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Strategies to improve the Willingness to Taste: The moderating role of children's Reward Sensitivity

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ABSTRACT

The present study investigates the effectiveness of different strategies to improve Willingness to Taste disliked vegetables and the moderating role of Reward Sensitivity. Preschool children ($N = 204$; age: $M = 4.48$, $SD = 1.01$) were randomly allocated to one of four different Willingness to Taste strategies. The findings indicate that first, Willingness to Taste is higher in the modelling and reward strategies compared to neutral instructions. Second, there is a differential effect of Willingness to Taste strategies dependent upon individual differences: children high in Reward Sensitivity were more likely to taste immediately when rewarded, while children low in Reward Sensitivity were more willing to taste when verbally encouraged, but with hesitation. This article thus highlights the roles of both individual differences and behavioral techniques for promoting a healthy diet in children.

1. Introduction

It has been shown that the intake of healthy food contributes to an overall sense of well-being (Blanchflower, Oswald, & Stewart-Brown, 2013) and the prevention of diseases (U.S. Department of Health and Human Services, 2010; U.S. Department of Health and Human Services/U.S. Department of Agriculture, 2005; World Health Organisation, 2003). For young children, healthy food is particularly essential to achieve age-adequate growth and cognitive development (du Plessis, Naude, & Swart, 2016), and may help to decrease energy intake by reducing the consumption of energy dense (i.e. high in sugar and fat) products (Spill, Birch, Roe, & Rolls, 2011). Furthermore, childhood is an important period for shaping children's food preferences and eating habits, which may continue into adulthood (Nicklaus, Boggio, Chabanet, & Issanchou, 2004; Nicklaus & Remy, 2013). Nevertheless, the consumption of vegetables in preschool children is far below the minimum food-based dietary guidelines (Huybrechts et al., 2008; Kim et al., 2014; Storey & Anderson, 2016).

Two frequently identified obstacles to achieve the recommended amount of vegetables in childhood are food neophobia (i.e. the rejection of novel or unknown foods) (Birch & Fisher, 1998) and picky/fussy eating (i.e. the rejection of familiar foods) (Galloway, Lee, & Birch, 2003). Irrespective of these psychological determinants of food rejection and their underlying mechanisms (for review see Lafraire, Rioux, Giboreau, & Picard, 2016), children are generally not eager to consume foods they dislike (Baxter & Thompson, 2002; Birch & Fisher, 1998; Cullen et al., 2003). Since vegetables happen to be the least-liked food category (Cashdan, 1998; Skinner, Carruth, Bounds, & Ziegler, 2002), methods are needed to improve children's liking for vegetables. The most common strategy for developing liking is Repeated Exposure with which children are repetitively exposed to the taste of certain food items. Several studies have proven this strategy to be effective in increasing children's liking and consumption of an initially disliked vegetable (Ahern, Caton, Blundell, & Hetherington, 2014; Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Caton et al., 2013; de Wild, de Graaf, & Jager, 2013; Hausner, Olsen, & Moller, 2012). However, no consensus has been reached on the amount of taste exposure necessary to increase liking. Despite this discrepancy, it has been generally agreed that at least one taste exposure is necessary. In other words, children can never benefit from the Repeated Exposure effect if they refuse to taste. Since it has been shown that a large proportion of children might be unwilling to taste vegetables in a Repeated Exposure intervention (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010), willingness to taste seems a crucial first step in the process of learning to like a food item. In the current study, we see Willingness to Taste as an initial

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approach behavior with specific antecedents and consequences, while considering liking as a more cognitive affective correlate of learning. Although past research has taken considerable interest in how to improve overall liking and consumption of vegetables, relatively little information is available concerning the strategies that can help children to enhance their Willingness to Taste.

Possible strategies to improve Willingness to Taste can be derived from evidence-based strategies for developing liking and increasing the consumption of vegetables. One possible way to improve Willingness to Taste is providing a good role model. Children are more likely to eat vegetables when they witness someone consuming them (Greenhalgh et al., 2009). Not only do adults (familiar as well as unfamiliar) seem to be effective role models (Hendy & Raudenbush, 2000), peers (Greenhalgh et al., 2009; Hendy, 2002) and even cartoon characters also have a positive influence on children's eating behavior (Harris & Baudin, 1972). After all, the Social Cognitive Theory (Bandura, 1977) has suggested that modelling can be very influential in establishing learning and behavioral change. Although modelling is more likely to be effective in the presence of a similar (e.g. peers), or familiar (e.g. parent or teacher) model (Bandura, 1977), adult strangers were also found to have a positive influence on children's food acceptance (Harper & Sanders, 1975).

