington et al., 2015). At this time, approximately 5-10 separate exposures can be required for children to acquire liking for, willingness to try (WTT) and to increase intake of a target vegetable, even when it is initially novel or disliked (Maier, Chabanet, Schaal, Issanchou, & Leathwood, 2007). The number of exposures is likely to vary based on the type of food, child age and individual characteristics (e.g. temperament, appetitive traits). Throughout childhood, evidence supporting positive effects of RE are robust (Appleton et al., 2018). Yet, effect sizes for intake are small (average 5-10g: Holley, Haycraft, & Farrow, 2015; Nekitsing, Blundell-Birtill, Cockroft, & Hetherington, 2019; O'Connell, Henderson, Luedicke, & Schwartz, 2012; Wardle, Cooke, et al., 2003) and positive effects gained during CF and early infancy may only be maintained up until the age of 2y (Barends et al., 2014; Hetherington et al., 2015). It is also important to note that liking and intake are assessed more often than WTT in RE studies. If children are not WTT any vegetables they may be removed from analyses, therefore limiting the generalisability of these studies (Caton et al., 2014).

Individual differences influence effectiveness of RE, with some children responding well by eating a little more each time the vegetable is offered while others are more hesitant or variable in their response (**Figure 1.**). Modelling individual differences in response to RE to artichoke purée revealed four eating patterns among infants (aged 4-38m): “learners” with a clear, linear increase in intake over exposures, “plate-clearers” who generally consumed most of what was offered each time; “non-eaters” who ate little over time and “others” who displayed high levels of variability across exposures (Caton et al., 2014). Eating traits entered into the model showed that plate clearers scored high on food approach traits (high enjoyment of food, low satiety responsiveness) and non-eaters scored high on food avoidance traits (high food fussiness, low satiety responsiveness (Caton et al., 2014). However, even among fussy eaters learning occurred.

Effects of RE vary by type of vegetable (Nekitsing et al., 2018; Zeinstra, Vrijhof, & Kremer, 2018). RE may increase intake for one vegetable type, but may not generalise to other vegetables. Stimulus generalisation is an important feature of learning, in which learning about one stimulus will transfer to other similar stimuli (Pearce, 1987, 1994). The magnitude of generalisation is determined by the extent of shared characteristics between stimuli. It is important to distinguish between generalisation which occurs across foods and across contexts. For generalisation to different foods, infants repeatedly exposed to a target vegetable were found to increase intake of the same vegetable and to other similar foods (e.g. other vegetables), but this did not generalise to other food groups (Birch, Gunder, Grimm-Thomas, & Laing, 1998). This finding, that liking of vegetables failed to transfer to other food groups (e.g. fruits) has been reported consistently across studies (Barends, de Vries, Mojet, & de Graaf, 2013), as well as failure to transfer to some other vegetables (Hetherington et al., 2015). For generalisation or transfer effects to occur, vegetables may need to share sensory properties, possibly in colour, shape and flavour components (Olsen, Ritz, Kraaij, & Møller, 2012), however few studies on RE test this systematically.

Secondly, generalisation may be difficult to achieve for other contexts (Gardner & Rebar, 2019). Therefore, it is important that RE studies are ecologically valid. Chawner, Blundell-Birtill, and Hetherington (2020) demonstrate that most vegetable intake by UK children occurs at mealtimes at home, in the evening, with family members. Therefore, consumption of vegetables as a snack in school during an intervention may not generalise to increasing vegetable intake during mealtimes at home when vegetables are commonly served, due to context dependent learning. Offering more contexts in which vegetables are usually eaten may establish habitual practices across contexts.

Lastly, RE to vegetables is often mere exposure plus. This means that exposure to vegetables occurs alongside other foods/flavours during CF (Hetherington et al., 2015), as a spread on a cracker or in a soup medium to prevent boredom (Zeinstra et al., 2018) and alongside other children (e.g. preschool). In these studies, the exposures occur in the context of commensality – the atmosphere is convivial, encouraging and positive, therefore increased intake of a novel vegetable such as mooli (Nekitsing, Blundell-Birtill, Cockroft, & Hetherington, 2019), may be enhanced by social learning. Even here, some children remain non-eaters despite enthusiastic engagement in the intervention tasks (nutrition education, sensory learning). These observations reflect the multiple and varied influences of the wider eating and learning context (e.g social setting, with or without accompanying foods etc.) on vegetable consumption, revealing that learning by repeated exposure is often more than just mere exposure. Associations between the target food, context and other stimuli that are present at the eating occasion are therefore significant to learning.

3.2 Associative Learning

Associative conditioning to acquire liking for vegetables pairs a target vegetable with an already liked taste (FFL), a more energy dense nutrient (FNL: flavour nutrient learning) or a rewarding consequence (see Johnson, McPhee, & Birch, 1991; Wadhera et al., 2015; Yeomans, 2010; Zellner, Rozin, Aron, & Kulish, 1983 for reviews). Alternatively, studies have attempted to produce a change in affective response to foods by pairing initially neutral foods with a food that already possesses a negative or positive valence, called evaluative conditioning (Martin & Levey, 1978). However, there is limited evidence to support this technique increasing preferences, with evidence showing that dislikes are more easily produced (Olsen et al., 2012; Van den Bosch, van Delft, de Wijk, de Graaf, & Boesveldt, 2015).

Associative techniques work on the premise that the disliked (or novel) vegetable will be associated with a more pleasant taste stimulus or post-ingestive consequence and this pleasant feeling will transfer to the vegetable itself (Birch, 1999). FFL and FNL are both reported to increase intake of vegetable purée in infants, yet RE alone often results in effects similar in magnitude to FFL and indeed larger effects on intake than FNL (Ahern, Caton, Blundell, & Hetherington, 2014; Bouhlal, Issanchou, Chabanet, & Nicklaus, 2014; Caton et al., 2013; de Wild, de Graaf, & Jager, 2013), even with fewer exposures (Hausner, Olsen, & Møller, 2012). However, it is important to note that these findings are reported for the average child and associative conditioning techniques (such as those discussed later in this section) can be helpful to increase vegetable liking and intake among certain subgroups of children.

When adding energy or FNL, studies report little or no effect on intake of vegetables for children 2-4y (de Wild et al., 2013), though preference may increase. FNL appears to have variable effects, perhaps due to insufficient intakes by children (Johnson et al., 1991; Kern, McPhee, Fisher, Johnson, & Birch, 1993) or detectable differences between foods presented, for example mouth coating or fatty taste.

For FFL, there is concern that vegetable liking may not transfer to the unmodified vegetable (Hausner et al., 2012). Using dips instead of manipulating the sweetness or saltiness of a vegetable can increase WTT during first exposures compared to RE (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012) and also increase intake of bitter vegetables for bitter sensitive children (Fisher et al., 2012). Similarly, when combining FFL and FNL, such as presenting Brussels sprouts with sweetened and unsweetened cream cheese, liking and consumption of vegetables increased above that of RE alone (Capaldi-Phillips & Wadhera, 2014). Appleton et al. (2018) report that effect sizes consistently favour RE to FFL and FNL in studies examining both liking and intake. Yet when used together, FFL and FNL may be of selective benefit to novel and bitter tasting vegetables and/or certain children. This could be because the additives used in these studies resemble combinations typically eaten within a meal (e.g. cauliflower and cream cheese) and therefore offer greater ecological validity to the eating experience. Parents often provide vegetables to their children in this way as a function of cultural norms (Ahern et al 2013). They may also add vegetables to other foods by stealth (Caton, Ahern, & Hetherington, 2011) with a goal of relying on implicit learning or lack of awareness to enhance intake.

