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Research report

Enhancing children's vegetable consumption using vegetable-promoting picture books. The impact of interactive shared reading and character–product congruence ☆

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ABSTRACT

The present study investigated whether and how a picture book promoting carrots can increase young children's carrot consumption. One hundred and four children (aged 4–6 years) participated in shared reading sessions using the book on five consecutive days in school. These children were assigned randomly to one of four experimental conditions. In a 2 × 2 between-subjects design, the reading style and character in the book were manipulated. The reading style was either passive (listening to the story) or interactive (also answering questions about the story). The character in the book fitted either conceptually well with carrots (a rabbit) or not (a turtle). Compared to a baseline group of 56 children who were not exposed to the book, the children in the experimental groups consumed almost twice as much carrots (in proportion to other foods consumed), $F(1, 159) = 7.08$, $p < .01$. Results suggest that picture books are particularly effective when children are actively involved, answering questions about the story. Young children seem to enjoy this interactive shared reading style, triggering positive feelings that increase children's liking and consumption of the healthy food promoted in the book.

Introduction

Many children do not eat enough fruit and vegetables (e.g., Geller & Dzewaltowski, 2009; Ocké et al., 2008). For two reasons, fruit and vegetable consumption is particularly important at a young age. First, it has been linked to a healthier weight in childhood (Lin & Morrison, 2002; Tohill, 2005) and adulthood (De Kroon, Renders, Van Wouwe, Van Buuren, & Hirasing, 2010). Second, food attitudes developed during the preschool years tend to persist into adulthood (Rasmussen et al., 2006; Zeinstra, Koelen, Kok, & De Graaf, 2007). An engaging way to stimulate children's fruit and vegetable consumption is via shared reading. Child nutrition programs, such as the American Alliance for a Healthier Generation (2011), are using picture books with characters modeling healthy food behaviors. However, whether and how such books stimulate children's healthy food consumption is currently unknown.

Therefore, the present study investigates whether picture books can stimulate young children's vegetable consumption. The first aim is to investigate whether exposure to a picture book promoting carrots can influence children's consumption of carrots and other (non-promoted) healthy and unhealthy foods. In an experimental study, we compare the consumption results of children exposed to the book with those of children not exposed. The second aim is to investigate how the impact of the picture book can be enhanced by asking children questions about the story during the reading session (i.e., *interactive shared reading*) or by using a book character that fits conceptually well with the vegetable promoted in the book (e.g., using a rabbit to promote carrots) (i.e., *character–product congruence*).

The impact of picture books on children's food consumption

Influencing children's healthy food consumption via picture books is generally referred to in the literature as Entertainment Education (EE). EE has two defining characteristics (Moyer-Gusé, 2008). First, EE-productions contain an *educational* message, for example that eating carrots makes you feel fit and strong. Second, the educational message is incorporated into an *entertaining* narrative, such as a story about the adventures of a rabbit. A growing body of research indicates that EE-productions can successfully influence the attitudes and behaviors of a number of different

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target groups (e.g., Moyer-Gusé & Nabi, 2010; Singhal, Cody, Rogers, & Sabido, 2004).

From an information-processing perspective, combining educational and entertaining content may be particularly effective among children aged 6 and under. Their limited information-processing abilities usually inhibit processing of purely educational messages (Buijzen, Van Reijmersdal, & Owen, 2010; Siegler, 1998). However, as we will explain in detail in the following sections, incorporating an educational message into an entertainment framework renders message processing less demanding for young children, consequently increasing their comprehension of and positive attitude toward the message (Buijzen et al., 2010; Fisch, 2000).

While the positive impact of EE-productions on children's academic and social skills has been well established (for overviews see: Fisch, 2000; Wilson, 2008), the impact on children's health behaviors has received little scientific attention. Preliminary research regarding healthy food messages used in various *Sesame Street* media outlets suggests that EE-productions may successfully enhance children's healthy food consumption (Ritchie, Whaley, Spector, Gomez, & Crawford, 2010). In addition, research regarding fruit and vegetable pictures in books suggests that repeated exposure to these books may enhance children's visual preference for and willingness to taste the exposed foods (Heath, Houston-Price, & Kennedy, 2010, 2011; Houston-Price, Butler, & Shiba, 2009). Based on these studies, we anticipate that exposure to the carrot-promoting picture book will increase children's consumption of carrots (H1a).