Secondly, providing a reward might also be effective to encourage children to taste a disliked food item. Although this strategy has been broadly studied in the context of liking and consumption of vegetables, opinions are divided when it comes to the consequences of using rewards. According to the Social Determination Theory (SDT), a reward serves as an extrinsic motivator and it can undermine the intrinsic motivation (Deci, Koestner, & Ryan, 1999). Indeed, some studies have shown that the preference and liking of food decreases when children are offered a reward (Birch, Marlin, & Rotter, 1984; Newman & Taylor, 1992). However, the relation between rewards and liking or consumption of food is more complex than stated in the SDT. Rewards can become powerful tools in the process of developing the liking for healthy food provided they are used appropriately. It has indeed been shown that exposure + reward parings have positive short and long term effects on liking and consumption (Cooke, Chambers, Anez, Croker, et al., 2011). Similar to Repeated Exposure, no consensus has been reached on the number of exposure + reward parings necessary to change liking and consumption. Overall, the effectiveness of rewards depends on the outcome variable (consumption vs. liking), the extent to which the child originally liked the food item, and the type of reward (for review see, Cooke, Chambers, Anez, & Wardle, 2011). In most studies, rewards are found to have positive effects on *consumption*. However, their effects on liking can be counterproductive, when the food item was already liked prior to the administration of the reward. Furthermore, the type of reward is important. Offering sweets as a reward seems to provoke negative effects: it enhances the preference for the sweets (Newman & Taylor, 1992). On the other hand, various studies have demonstrated that both non-food tangible rewards (e.g. stickers) and non-tangible rewards (e.g. praise) enhance children's liking and consumption of disliked food items (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004; Nicklas et al., 2001; Vereecken, Keukelier, & Maes, 2004). However, compared to a non-tangible reward (i.e. praise), tangible rewards seem to be more powerful in facilitating tasting (Cooke, Chambers, Anez, Croker, et al., 2011).

Verbal encouragement can be seen as a third possible strategy to enhance Willingness to Taste. It is a commonly used strategy to positively encourage individuals to provide an optimal effort in different types of behavior (Andreacci et al., 2002), including eating behavior. Verbal encouragement by food service staff is associated with higher fruit and vegetable consumption in elementary school children (Perry et al., 2004). Even at younger ages (12–17 months), children are more likely to accept food when their caregivers provide positive verbal encouragement (Dearden et al., 2009). Verbal encouragement needs to be differentiated from verbal coercion or pressure, which is inversely related to the consumption of fruit and vegetables (Brown, Ogden, Vögele, & Gibson, 2008; Galloway, Fiorito, Francis, & Birch, 2006). While verbal coercion is a negative form of verbal prompting in which the child feels pressured to eat, verbal encouragement is a less intrusive form of verbal instruction in which precautions are made to prevent the child from feeling obligated to taste (e.g. child-friendly tone).

1.1. Child characteristics

Previous studies mainly examined the effectiveness of different strategies in improving *liking*, *consumption* or *acceptance* of vegetables in general. However, children may react differently to different strategies, depending on their personal characteristics (Blissett, Bennett, Fogel, Harris, & Higgs, 2016). Personality theories assume that unique individual characteristics play a role in the expression of (eating) behavior (Block, 1993; Davis et al., 2007). Recently, it was shown that the effectiveness of strategies to facilitate the acceptance of a novel fruit depended on food responsiveness: physical prompting strategies in combination with modelling facilitated the acceptance of a novel fruit, but only in food-responsive children (Blissett et al., 2016). It was also shown that the effectiveness of strategies to increase consumption of a moderately-liked vegetable is linked to bitter-sensitivity: bitter-sensitive preschoolers consumed significantly more broccoli after being repeatedly exposed to broccoli with dressing than when served plain. In contrast, the dressing did not promote consumption among bitter-insensitive preschoolers (Fisher et al., 2012). This differential sensitivity to different strategies highlights the importance of individual characteristics.

While research has suggested that we take into account a child's individual Reward Sensitivity as a biological predisposition that guides human learning and behavior (Beaver et al., 2006), little is known about the specific role of a child's Reward Sensitivity in learning to like and consume vegetables. Reward Sensitivity is assumed to reflect the sensitivity of a neuropsychological system referred to as the Behavioral Approach System (BAS) (Gray, 1981, 1987, 1990). The BAS responds to positive, rewarding environmental stimuli by activation of the dopaminergic system (Depue & Collins, 1999; Gray, 1994), which causes the initiation of "approach" behavior in order to obtain the rewarding goal (Kane, Loxton, Staiger, & Dawe, 2004). In following the definition of Reward Sensitivity, children high in Reward Sensitivity are expected to respond more strongly to rewarding environmental stimuli compared to those lower in Reward Sensitivity. Consequently, a Willingness to Taste strategy with a rewarding aspect is probably most effective in children higher in Reward Sensitivity.

1.2. The current research

Past research has examined different strategies to increase the liking and consumption of healthy foods such as modelling, reward learning and verbal encouragement. Willingness to Taste, however, has been less researched, even though it is a first crucial step in the process of developing liking for healthy food. Thus, the current study first aims to investigate which strategy is effective in increasing children's Willingness to Taste a disliked vegetable. We expect that modelling, rewarding and encouragement are more effective to improve Willingness to Taste than neutral instructions.

Second, we aim to explore whether Willingness to Taste depends on children's characteristics under different conditions. We