3.3 Intake in the absence of explicit learning

Hiding vegetables in composite meals has been popularised by cookbooks aimed at parents (“The Sneaky Chef”; “Deceptively Delicious”). When this approach has been tested in the laboratory, hidden vegetables produce a net increase in vegetable intakes. Spill, Birch, Roe, and Rolls (2011) found a dose-response effect with significantly greater intake of vegetables when vegetable content was tripled and quadrupled compared to the standard vegetable condition. In addition, hiding the vegetable content in this way did not influence intake of the vegetables provided as side dishes. In a school setting with older children (7-10y), the provision of vegetable enriched snack bars increased liking for the snack bars following exposure, but liking for the vegetables included in the bars was either stable or decreased (Jønsson, Angka, Olsen, Tolver, & Olsen, 2019). This is an interesting finding because if no explicit learning occurs, with no exposure to the vegetables on their own, decreases in liking of vegetables would not be expected. This effect, after exposure to hidden vegetables, could therefore be due to measurement error (children rating their liking for each vegetable *compared* with the more palatable snack bars they are tasting) or context dependent learning (the child expects to eat snack bars at snack time, so when vegetables are presented, children may rate them as less liked). Therefore, whilst providing vegetables by stealth may increase overall intake of vegetables, if there is no opportunity for explicit associative learning to occur, then future intake/liking of vegetables (when explicitly present) may remain unaffected. Nonetheless, offering vegetables by stealth may be one of a limited number of techniques for increasing vegetable consumption in fussy eaters who might otherwise reject them.

3.4 Rewards

Learning theory predicts that using incentives will increase liking and intake of vegetables. Rewards can range from social praise to tangible gifts such as toys or stickers and may have both facilitating and undermining effects on children's intake of food (see Cooke, Chambers, Añez, & Wardle, 2011 for a review). When administering rewards, problems arise when the behaviour becomes a means to the reward and there is a reduction of intrinsic motivation to perform the 'target' behaviour (Deci, Koestner, & Ryan, 1999). Therefore, where rewards are deemed necessary potential adverse effects should also be considered (**Figure 1.** illustrating both positive and negative outcomes of learning).

Rewards offered for consuming vegetables may elicit positive changes in liking and intake with effects that are larger than those using RE alone (Appleton et al., 2018) and more persistent effects at follow-up (Cooke, Chambers, Añez, Croker, et al., 2011). However, there are caveats; the type of reward offered is very important. Food rewards for tasting or eating vegetables (e.g. "eat your vegetables and you can have dessert") have been shown to be detrimental for preference of the target food (Newman & Taylor, 1992), whereas small non-food rewards may have more positive long term outcomes. Tangible rewards (small toys and stickers) increase intake more than verbal praise during interventions (Morrill, Madden, Wengreen, Fargo, & Aguilar, 2016) with effects being present at 3m follow-up (Remington, Añez, Croker, Wardle, & Cooke, 2012). Using RE with stickers can also increase WTT and intake of vegetables (Corsini, Slater, Harrison, Cooke, & Cox, 2013; Wardle, Herrera, Cooke, & Gibson, 2003), as well as decreasing the number of refusals by children (Fildes, van Jaarsveld, Wardle, & Cooke, 2014). However, this may work only for liked or neutral vegetables. When vegetables are already disliked, use of rewards can increase rated liking but may not increase intake in all children (Holley et al., 2015). For incentives to work, the food cannot be disliked to the extent that even a reward fails to encourage its intake. Individual differences in reward sensitivity may determine the effectiveness of incentives for vegetable consumption. Children with high reward sensitivity may try vegetables immediately with a reward, but those with low reward sensitivity may try only vegetables together with verbal encouragement (Vandeweghe, Verbeken, Moens, Vervoort, & Braet, 2016).

3.5 Non-taste exposure

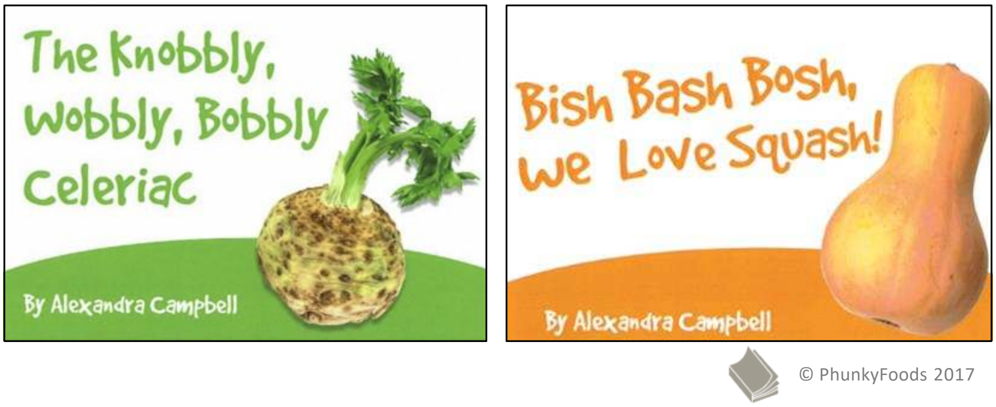
Young children will see, smell and touch the food before deciding to taste. These non-taste exposures are also effective for increasing vegetable familiarity and WTT. Children learn by doing and involving them in playful activities enhances their learning (Barab, Arici, & Jackson, 2005). Sensory play where children are encouraged to "play with your food!" results in increased willingness to try the foods and generalises to other new foods (Coulthard & Sealy, 2017).

Sensory education programmes such as the "SAPERE" method (https://www.sapere-association.com/) use play and sensory awareness tasks within school lessons to encourage children to be curious about the foods they eat. Play is fundamental to children's learning, but where the focus is too heavily on education rather than enjoyment, learning declines (Hughes, 2009). Sensory education has been shown to increase WTT new foods and to reduce neophobia in 8-12 year old children (Mustonen & Tuorila, 2010). Unlike RE studies, sensory education places no expectations on the child to consume the novel vegetable, and so the emotional tone of the lesson is encouraging and positive (see also Flavour School, https://www.flavourschool.org.uk/the-program).

Even in the absence of real food, familiarity with vegetables can be achieved with picture books (Dulay, Masento, Harvey, Messer, & Houston-Price, 2020; Heath, Houston-Price, & Kennedy, 2011; Houston-Price, Butler, & Shiba, 2009; Osborne & Forestell, 2012), facilitating WTT and preference development through recognition skills (Houston-Price, Owen, Kennedy, & Hill, 2019) and storybooks that provide a narrative or develop a character to enhance the playful element of the learning experience (de Droog, Buijzen, & Valkenburg, 2014; de Droog, van Nee, Govers, & Buijzen, 2017). Studies where reading a storybook about a novel vegetable, presented alongside experiential learning (seeing, smelling, touching and exploring different shapes), increased intake of a novel vegetable (Nekitsing, Blundell-Birtill, Cockroft, Fildes, & Hetherington, 2019; **Figure 2.**). For children who were fussy (non-eaters), intake increased when experiential learning was provided with the book, illustrating additive benefits of integrating techniques during intervention for children with different individual needs.

There are further opportunities to increase vegetable familiarity and preference/liking (and possibly intake) through nutrition education (Dhandevi & Jeewon, 2015), gardening (Ohly et al., 2016), cooking/preparing meals (Ehrenberg, Leone, Sharpe, Reardon, & Anzman-Frasca, 2019; Van der Horst, Ferrage, & Rytz, 2014) and visual nudges (e.g. pictures of vegetables on plates; Sharps, Thomas, & Blissett, 2020). Additionally, non-tasting games (Coulthard & Ahmed, 2017), computerised apps that enhance familiarity with vegetables (Farrow et al., 2019) and personalised apps (Dulay et al., 2020) have also been used to encourage WTT. The use of games to promote vegetable intake has not been tested extensively yet digital platforms, videos, gaming and play are clearly important routes to explore. Animated characters and videos of other children eating vegetables have been used to promote intake across several studies (Horne et al., 2011; Staiano, Marker, Frelier, Hsia, & Martin, 2016). Though less direct than providing actual foods, storybooks, play and digital media increase familiarity and encourage WTT in those children that are non-eaters, through facilitating positive affective experience during exposure to vegetables.