The picture book may also influence the consumption of non-promoted foods. First, we may expect a spill-over effect for other healthy foods. Research suggests that advertising a specific food may also stimulate the consumption of unadvertised foods from the same category (Buijzen, Schuurman, & Bomhof, 2008). In other words, promoting a specific vegetable may encourage the consumption of other vegetables. Second, we may expect a displacement-effect for unhealthy foods. Research suggests that the high fiber content of vegetables reduces the craving for high-calorie snacks (Lin & Morrison, 2002; Tohill, 2005). We thus anticipate that exposure to the carrot-promoting picture book will increase children's consumption of other (non-promoted) healthy foods (H1b), and decrease their consumption of unhealthy foods (H1c).

Enhancing the impact of picture books via cognitive and affective processing

To enhance the impact of picture books on children's healthy food consumption, we also need to understand how they work. Based on literature regarding young children's information processing, we put forward two perspectives: one proposing a *cognitive* route to processing picture book content, the other an *affective* route.

The cognitive route to processing picture book content

The cognitive perspective on the effectiveness of picture books explains how children process the educational content in EE-productions. EE-productions are generally easier processed by young children than purely educational messages, because new information can be linked to existing story and character schemas. Fisch's (2000) capacity model predicts that easier processing of the EE-production means that greater cognitive resources are available to deeply process the embedded educational message, resulting in increased message comprehension. The advantage of a more deeply processed and comprehended message is that children may develop strong beliefs, for example that eating carrots makes them strong (Zeinstra et al., 2007), which we refer to as a child's cognitive response. In turn, a strong belief about a food's benefits (e.g., providing strength), has shown to predict consumption of that food (Oram, 1994).

Cognitive processing of picture book content may be enhanced through interactive shared reading (Barrentine, 1996; Dickinson, 2001; Whitehurst et al., 1988). This reading style demands active participation of the child and is designed to assist children's processing and comprehension of picture book content. For example, during the reading session, children are asked questions about the characters, to make storyline predictions, and to make connections between story and real life events (McGee & Schickedanz, 2007; Whitehurst, 1992). Compared to passive reading (whereby children merely listen to the story), interactive reading has shown to be more effective, resulting in enhanced comprehension of the content and ultimately to the desired (behavioral) change (Barrentine, 1996; Dickinson, 2001; Whitehurst et al., 1988).

We thus anticipate that interactive shared reading of the carrot-promoting picture book will increase children's carrot consumption (H2a). Specifically, we initially expect interactive shared reading to enhance children's processing and comprehension of the picture book content, as measured in a stronger cognitive response toward carrots (H2b). In turn, this strong cognitive response will enhance children's carrot consumption (H2c). This hypothesized mediated path is presented in Fig. 1.

The affective route to processing picture book content

The affective perspective on the effectiveness of picture books explains how children process the entertaining content in EE-productions. According to persuasion models (e.g., Buijzen et al., 2010), the positive feelings evoked when processing entertaining content are easily transferred to the food promoted in the EE-production, resulting in a more positive response toward that food. In turn, positive responses toward foods have shown to predict consumption (Institute of Medicine, 2006).

Affective processing of picture book content may be enhanced using characters. In books the embedded message is often communicated via a character's behavior. For example, the character is able to rescue his friend after eating carrots to make him fit. Characters evoke strong positive emotions that children typically transfer to everything associated with that character, including the food it promotes (Acuff & Reiher, 1997; De Droog, Valkenburg, & Buijzen, 2011b; Roberto, Baik, Harris, & Brownell, 2010). Recent studies suggest that characters conceptually congruent with the food they promote (i.e., a rabbit and a carrot), automatically evoke a pleasant feeling due to ease of processing the familiar character–product concept. This automatic feeling feeds into children's conscious evaluations, resulting in a more elaborate positive response toward the food, and increased consumption (De Droog, Buijzen, Opree, & Valkenburg, 2011a; De Droog, Buijzen, & Valkenburg, 2012; Hoffmann, 1986).

We anticipate that this effect of character–product congruence also applies to book characters and, thus, that easier processing of

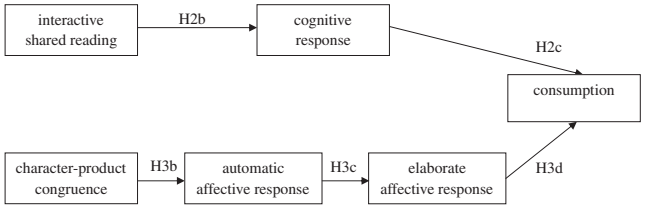

Fig. 1. Conceptual processing model of the impact of the carrot-promoting picture book on young children's carrot consumption.