



Research report

Exposure to vegetable variety in infants weaned at different ages[☆]Helen Coulthard^{a,*}, Gillian Harris^b, Anna Fogel^b^a Division of Psychology, School of Applied Social Sciences, Faculty of Health & Life Sciences, De Montfort University, Hawthorn Building, Leicester, LE1 9BH, UK^b School of Psychology, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

ARTICLE INFO

Article history:

Received 22 May 2013

Received in revised form 18 March 2014

Accepted 20 March 2014

Available online 28 March 2014

Keywords:

Vegetable consumption

Exposure

Infant

Complementary feeding

Exclusive breast feeding

ABSTRACT

The aim of the current study was to examine the effectiveness of different vegetable exposure methods (variety versus single taste) over a 9 day period in two groups of infants; those introduced to solids prior to the age of 5.5 months, and those introduced after 5.5 months. Sixty parent–infant dyads were recruited in South Birmingham, UK. Infants' acceptance of a novel vegetable (pea puree) was measured after a 9 day exposure period in the infants a week after they were first introduced to solid foods. During the exposure period half of each age group was given carrot every day, and the other half was given a variety pack of courgette, parsnip and sweet potato. A baseline measurement of the infants' acceptance of a vegetable (carrot) was taken prior to the exposure period. There was no difference between the groups in consumption of the baseline vegetable (carrot). There were no main effects of exposure group or age group on consumption of pea after the exposure period. There was, however, an interaction between the age of introduction and exposure group on consumption of the new vegetable (pea). In particular, infants weaned at 6 months in the single taste group ate significantly less pea puree than those in the variety group. These findings suggest that infants, who are weaned at 6 months or later, may benefit from being weaned onto a variety of tastes rapidly to ensure adequate exposure to taste. This study constitutes some of the first evidence to suggest that there may be a sensitive period for the acceptance of tastes between the ages of 4 and 6 months.

© 2014 Elsevier Ltd. All rights reserved.

Introduction

It is well established that consumption of a variety of fruit and vegetables is optimal for long term health and prevention of certain chronic illnesses (Mosby, Cosgrove, Sarkardei, Platt, & Kaina, 2012; van Duyn & Plivonka, 2000). The problem with vegetables is that infants are born with inherent taste preferences that favour foods that are sweet and not bitter (Rosenstein & Oster, 1988). Many cruciferous vegetables unfortunately have a bitter back taste, despite being high in potentially beneficial vitamins (Manchali, Murthy, & Patil, 2012), and can initially produce reactions of rejection and distaste (Rosenstein & Oster, 1988) which can prevent parents from re-offering those foods (Maier, Chabanet, Schaal, Leathwood, & Issanchou, 2008).

There have been several studies with infants of weaning age that have examined the factors that influence preference for vegetables, with the intention of informing best practice for strategies that may be adopted by mothers. In particular it is known that

repeated presentation of a flavour, even one that is initially disliked, can lead to preference (Maier, Chabanet, Schaal, Issanchou, & Leathwood, 2007; Pliner, 1982), and that this effect is very rapid in early weaning (Birch, Gunder, Grimm-Thomas, & Laing, 1998; Sullivan & Birch, 1994), but that it becomes increasingly more difficult to get the infant to taste and accept new foods by their second year (Birch & Marlin, 1982), an effect known as food neophobia (Pliner, 1994). Such is the strength of the effect of repeated presentation, that the effect has been found to be as effective as flavour–flavour learning, where a disliked or novel flavour is repeatedly presented with a liked taste or flavour, for example a sweet tastant (Caton et al., 2013; Hausner, Olsen, & Møller, 2012; Remy, Issanchou, Chabanet, & Nicklaus, 2013). Therefore, it is widely accepted that repeated presentation is the most simple and effective method of increasing consumption of a target vegetable in infant samples.

In infants repeated exposure to a single taste can increase liking for that particular food, yet there has also been research, which has examined strategies aimed at increasing the consumption of novel vegetables. In particular, it has been found that exposure to variety of vegetables, rather than a single vegetable, not only encourages acceptance of a new vegetable, but also novel foods from other food groups, such as protein (Gerrish & Mennella, 2001), and that rotating the variety of vegetables given on a daily basis is the most effective method to facilitate novel vegetable consumption (Maier et al.,

[☆] Acknowledgements: This research was funded by a grant from the Feeding for Life Foundation.

* Corresponding author.

E-mail address: hcoulthard@dmu.ac.uk (H. Coulthard).

2008). It is also known that babies are more accepting of new flavours if they have been breast fed (e.g. Maier et al., 2008; Sullivan & Birch, 1994), especially if those flavours are preferred and eaten by their mothers (Forestell & Mennella, 2007). In addition there is some new evidence that vegetables are more readily accepted if introduced earlier in the weaning process (Lange et al., 2013).