Figure 2. Non-taste exposure through storybooks with pictures of real vegetables. Included with permission from ©PhunkyFoods.



4 Social, cultural and food environments

Most studies of food learning take place in environments where investigators may control (laboratory) or change (pre-school) the setting to suit the study. Beyond these settings, parenting styles (e.g. authoritarian, authoritative etc.), parental practices (e.g. restriction, monitoring etc.) and physical aspects of the food environment (e.g. food availability, presentation/preparation method etc.) influence healthy eating behaviours (Bassul, Corish, & Kearney, 2020; Burnett, Lamb, McCann, Worsley, & Lacy, 2020; Pearson, Biddle, & Gorely, 2009; Yee, Lwin, & Ho, 2017). Here, children's learning can be implicit – learning about social norms and expectation of which foods to eat and how much. In a child's life, external influencers are multiple and varied (Alruwaily et al., 2020).

Children learn through modelling the behaviour of others, whether real or virtual (Farrow et al., 2019) and are influenced by perceived or actual social norms (Sharps & Robinson, 2015). For instance, when children aged 6-11y were led to believe that other children had eaten a large amount or small amount of carrots, intake was greatest when assigned to a large norm, compared to a low, no norm or control condition (Sharps &

Robinson, 2015). In unfamiliar circumstances informational social norms increased intake of carrots (Sharps & Robinson, 2017). What other children are doing, the social norms they are exposed to and visual prompting encourage intake of vegetables, especially if they are already liked.

Social learning outcomes favour some foods over others. In a study from the Netherlands involving much-loved TV characters – Ernst and Bobbie (http://www.ernstbobbie.nl/), children watched characters eating carrots during a classroom snack (Zeinstra, Kooijman, & Kremer, 2017). The TV characters promoted injunctive norms (eat carrots to make you strong and fast) and modelled consumption of carrots with enthusiasm. However, viewing the video had no effect on intake after 8 sessions, but at 9m follow-up children in the experimental conditions (video, or video plus positive restriction) increased their intake. The authors suggested that this delayed effect may be due to the novelty of eating carrots in a classroom initially then to the impact of evaluative conditioning in the long term. Children may have learned to associate the convivial atmosphere, positive role model and eating carrots in class over time (Zeinstra et al., 2017). This illustrates the importance of ecologically valid interventions, as children may not have had opportunity to assimilate intervention practices into their everyday life. In this study around 40% of children were classed as "non-eaters" eating less than 10g of carrot. In contrast, children 3-5y watching videos of peppers being eaten by other children increased preference for and consumption of peppers compared with the control (no video) group (Staiano et al., 2016). Therefore, in a social setting, even with encouragement, playful support and modelling, children differ in the extent to which they respond to social learning interventions and to the type of models used during interventions.

Furthermore, foods high in energy density (HED) and palatability are often favoured in social learning contexts. This was demonstrated by, Coates, Hardman, Halford, Christiansen, and Boyland (2019) who randomly allocated children aged 9-11y to view Instagram kid influencers promoting HED foods (e.g. cookies), non-food products or nutrient dense foods (e.g. banana). The children were then offered a snack, and the children who had viewed the HED snacks, selectively consumed more of these foods compared to those in the other conditions. In response to viewing the influencer promoting nutrient dense, "healthy" foods, there was no concomitant increase in intake of these foods. There appears to be a selective advantage of food promotion on HED, palatable foods compared to more nutritious, low energy density foods such as fruits and vegetables.

5 Practical applications of the model

In updating the current model (Johnson, 2016), evidence has been integrated from studies of the complex environments that children eat and learn in, the individual differences that children bring to each eating occasion and the features of foods they are exposed to (**Figure 1.**). The model illustrates the timeframe through which different strategies support children's learning to like and to eat vegetables. Evidence is largely from experimental studies, but most intake of vegetables occurs at home. Therefore, an integrated intervention to facilitate habitual intake of vegetables is ecologically valid, provides feasible and realistic strategies suited to the child's age, ability, appetite, temperament and context.

To achieve this more integrated approach in practice involves consideration of the child, the setting and the target food (**Figure 1.**). An integrated approach acknowledges how and where vegetables are typically consumed, characteristics and current state of the child and strategies that can be assimilated into everyday habits. It may also consider specific combinations of biopsychosocial factors and/or learning techniques which influence consumption. In practice, integrated approaches will succeed if adapted to individuals or groups of children with similar trait profiles, with specific aims to increase WTT, liking and/or intake, within a typical eating context.

Advice to parents might include regular exposure (without pressure to eat) however, this form of learning is scaffolded by other techniques. Anzman-Frasca et al. (2018) suggest that simple techniques such as RE, modelling and praise could be used before moving on to other methods including non-food rewards or changing the presentation or flavour of the vegetable using associative conditioning. The authors reason that these latter techniques can then be reserved to motivate initial tastings for vegetables that are consistently avoided or refused. This approach may reduce parental frustration when RE is suggested, but does not work for their child.

Sensory experience with vegetables must be positive to promote pleasure to facilitate liking (Nicklaus, 2016). Parents and caregivers might enhance enjoyment of food and eating through participating in food preparation, with the potential to reduce neophobia or fussy eating (Van der Horst, 2012; Van der Horst, Mathias, Patron, & Allirot, 2019). This is a holistic and gradual approach, but is important because it is *easier* to learn to dislike than to like vegetables (Van den Bosch et al., 2015). Although liking is necessary for consumption it is *not sufficient* and the relationship between liking and consumption is non-linear (see Hayes, 2020 for a discussion). Therefore, in addition to developing liking, the overall evaluative experience of the eating occasion needs to be pleasant, positive and rewarding.

Engaging in food preparation and tasting vegetables can be fun but overemphasis on eating more vegetables and/or restricting access to highly liked, HED foods (e.g. desserts) can lead to paradoxical effects (Fisher & Birch, 1999). Such practices can be viewed by the child as pressuring and coercive, inhibiting learning (Vollmer & Baietto, 2017). Like adults, children may not be hungry when foods are offered or they may not be ready to try them. During or after a meal is eaten, appetite for vegetables, such as those that are bitter, may decrease compared to before the meal, when hunger facilitates intake (Olsen, Ritz, Hartvig, & Møller, 2011; Spill, Birch, Roe, & Rolls, 2010). Understanding and adapting to individual child needs is an example of responsive feeding, which is associated with low fussiness and high enjoyment of food (Finnane, Jansen, Mallan, & Daniels, 2017). Therefore, eating without pressure or expectation (e.g. SAPERE) but encouragement to taste or try, reduces conflict. If children try the vegetables offered, if these vegetables are offered regularly and the tone is positive and encouraging, then the overall experience is enjoyable, which is conducive to learning.

In contrast to many studies included in this review, children's day-to-day intake of vegetables is typically accompanied by other foods. For example, in the UK children consume only one portion of vegetables per day, with the largest daily amount eaten in the evening, most frequently accompanied by foods high in proteins and complex carbohydrates (e.g. plant or animal proteins and potatoes, pasta or rice: Chawner et al., 2020). Therefore, while RE to vegetables increases familiarity exposure to a single vegetable rarely occurs in the child's usual environment. Consequently, the role of competing foods (other available foods; e.g. more palatable, highly favoured foods such as chicken nuggets, chips) must be acknowledged. Ideally, if children learn to eat vegetables alongside competing foods for a balanced and varied diet, then establishing liking beforehand increases the likelihood that the vegetable component of the meal will be eaten. Evidence suggests that specific pairings of vegetables and entrées (the main meal) affects levels of food waste (Ishdorj, Capps Jr, Storey, & Murano, 2015). However, it is not known whether this is due to entrée items being more palatable than the vegetables, whether specific food pairings are an unfamiliar combination, or for other reasons that may influence eating combinations of foods, such as the disparity of liking between vegetables and entrée items (Chawner, Blundell-Birtill, & Hetherington, in press).

6 Future research and problems/gaps

There remain many gaps in the current literature concerning factors that influence children's ability to learn to like and consume vegetables. Firstly, little is known about the transition between developmental stages. The progression of learning from vegetable pureés during infancy to eating 40g (one portion) of a vegetable on a plate during childhood is poorly understood. Reductionist approaches of using one technique at a time has been useful to determine which practices are effective for food preference development. However, effect sizes for single techniques are generally small (Appleton et al., 2018) and could be improved by use of techniques that complement each other. Holley et al. (2015) found that using modelling and rewards together with RE resulted in larger effect sizes for vegetables than any one method alone.

Using multiple techniques may ensure that children with additional or individual needs (e.g. fussy eaters that require more time and familiarity) receive an appropriate intervention. Alternatively, studies that design interventions for specific groups of children with similar individual needs may see larger (or at least more consistent) effects than studies aggregating intake for all children, regardless of individual differences. Therefore, a personalised approach is necessary.

Further study on generalisation and transfer effects is also warranted with children 2-6y and older. RE to one vegetable does not lead to acceptance of different vegetables at separate eating occasions (Hetherington et al., 2015), yet it is not known whether children will require fewer exposures to a second vegetable after being exposed to and accepting a first vegetable. It is also not clear how to transfer effects to other foods and across contexts once learning occurs.

At mealtimes especially, children may develop habits for refusing foods without trying them, which may not be linked to liking (Birch & Marlin, 1982). It is not yet understood whether children refuse certain foods because they have refused them previously (especially when the result is the removal of the food) and whether this extends to other novel vegetables. Furthermore, previous experiences with vegetables could impact on the success of future interventions, and so taking learning history and familiarity into account could be important.

Lastly, this review has focused on learning to eat vegetables in infancy and early childhood. Research with older children and adolescents is sparse and interventions that are implemented tend to produce modest or no effects (Coates et al., 2019; Fritts et al., 2019; Pedersen, Grønhøj, & Thøgersen, 2016; Sharps, Hetherington, Blundell-Birtill, Rolls, & Evans, 2019). Studies to examine which techniques succeed in increasing vegetable intake through learning in older children are needed to promote healthier dietary intakes.

Conclusion

Learning to like vegetables and to eat them regularly presents a challenge to parents and caregivers. Biology, environment and individual differences may interact to reduce the appeal of vegetables, yet these foods confer selective health benefits. Learning theory and interventions developed to apply these principles have provided a substantial platform on which to base more integrated research on how children (and their families) will transition to eating more vegetables as part of a more plant-based diet. In order to achieve enhanced impact, future research could implement interventions within an ecologically valid context resembling habitual eating behaviour, combining multiple complementary techniques for potential additive effects and taking account of individual differences between children that may constrain or enhance their learning.

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References

Ahern, S. M., Caton, S. J., Blundell, P., & Hetherington, M. M. (2014). The root of the problem: increasing root vegetable intake in preschool children by repeated exposure and flavour flavour learning. *Appetite, 80*, 154-160.

Alruwaily, A., Mangold, C., Greene, T., Arshonsky, J., Cassidy, O., Pomeranz, J. L., & Bragg, M. (2020). Child social media influencers and unhealthy food product placement. *Pediatrics, 146*(5).

Anzman-Frasca, S., Ventura, A. K., Ehrenberg, S., & Myers, K. P. (2018). Promoting healthy food preferences from the start: a narrative review of food preference learning from the prenatal period through early childhood. *Obesity Reviews, 19*(4), 576-604.

Anzman-Frasca, S., Savage, J. S., Marini, M. E., Fisher, J. O., & Birch, L. L. (2012). Repeated exposure and associative conditioning promote preschool children's liking of vegetables. *Appetite, 58*(2), 543-553.

Appleton, K. M., Hemingway, A., Rajska, J., & Hartwell, H. (2018). Repeated exposure and conditioning strategies for increasing vegetable liking and intake: systematic review and meta-analyses of the published literature. *The American Journal of Clinical Nutrition, 108*(4), 842-856.

Aune, D., Giovannucci, E., Boffetta, P., Fadnes, L. T., Keum, N., Norat, T., . . . Tonstad, S. (2017). Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology, 46*(3), 1029-1056.

Barab, S., Arici, A., & Jackson, C. (2005). Eat your vegetables and do your homework: A design-based investigation of enjoyment and meaning in learning. *Educational Technology*, 15-21.

Barends, C., de Vries, J., Mojet, J., & de Graaf, C. (2013). Effects of repeated exposure to either vegetables or fruits on infant's vegetable and fruit acceptance at the beginning of weaning. *Food Quality and Preference, 29*(2), 157-165.

Barends, C., de Vries, J. H., Mojet, J., & de Graaf, C. (2014). Effects of starting weaning exclusively with vegetables on vegetable intake at the age of 12 and 23 months. *Appetite, 81*, 193-199.

Bassul, C., Corish, C., & Kearney, J. (2020). Associations between the home environment, feeding practices and children's intakes of fruit, vegetables and confectionary/sugar-sweetened beverages. *International Journal of Environmental Research and Public Health*

17(13), 4837.

Beauchamp, G. K., & Mennella, J. A. (2009). Early flavor learning and its impact on later feeding behavior. *Journal of Pediatric Gastroenterology and Nutrition, 48*, S25-S30.

Beauchamp, G. K., & Mennella, J. A. (2011). Flavor perception in human infants: development and functional significance. *Digestion, 83*(Suppl. 1), 1-6.

Beckerman, J. P., Slade, E., & Ventura, A. K. (2020). Maternal diet during lactation and breast-feeding practices have synergistic association with child diet at 6 years. *Public Health Nutrition, 23*(2), 286-294.

Bell, K. I., & Tepper, B. J. (2006). Short-term vegetable intake by young children classified by 6-n-propylthoiuracil bitter-taste phenotype. *The American Journal of Clinical Nutrition, 84*(1), 245-251.