Many studies on the efficacy of exposure to taste have been carried out before the recent change in infant feeding recommendation proposed by the World Health Organization (2001); that infants be exclusively breast fed until 6 months of age (Gerrish & Mennella, 2001; Sullivan & Birch, 1994). The majority of studies that have evaluated the shift in age of complementary feeding have mainly focused on whether there are adverse effects on growth of the infants (Cohen, Brown, Canahuati, Riviera, & Dewey, 1995; Nielsen et al., 2012), nutrient intake (Jonsdottir et al., 2012) or atopic reactions (Palmer & Prescott, 2012). However, there have been few studies that have examined the eating behaviour of infants introduced to solid foods at different ages (Nicklaus, 2011). In particular, that the well accepted effect of exposure may become less effective within this time frame. There is some evidence that infants introduced to solid foods earlier accept a wider range of foods (Blissett, Bennett, Donohoe, Rogers, & Higgs, 2012; Coulthard, Harris, & Emmett, 2009), which some believe is evidence for a sensitive period for the acceptance of tastes (Cashdan, 1994). Most of these studies are based on parental report of food consumption, and may be subject to reporting bias. There is a need for experimental studies that examine acceptance of foods according to the timing of complementary feeding, and whether the efficacy of strategies, such as variety exposure, differs according to the age of the infant (Przyrembel, 2012).

The aim of the present study is to examine the efficacy of exposure to variety in infants introduced to complementary foods prior to the recommended age of 6 months, and those weaned at the recommended time. All the infants recruited were breast fed, to control for the effects of breastfeeding on food acceptance. It was expected that infants weaned onto a variety of vegetables would accept more of a new vegetable, than those weaned onto a single vegetable. It was also expected that there would be a difference in acceptance of a new vegetable according to the age of introduction to solid foods.

Method

Participants

Initially 77 parent and infant dyads were recruited from children's centres, playgroups and post-natal groups around the South Birmingham area of the UK. This is an inner city area with mixed ethnicity and social groups. All infants had to be healthy, full term (38+ weeks), had been breast fed from birth and had been breastfed exclusively until the age of introduction of complementary feeding.

Infants who had eaten pea ($n = 1$), were not exclusively breast fed until complementary feeding ($n = 5$), had been weaned earlier than anticipated ($n = 7$) or were being weaned directly onto finger foods (baby-led weaning, $n = 3$) were excluded. Furthermore, one infant dropped out during the course of the study. There were 60 infants (32 boys and 28 girls) in the final sample. All the parents included in the study happened to be the mothers of the infants. All mother–infant dyads were recruited if they had stated the intention of weaning at either 4 months (early) or 6 months of age (recommended). In reality some weaned slightly before or after these ages, but they were still included in the study. Ethical permission for the study was granted by the University of Birmingham's Research Ethics Committee.

The range of the age of introduction to complementary foods was 4–6 months, with a mean age of 5.18 (0.84) months. A median split was performed on the sample to produce two groups of infants; those

who were introduced to complementary foods earlier than recommended (early introduction) and those who were introduced at, or a week before the current recommended age (later introduction). In the early introduction group the mean age of introduction to complementary foods was 4.50 (0.43) months, with a range of 4–5 months. In the later introduction group, the mean age of introduction to solid foods was 5.91 (0.03) months, with a range of 5.5–6 months.

Design

The dependent variable was the amount of vegetables consumed in grams, during the two testing sessions. In the first testing session (day 1 of the study) this was a carrot puree, and in the second testing session (day 11 of the study) it was a pea puree. The design of the study contained one quasi experimental factor; the age of introduction to solids, which was measured in months. The second independent variable was an experimental factor; whether the infant had been randomly assigned within each weaning-age group, to the single taste or variety exposure group. Randomisation was achieved using a simple number generation technique, with the age of infants being stratified within this method, to ensure a fairly even distribution across the factors. Infants in the single taste group were given carrot puree (Ca) every day for 9 consecutive days, and infants in the variety group were given parsnip (Pa), courgette (Co) and sweet potato (Sp) with daily changes for 9 consecutive days. The exposure phase ran from days 2 to 10 of the study.

Experimental food

There were two vegetable purees used in the testing sessions, and four types of puree used in the exposure packs. All purees were made from fresh, organic vegetables, deemed in the UK to be acceptable for use as a home prepared baby food, which were made in one cooking period at the University of Birmingham food laboratory by a single laboratory technician. They were steamed, pureed, and boiled water was added as necessary to ensure a similar thickness that would be acceptable for young infants. No other tastes or seasonings were added. The exposure pack vegetables were cooked, pureed, weighed, and placed into pots (50 g) and then frozen. The experimental foods (carrot and pea) were frozen in 250 g freezer bags. A sensory panel evaluated the carrot and pea puree, as well as the exposure foods, according to three variables; sweetness, bitterness and texture. There was no reported difference in the sweetness or bitterness of the experimental vegetables; however, the pea was rated as significantly less smooth in texture than the carrot puree ($p < 0.05$). Sensory panel ratings of the exposure foods also showed some differences in the rated sensory qualities of the foods (courgette, carrot, parsnip and sweet potato). In particular it was found that the courgette was rated as significantly more bitter than the parsnip, sweet potato and carrot ($p < 0.05$), and the sweet potato was rated as sweeter than the courgette, parsnip and carrot ($p < 0.05$). There were no differences in ratings of the texture of the exposure foods ($p > 0.05$).

Demographic variables

Mothers were asked to report the number of years they had spent in education, their fruit & vegetable (FV) consumption (portions/day) and age. The infant's gender, date of birth and age of introduction to complementary feeding (months) were also recorded.

Weight and length

On day 1 of testing the weight and length of the infants were measured. The weight was recorded on a SECA 364 (Infant & Baby

Download English Version:

<https://daneshyari.com/en/article/939582>

Download Persian Version:

<https://daneshyari.com/article/939582>

[Daneshyari.com](https://daneshyari.com)