Birch, L. (1999). Development of food preferences. *Annual Review of Nutrition, 19*(1), 41-62.
Birch, L., Gunder, L., Grimm-Thomas, K., & Laing, D. G. (1998). Infants' consumption of a new food enhances acceptance of similar foods. *Appetite, 30*(3), 283-295.
Birch, L., & Marlin, D. W. (1982). I don't like it; I never tried it: effects of exposure on two-year-old children's food preferences. *Appetite, 3*(4), 353-360.
Blekkenhorst, L. C., Sim, M., Bondonno, C. P., Bondonno, N. P., Ward, N. C., Prince, R. L., . . . Hodgson, J. M. (2018). Cardiovascular health benefits of specific vegetable types: a narrative review. *Nutrients, 10*(5), 595.
Boeing, H., Bechthold, A., Bub, A., Ellinger, S., Haller, D., Kroke, A., . . . Schulze, M. (2012). Critical review: vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition, 51*(6), 637-663.
Bouhlal, S., Issanchou, S., Chabanet, C., & Nicklaus, S. (2014). 'Just a pinch of salt'. An experimental comparison of the effect of repeated exposure and flavor-flavor learning with salt or spice on vegetable acceptance in toddlers. *Appetite, 83*, 209-217.
Burnett, A. J., Lamb, K. E., McCann, J., Worsley, A., & Lacy, K. E. (2020). Parenting styles and the dietary intake of pre-school children: a systematic review. *Psychology and Health, 35*(11), 1326-1345.
Capaldi-Phillips, E. D., & Wadhera, D. (2014). Associative conditioning can increase liking for and consumption of brussels sprouts in children aged 3 to 5 years. *Journal of the Academy of Nutrition and Dietetics, 114*(8), 1236-1241.
Carney, E. M., Stein, W. M., Reigh, N. A., Gater, F. M., Bakke, A. J., Hayes, J. E., & Keller, K. L. (2018). Increasing flavor variety with herbs and spices improves relative vegetable intake in children who are propylthiouracil (PROP) tasters relative to nontasters. *Physiology and Behavior, 188*, 48-57.
Carter, P., Gray, L. J., Troughton, J., Khunti, K., & Davies, M. J. (2010). Fruit and vegetable intake and incidence of type 2 diabetes mellitus: systematic review and meta-analysis. *British Medical Journal, 341*.
Caton, S. J., Ahern, S. M., & Hetherington, M. M. (2011). Vegetables by stealth. An exploratory study investigating the introduction of vegetables in the weaning period. *Appetite, 57*(3), 816-825.
Caton, S. J., Ahern, S. M., Remy, E., Nicklaus, S., Blundell, P., & Hetherington, M. M. (2013). Repetition counts: repeated exposure increases intake of a novel vegetable in UK pre-school children compared to flavour–flavour and flavour–nutrient learning. *British Journal of Nutrition, 109*(11), 2089-2097.
Caton, S. J., Blundell, P., Ahern, S. M., Nekitsing, C., Olsen, A., Møller, P., . . . Hetherington, M. M. (2014). Learning to eat vegetables in early life: the role of timing, age and individual eating traits. *PloS one, 9*(5), e97609.
Chawner, L. R., Blundell-Birtill, P., & Hetherington, M. M. (2019). Interventions for increasing acceptance of new foods among children and adults with developmental disorders: a systematic review. *Journal of Autism and Developmental Disorders, 49*(9), 3504-3525.
Chawner, L. R., Blundell-Birtill, P., & Hetherington, M. M. (2020). Predictors of vegetable consumption in children and adolescents: Analyses of the UK National Diet and Nutrition Survey (2008-2017). *British Journal of Nutrition*, 1-35.

Chawner, L. R., Blundell-Birtill, P., & Hetherington, M. M. (in press). Children's selection of vegetables versus competing foods: An online study examining the role of meal contexts, liking and familiarity. . *Appetite*.

Coates, A. E., Hardman, C. A., Halford, J. C., Christiansen, P., & Boyland, E. J. (2019). Social media influencer marketing and children's food intake: a randomized trial. *Pediatrics, 143*(4).

Cooke, L. J., Chambers, L. C., Añez, E. V., Croker, H. A., Boniface, D., Yeomans, M. R., & Wardle, J. (2011). Eating for pleasure or profit: the effect of incentives on children's enjoyment of vegetables. *Psychological Science, 22*(2), 190-196.

Cooke, L. J., Chambers, L. C., Añez, E. V., & Wardle, J. (2011). Facilitating or undermining? The effect of reward on food acceptance. A narrative review. *Appetite, 57*(2), 493-497.

Cooke, L. J., Gibson, E., Sapochnik, M., Sheiham, A., & Lawson, M. (2004). Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition, 7*(2), 295-302.

Corsini, N., Slater, A., Harrison, A., Cooke, L., & Cox, D. N. (2013). Rewards can be used effectively with repeated exposure to increase liking of vegetables in 4–6-year-old children. *Public Health Nutrition, 16*(5), 942-951.

Coulthard, H., & Ahmed, S. (2017). Non taste exposure techniques to increase fruit and vegetable acceptance in children: Effects of task and stimulus type. *Food Quality and Preference, 61*, 50-54.

Coulthard, H., Harris, G., & Emmett, P. (2009). Delayed introduction of lumpy foods to children during the complementary feeding period affects child's food acceptance and feeding at 7 years of age. *Maternal and Child Nutrition, 5*(1), 75-85.

Coulthard, H., Harris, G., & Fogel, A. (2016). Association between tactile over-responsivity and vegetable consumption early in the introduction of solid foods and its variation with age. *Maternal and Child Nutrition, 12*(4), 848-859.

Coulthard, H., & Sealy, A. (2017). Play with your food! Sensory play is associated with tasting of fruits and vegetables in preschool children. *Appetite, 113*, 84-90.

de Droog, S. M., Buijzen, M., & Valkenburg, P. M. (2014). Enhancing children's vegetable consumption using vegetable-promoting picture books. The impact of interactive shared reading and character–product congruence. *Appetite, 73*, 73-80.

de Droog, S. M., van Nee, R., Govers, M., & Buijzen, M. (2017). Promoting toddlers' vegetable consumption through interactive reading and puppetry. *Appetite, 116*, 75-81.

de Wild, V. W., de Graaf, C., & Jager, G. (2013). Effectiveness of flavour nutrient learning and mere exposure as mechanisms to increase toddler's intake and preference for green vegetables. *Appetite, 64*, 89-96.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*(6), 627.

Dhandevi, P., & Jeewon, R. (2015). Fruit and vegetable intake: Benefits and progress of nutrition education interventions-narrative review article. *Iranian Journal of Public Health, 44*(10), 1309.

Diktas, H., Roe, L., Keller, K., Sanchez, C., & Rolls, B. (2021). Promoting vegetable intake in preschool children: independent and combined effects of portion size and flavor enhancement. *Appetite, 4*, 105250.

Dovey, T. M., Staples, P. A., Gibson, E. L., & Halford, J. C. (2008). Food neophobia and 'picky/fussy'eating in children: a review. *Appetite, 50*(2-3), 181-193.
Duffy, E. W., Kay, M. C., Jacquier, E. F., Catellier, D., Hampton, J., Anater, A. S., & Story, M. (2019). Trends in food consumption patterns of US infants and toddlers from Feeding Infants and Toddlers Studies (FITS) in 2002, 2008, 2016. *Nutrients, 11*(11), 2807.
Dulay, K. M., Masento, N., Harvey, K., Messer, D. J., & Houston-Price, C. (2020). Me and my veggies: The use of interactive, personalised picture books in healthy eating interventions. *Nutrition Bulletin, 45*(1), 51-58.
Ehrenberg, S., Leone, L., Sharpe, B., Reardon, K., & Anzman-Frasca, S. (2019). Using repeated exposure through hands-on cooking to increase children's preferences for fruits and vegetables. *Appetite, 142*, 104347.
Eldridge, A. L., Catellier, D. J., Hampton, J. C., Dwyer, J. T., & Bailey, R. L. (2019). Trends in mean nutrient intakes of US infants, toddlers, and young children from 3 Feeding Infants and Toddlers Studies (FITS). *The Journal of Nutrition, 149*(7), 1230-1237.
Emmett, P. M., Hays, N. P., & Taylor, C. M. (2018). Antecedents of picky eating behaviour in young children. *Appetite, 130*, 163-173.
Ernst and Bobbie (http://www.ernstbobbie.nl/) Accessed on 01/12/2020.
Evans, C. E., Christian, M. S., Cleghorn, C. L., Greenwood, D. C., & Cade, J. E. (2012). Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. *The American Journal of Clinical Nutrition, 96*(4), 889-901.
Farrow, C., Belcher, E., Coulthard, H., Thomas, J. M., Lumsden, J., Hakobyan, L., & Haycraft, E. (2019). Using repeated visual exposure, rewards and modelling in a mobile application to increase vegetable acceptance in children. *Appetite, 141*, 104327.
Farrow, C., & Coulthard, H. (2018). Multisensory evaluation and the neophobic food response. In *Food neophobia* (pp. 219-236): Elsevier.
Fildes, A., van Jaarsveld, C. H., Llewellyn, C. H., Fisher, A., Cooke, L., & Wardle, J. (2014). Nature and nurture in children's food preferences. *The American Journal of Clinical Nutrition, 99*(4), 911-917.
Fildes, A., van Jaarsveld, C. H., Wardle, J., & Cooke, L. (2014). Parent-administered exposure to increase children's vegetable acceptance: a randomized controlled trial. *Journal of the Academy of Nutrition and Dietetics, 114*(6), 881-888.
Finnane, J. M., Jansen, E., Mallan, K. M., & Daniels, L. A. (2017). Mealtime structure and responsive feeding practices are associated with less food fussiness and more food enjoyment in children. *Journal of Nutrition Education and Behavior, 49*(1), 11-18. e11.
Fisher, J. O., & Birch, L. L. (1999). Restricting access to foods and children's eating. *Appetite, 32*(3), 405-419.
Fisher, J. O., Mennella, J. A., Hughes, S. O., Liu, Y., Mendoza, P. M., & Patrick, H. (2012). Offering "dip" promotes intake of a moderately-liked raw vegetable among preschoolers with genetic sensitivity to bitterness. *Journal of the Academy of Nutrition and Dietetics, 112*(2), 235-245.
Flavour School. https://www.flavourschool.org.uk/the-program Accessed on 01/12/2020.
Fritts, J. R., Bermudez, M. A., Hargrove, R. L., Alla, L., Fort, C., Liang, Q., . . . Keller, K. L. (2019). Using Herbs and Spices to Increase Vegetable Intake Among Rural Adolescents. *Journal of Nutrition Education and Behavior, 51*(7), 806-816. e801.

Gardner, B., & Rebar, A. L. (2019). Habit formation and behavior change. In *Oxford Research Encyclopedia of Psychology*.
Harris, G., & Mason, S. (2017). Are there sensitive periods for food acceptance in infancy? *Current Nutrition Reports, 6*(2), 190-196.
Hartley, L., Igbinedion, E., Holmes, J., Flowers, N., Thorogood, M., Clarke, A., . . . Rees, K. (2013). Increased consumption of fruit and vegetables for the primary prevention of cardiovascular diseases. *Cochrane Database of Systematic Reviews*(6).
Hausner, H., Bredie, W. L., Mølgaard, C., Petersen, M. A., & Møller, P. (2008). Differential transfer of dietary flavour compounds into human breast milk. *Physiology and Behavior, 95*(1-2), 118-124.
Hausner, H., Olsen, A., & Møller, P. (2012). Mere exposure and flavour–flavour learning increase 2–3 year-old children's acceptance of a novel vegetable. *Appetite, 58*(3), 1152-1159.
Hayes, J. E. (2020). Influence of Sensation and Liking on Eating and Drinking. In *Handbook of Eating and Drinking: Interdisciplinary Perspectives* (pp. 131-155).
Haymond, M., Kappelgaard, A.-M., Czernichow, P., Biller, B. M., Takano, K., Kiess, W., & hormone, on behalf of the participants in the global advisory panel meeting on the effects of growth hormone. (2013). Early recognition of growth abnormalities permitting early intervention. *Acta Paediatrica, 102*(8), 787-796.
Heath, P., Houston-Price, C., & Kennedy, O. B. (2011). Increasing food familiarity without the tears. A role for visual exposure? *Appetite, 57*(3), 832-838.
Hepper, P. G. (1996). Fetal memory: does it exist? What does it do? *Acta Paediatrica, 85*, 16-20.
Hetherington, M. M., Schwartz, C., Madrelle, J., Croden, F., Nekitsing, C., Vereijken, C. M., & Weenen, H. (2015). A step-by-step introduction to vegetables at the beginning of complementary feeding. The effects of early and repeated exposure. *Appetite, 84*, 280-290.
Holley, C. E., Farrow, C., & Haycraft, E. (2016). Investigating the role of parent and child characteristics in healthy eating intervention outcomes. *Appetite, 105*, 291-297.
Holley, C. E., Farrow, C., & Haycraft, E. (2017). A systematic review of methods for increasing vegetable consumption in early childhood. *Current Nutrition Reports, 6*(2), 157-170.
Holley, C. E., Haycraft, E., & Farrow, C. (2015). 'Why don't you try it again?'A comparison of parent led, home based interventions aimed at increasing children's consumption of a disliked vegetable. *Appetite, 87*, 215-222.
Holley, C. E., Haycraft, E., & Farrow, C. (2020). Unpacking the relationships between positive feeding practices and children's eating behaviours: The moderating role of child temperament. *Appetite, 147*, 104548.
Horne, P. J., Greenhalgh, J., Erjavec, M., Lowe, C. F., Viktor, S., & Whitaker, C. J. (2011). Increasing pre-school children's consumption of fruit and vegetables. A modelling and rewards intervention. *Appetite, 56*(2), 375-385.
Houston-Price, C., Butler, L., & Shiba, P. (2009). Visual exposure impacts on toddlers' willingness to taste fruits and vegetables. *Appetite, 53*(3), 450-453.
Houston-Price, C., Owen, L. H., Kennedy, O. B., & Hill, C. (2019). Parents' experiences of introducing toddlers to fruits and vegetables through repeated exposure, with and without prior visual familiarization to foods: Evidence from daily diaries. *Food Quality and Preference, 71*, 291-300.
Hughes, F. P. (2009). *Children, play, and development*: Sage.

Ishdorj, A., Capps Jr, O., Storey, M., & Murano, P. S. (2015). Investigating the relationship between food pairings and plate waste from elementary school lunches. *Food and Nutrition Sciences, 6*, 1029-1044.

Johnson, S. (2016). Developmental and environmental influences on young children's vegetable preferences and consumption. *Advances in Nutrition, 7*(1), 220S-231S.

Johnson, S., McPhee, L., & Birch, L. (1991). Conditioned preferences: young children prefer flavors associated with high dietary fat. *Physiology and Behavior, 50*(6), 1245-1251.

Jønsson, S. R., Angka, S., Olsen, K., Tolver, A., & Olsen, A. (2019). Repeated exposure to vegetable-enriched snack bars may increase children's liking for the bars-but not for the vegetables. *Appetite, 140*, 1-9.

Kaukonen, R., Lehto, E., Ray, C., Vepsäläinen, H., Nissinen, K., Korkalo, L., . . . Roos, E. (2019). A cross-sectional study of children's temperament, food consumption and the role of food-related parenting practices. *Appetite, 138*, 136-145.

Keller, K. L., & Adise, S. (2016). Variation in the ability to taste bitter thiourea compounds: implications for food acceptance, dietary intake, and obesity risk in children. *Annual Review of Nutrition, 36*, 157-182.

Kern, D. L., McPhee, L., Fisher, J., Johnson, S., & Birch, L. L. (1993). The postingestive consequences of fat condition preferences for flavors associated with high dietary fat. *Physiology and Behavior, 54*(1), 71-76.

Kidwell, K. M., Kozikowski, C., Roth, T., Lundahl, A., & Nelson, T. D. (2018). Concurrent and longitudinal associations among temperament, parental feeding styles, and selective eating in a preschool sample. *Journal of Pediatric Psychology, 43*(5), 572-583.

Ledford, J. R., & Gast, D. L. (2006). Feeding problems in children with autism spectrum disorders: A review. *Focus on Autism and Other Developmental Disabilities, 21*(3), 153-166.

Lee, J., Shin, A., Oh, J. H., & Kim, J. (2017). Colors of vegetables and fruits and the risks of colorectal cancer. *World Journal of Gastroenterology, 23*(14), 2527.

Liu, R. H. (2003). Health benefits of fruit and vegetables are from additive and synergistic combinations of phytochemicals. *The American Journal of Clinical Nutrition, 78*(3), 517S-520S.

Maier, A. S., Chabanet, C., Schaal, B., Issanchou, S., & Leathwood, P. (2007). Effects of repeated exposure on acceptance of initially disliked vegetables in 7-month old infants. *Food Quality and Preference, 18*(8), 1023-1032.

Martin, I., & Levey, A. B. (1978). Evaluative conditioning. *Advances in Behaviour Research and Therapy, 1*(2), 57-101.

Mennella, J. A., & Bobowski, N. K. (2015). The sweetness and bitterness of childhood: Insights from basic research on taste preferences. *Physiology and Behavior, 152*, 502-507.

Mennella, J. A., Jagnow, C. P., & Beauchamp, G. K. (2001). Prenatal and postnatal flavor learning by human infants. *Pediatrics, 107*(6), e88-e88.

Mennella, J. A., Johnson, A., & Beauchamp, G. K. (1995). Garlic ingestion by pregnant women alters the odor of amniotic fluid. *Chemical Senses, 20*(2), 207-209.

Moding, K. J., Bellows, L. L., Grimm, K. J., & Johnson, S. L. (2020). A longitudinal examination of the role of sensory exploratory behaviors in young children's acceptance of new foods. *Physiology and Behavior, 218*, 112821.

Morrill, B. A., Madden, G. J., Wengreen, H. J., Fargo, J. D., & Aguilar, S. S. (2016). A randomized controlled trial of the Food Dudes program: tangible rewards are more

effective than social rewards for increasing short-and long-term fruit and vegetable consumption. *Journal of the Academy of Nutrition and Dietetics, 116*(4), 618-629.
Moss, K. M., Dobson, A. J., Tooth, L., & Mishra, G. D. (2020). Associations between feeding practices in infancy and fruit and vegetable consumption in childhood. *British Journal of Nutrition, 124*(12), 1320-1328.
Mustonen, S., & Tuorila, H. (2010). Sensory education decreases food neophobia score and encourages trying unfamiliar foods in 8–12-year-old children. *Food Quality and Preference, 21*(4), 353-360.
Nekitsing, C., Blundell-Birtill, P., Cockroft, J. E., Fildes, A., & Hetherington, M. M. (2019). Increasing intake of an unfamiliar vegetable in preschool children through learning using storybooks and sensory play: a cluster randomized trial. *Journal of the Academy of Nutrition and Dietetics, 119*(12), 2014-2027.
Nekitsing, C., Blundell-Birtill, P., Cockroft, J. E., & Hetherington, M. M. (2018). Systematic review and meta-analysis of strategies to increase vegetable consumption in preschool children aged 2–5 years. *Appetite, 127*, 138-154.
Nekitsing, C., Blundell-Birtill, P., Cockroft, J. E., & Hetherington, M. M. (2019). Taste exposure increases intake and nutrition education increases willingness to try an unfamiliar vegetable in preschool children: a cluster randomized trial. *Journal of the Academy of Nutrition and Dietetics, 119*(12), 2004-2013.
Newman, J., & Taylor, A. (1992). Effect of a means-end contingency on young children's food preferences. *Journal of Experimental Child Psychology, 53*(2), 200-216.
Nicklaus, S. (2016). The role of food experiences during early childhood in food pleasure learning. *Appetite, 104*, 3-9.
Nicklaus, S., Boggio, V., Chabanet, C., & Issanchou, S. (2005). A prospective study of food variety seeking in childhood, adolescence and early adult life. *Appetite, 44*(3), 289-297.
Nor, N. D. M., Houston-Price, C., Harvey, K., & Methven, L. (2018). The effects of taste sensitivity and repeated taste exposure on children's intake and liking of turnip (Brassica rapa subsp. rapa); a bitter Brassica vegetable. *Appetite, 157*, 104991.
O'Brien, S. A., Feeney, E. L., Scannell, A. G., Markey, A., & Gibney, E. R. (2013). Bitter taste perception and dietary intake patterns in irish children. *Lifestyle Genomics, 6*(1), 43-58.
O'Connell, M. L., Henderson, K. E., Luedicke, J., & Schwartz, M. B. (2012). Repeated exposure in a natural setting: A preschool intervention to increase vegetable consumption. *Journal of the Academy of Nutrition and Dietetics, 112*(2), 230-234.
Ohly, H., Gentry, S., Wigglesworth, R., Bethel, A., Lovell, R., & Garside, R. (2016). A systematic review of the health and well-being impacts of school gardening: synthesis of quantitative and qualitative evidence. *BMC Public Health, 16*(1), 286.
Olsen, A., Ritz, C., Hartvig, D. L., & Møller, P. (2011). Comparison of sensory specific satiety and sensory specific desires to eat in children and adults. *Appetite, 57*(1), 6-13.
Olsen, A., Ritz, C., Kraaij, L. W., & Møller, P. (2012). Children’s liking and intake of vegetables: A school-based intervention study. *Food Quality and Preference, 23*(2), 90-98.
Osborne, C. L., & Forestell, C. A. (2012). Increasing children's consumption of fruit and vegetables: Does the type of exposure matter? *Physiology and Behavior, 106*(3), 362-368.

Oyebode, O., Gordon-Dseagu, V., Walker, A., & Mindell, J. S. (2014). Fruit and vegetable consumption and all-cause, cancer and CVD mortality: analysis of Health Survey for England data. *Epidemiol Community Health, 68*(9), 856-862.

Pearce, J. M. (1987). A model for stimulus generalization in Pavlovian conditioning. *Psychological Review, 94*(1), 61.

Pearce, J. M. (1994). Similarity and discrimination: a selective review and a connectionist model. *Psychological Review, 101*(4), 587.

Pearson, N., Biddle, S. J., & Gorely, T. (2009). Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public Health Nutrition, 12*(2), 267-283.

Pedersen, S., Grønhøj, A., & Thøgersen, J. (2016). Texting your way to healthier eating? Effects of participating in a feedback intervention using text messaging on adolescents' fruit and vegetable intake. *Health Education Research, 31*(2), 171-184.

Pliner, P. (1982). The effects of mere exposure on liking for edible substances. *Appetite, 3*(3), 283-290.

Remington, A., Añez, E., Croker, H., Wardle, J., & Cooke, L. (2012). Increasing food acceptance in the home setting: a randomized controlled trial of parent-administered taste exposure with incentives. *The American Journal of Clinical Nutrition, 95*(1), 72-77.

Russell, C. G., & Worsley, T. (2016). Associations between appetitive traits and food preferences in preschool children. *Food Quality and Preference, 52*, 172-178.

Sanson, A., Hemphill, S. A., & Smart, D. (2004). Connections between temperament and social development: A review. *Social Development, 13*(1), 142-170.

Sapere Association. https://www.sapere-association.com/ Accessed on 01/12/2020.

Schwartz, C., Chabanet, C., Lange, C., Issanchou, S., & Nicklaus, S. (2011). The role of taste in food acceptance at the beginning of complementary feeding. *Physiology and Behavior, 104*(4), 646-652.

Searle, B.-R. E., Harris, H. A., Thorpe, K., & Jansen, E. (2020). What children bring to the table: The association of temperament and child fussy eating with maternal and paternal mealtime structure. *Appetite, 151*, 104680.

Seiverling, L., Towle, P., Hendy, H. M., & Pantelides, J. (2018). Prevalence of feeding problems in young children with and without autism spectrum disorder: A chart review study. *Journal of Early Intervention, 40*(4), 335-346.

Sharp, W. G., & Postorino, V. (2017). Food selectivity in autism spectrum disorder. In *Clinical handbook of complex and atypical eating disorders* (pp. 126-148): Oxford University Press Oxford.

Sharps, M., Hetherington, M. M., Blundell-Birtill, P., Rolls, B. J., & Evans, C. E. (2019). The effectiveness of a social media intervention for reducing portion sizes in young adults and adolescents. *Digital Health, 5*, 2055207619878076.

Sharps, M., & Robinson, E. (2015). Perceived eating norms and vegetable consumption in children. *International Journal of Behavioral Nutrition and Physical Activity, 12*(1), 135.

Sharps, M., & Robinson, E. (2017). Perceived eating norms and children's eating behaviour: An informational social influence account. *Appetite, 113*, 41-50.

Sharps, M., Thomas, E., & Blissett, J. M. (2020). Using pictorial nudges of fruit and vegetables on tableware to increase children's fruit and vegetable consumption. *Appetite, 144*, 104457.

Slavin, J. L., & Lloyd, B. (2012). Health benefits of fruits and vegetables. *Advances in Nutrition, 3*(4), 506-516.
Smethers, A. D., Roe, L. S., Sanchez, C. E., Zuraikat, F. M., Keller, K. L., Kling, S. M., & Rolls, B. J. (2019). Portion size has sustained effects over 5 days in preschool children: A randomized trial. *The American Journal of Clinical Nutrition, 109*(5), 1361-1372.
Smith, A. D., Herle, M., Fildes, A., Cooke, L., Steinsbekk, S., & Llewellyn, C. H. (2017). Food fussiness and food neophobia share a common etiology in early childhood. *Journal of Child Psychology and Psychiatry, 58*(2), 189-196.
Smith, B., Rogers, S. L., Blissett, J., & Ludlow, A. K. (2020). The relationship between sensory sensitivity, food fussiness and food preferences in children with neurodevelopmental disorders. *Appetite*, 104643.
Smith, A. M., Roux, S., Naidoo, N. R., & Venter, D. J. (2005). Food choices of tactile defensive children. *Nutrition, 21*(1), 14-19.
Spill, M. K., Birch, L. L., Roe, L. S., & Rolls, B. J. (2010). Eating vegetables first: the use of portion size to increase vegetable intake in preschool children. *The American Journal of Clinical Nutrition, 91*(5), 1237-1243.
Spill, M. K., Birch, L. L., Roe, L. S., & Rolls, B. J. (2011). Hiding vegetables to reduce energy density: an effective strategy to increase children's vegetable intake and reduce energy intake–. *The American Journal of Clinical Nutrition, 94*(3), 735-741.
Staiano, A. E., Marker, A. M., Frelier, J. M., Hsia, D. S., & Martin, C. K. (2016). Influence of screen-based peer modeling on preschool children's vegetable consumption and preferences. *Journal of Nutrition Education and Behavior, 48*(5), 331-335. e331.
Stifter, C. A., & Moding, K. J. (2019). Temperament in obesity-related research: Concepts, challenges, and considerations for future research. *Appetite, 141*, 104308.
Tennant, D. R., Davidson, J., & Day, A. J. (2014). Phytonutrient intakes in relation to European fruit and vegetable consumption patterns observed in different food surveys. *British Journal of Nutrition, 112*(7), 1214-1225.
Van den Bosch, I., van Delft, J., de Wijk, R., de Graaf, C., & Boesveldt, S. (2015). Learning to (dis) like: the effect of evaluative conditioning with tastes and faces on odor valence assessed by implicit and explicit measurements. *Physiology and Behavior, 151*, 478-484.
Van der Horst, K. (2012). Overcoming picky eating. Eating enjoyment as a central aspect of children's eating behaviors. *Appetite, 58*(2), 567-574.
Van der Horst, K., Ferrage, A., & Rytz, A. (2014). Involving children in meal preparation. Effects on food intake. *Appetite, 79*, 18-24.
Van der Horst, K., Mathias, K. C., Patron, A. P., & Allirot, X. (2019). Art on a Plate: A Pilot Evaluation of an International Initiative Designed to Promote Consumption of Fruits and Vegetables by Children. *Journal of Nutrition Education and Behavior, 51*(8), 919-925. e911.
Vandeweghe, L., Verbeken, S., Moens, E., Vervoort, L., & Braet, C. (2016). Strategies to improve the Willingness to Taste: The moderating role of children's Reward Sensitivity. *Appetite, 103*, 344-352.
Ventura, A. K., & Worobey, J. (2013). Early influences on the development of food preferences. *Current Biology, 23*(9), R401-R408.
Vollmer, R. L., & Baietto, J. (2017). Practices and preferences: Exploring the relationships between food-related parenting practices and child food preferences for high fat and/or sugar foods, fruits, and vegetables. *Appetite, 113*, 134-140.

Vollrath, M. E., Stene-Larsen, K., Tonstad, S., Rothbart, M. K., & Hampson, S. E. (2012). Associations between temperament at age 1.5 years and obesogenic diet at ages 3 and 7 years. *Journal of Developmental and Behavioral Pediatrics, 33*(9), 721.
Wadhera, D., Phillips, E. D. C., & Wilkie, L. M. (2015). Teaching children to like and eat vegetables. *Appetite, 93*, 75-84.
Wang, X., Ouyang, Y., Liu, J., Zhu, M., Zhao, G., Bao, W., & Hu, F. B. (2014). Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *British Medical Journal, 349*, g4490.
Wardle, J., Cooke, L. J., Gibson, E. L., Sapochnik, M., Sheiham, A., & Lawson, M. (2003). Increasing children's acceptance of vegetables; a randomized trial of parent-led exposure. *Appetite, 40*(2), 155-162.
Wardle, J., Herrera, M. L., Cooke, L., & Gibson, E. L. (2003). Modifying children's food preferences: the effects of exposure and reward on acceptance of an unfamiliar vegetable. *European Journal of Clinical Nutrition, 57*(2), 341-348.
WHO. (2003). Promoting fruit and vegetable consumption around the world. *https://www.who.int/dietphysicalactivity/fruit/en/*, Accessed on 01/12/2020.
WHO. (2014). Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases. *https://www.who.int/elena/titles/bbc/fruit_vegetables_ncds/en/*, Accessed on 01/12/2020.
Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., . . . Wood, A. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet, 393*(10170), 447-492.
Yee, A. Z., Lwin, M. O., & Ho, S. S. (2017). The influence of parental practices on child promotive and preventive food consumption behaviors: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 1-14.
Yeomans, M. R. (2010). Understanding individual differences in acquired flavour liking in humans. *Chemosensory Perception, 3*(1), 34-41.
Zeinstra, G. G., Kooijman, V., & Kremer, S. (2017). My idol eats carrots, so do I? The delayed effect of a classroom-based intervention on 4–6-year-old children’s intake of a familiar vegetable. *Food Quality and Preference, 62*, 352-359.
Zeinstra, G. G., Vrijhof, M., & Kremer, S. (2018). Is repeated exposure the holy grail for increasing children's vegetable intake? Lessons learned from a Dutch childcare intervention using various vegetable preparations. *Appetite, 121*, 316-325.
Zellner, D. A., Rozin, P., Aron, M., & Kulish, C. (1983). Conditioned enhancement of human's liking for flavor by pairing with sweetness. *Learning and Motivation, 14*(3), 338-350.