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Promoting toddlers' vegetable consumption through interactive reading and puppetry

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ABSTRACT

Picture books with characters that promote healthy eating are increasingly being used to make this behavior more attractive. The first aim of this study was to investigate whether the effect of vegetable-promoting picture books on toddlers' vegetable consumption differed according to the reading style and the use of a hand puppet during reading. The second aim was to investigate whether these effects were mediated by toddlers' narrative involvement and character imitation. In a 2 (reading style: interactive vs. passive) x 2 (puppet use: with vs. without puppet) between-subjects design, 163 toddlers (2–3 years) were randomly assigned to one of the four reading conditions. The story was about a rabbit that loves to eat carrots. After the fourth reading day, the eating task was conducted in which children could eat freely from four different snacks, including carrots. The main finding was that interactive reading produced the greatest carrot consumption. The explanation for this effect was that interactive reading stimulated toddlers to imitate poses of the book characters, even more when interactive reading was supported by the use of a hand puppet. The findings underline that young children should be actively involved with health interventions in order for them to be effective.

1. Introduction

Vegetable consumption is linked to many health benefits (Van Duyn & Pivonka, 2000). This behavior often tracks back to the foods we ate and preferred during our childhood years (Mikkilä, Räsänen, Raitakari, Pietinen, & Viikari, 2004). Unfortunately, in most European countries children are not eating the required amount (Lynch et al., 2014; Ocke, Van Rossum, Fransen, Buurma, De Boer, Brants et al., 2008). To make healthy eating more attractive, picture books with engaging characters are being used (Alliance for a Healthier Generation, 2014; Bitescience, 2016). These have shown to increase the vegetable consumption of preschoolers (4–6 years) when read "interactively", meaning that questions about the story are asked to the child during reading (De Droog, Buijzen & Valkenburg, 2014). With growing governmental attention to younger children (Kirk & Heather, 2015), this study investigated how vegetable-promoting picture books could increase the vegetable consumption of toddlers (2–3 years).

As yet, the positive impact of interactive reading on vegetable consumption has not been tested among toddlers (De Droog et al., 2014). We expected that interactive reading of a vegetable-promoting picture book would increase toddlers' vegetable consumption for two reasons. First, earlier studies among toddlers with non-interactive ("passive") readings of picture books did demonstrate an increased willingness to taste the depicted foods (Heath, Houston-Price, & Kennedy, 2011; Houston-Price, Butler, & Shiba, 2009). Second, interactive reading has been effective among toddlers in other domains, including literacy skills (Mol, Bus, de Jong, & Smeets, 2008; Whitehurst et al., 1988, 1994), suggesting that interactive reading could increase the effectiveness of vegetable-promoting picture books. However, there is also literature suggesting that toddlers may need additional stimulation. Unlike older children, toddlers often need live demonstrations of picture book events to recognize these in their own world (Simcock & DeLoache, 2006). Hand puppets may be used during reading to provide a live demonstration of the healthy eating task from the book, thereby facilitating toddlers' recognition and imitation of this task in real life. For this reason, we expected a moderating effect of puppet use, with puppet use increasing the impact of interactive reading on toddlers' vegetable consumption.

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Furthermore, to increase understanding about vegetable promotion among toddlers, we investigated two mechanisms that may explain the impact of picture book interventions. The first is "narrative involvement". Interactive reading is expected to increase narrative involvement, including attentive listening, picture-pointing, talking about the story, and singing songs from the book (De Droog et al., 2014). Puppets may further increase this type of narrative involvement, grabbing and maintaining children's attention through their movements and sounds (Myers, 2005; Soundy, 1993), thereby facilitating information recollection (Block, Parris, & Whiteley, 2008). The second mechanism is "character imitation". Interactive reading is expected to stimulate imitation of character poses from the book, such as mimicking to be strong or eating carrots just like the characters (De Droog et al., 2014). Puppets may further stimulate this type of character imitation, because children more easily imitate characters that come across as real due to their personalized responses (Bond & Calvert, 2014; Calvert, Richards, & Kent, 2014).

Thus, we hypothesized that the impact of interactive reading on consumption (H1) would be moderated by puppet use (H2). In addition, we hypothesized that the impact of interactive reading on consumption would be mediated by narrative involvement (H3) and character imitation (H4), which would in turn also be moderated by puppet use (H5).

2. Materials and methods

2.1. Sample

In February and March 2015, 199 toddlers aged 2–3 years were recruited from seven nursery schools in Rotterdam, the Netherlands. Only schools without formal fruit and vegetable programs were selected. The sample consisted of toddlers from mostly low-SES households with various cultural backgrounds. Children who were absent on the last reading day ($n = 34$), were excluded from the analyses (see Procedure). This drop-out was due to the fact that many parents kept their toddlers at home on Friday (e.g., because parents worked from home). Another 2 children dropped out, because their parents did not give consent for study participation. In total, data from 163 toddlers were collected (52.1% boys) with a mean age of 2.63 years ($SD = 0.48$). On the final reading day, 2 children were removed from the reading sessions for being disruptive (e.g., not listening, running around), and 7 children did not participate in the eating task, because they were already taken home before the task had taken place. The total drop-out was evenly spread across conditions. For a detailed overview of the specific sample sizes during each phase (i.e., enrolment, intervention allocation, and data analysis), a CONSORT flow diagram is provided as supplementary online material. The study was approved by the Ethics Committee Faculty of Social Sciences, Radboud University (ECSW2015-1901-283), and registered at the Australian New Zealand Clinical Trials Registry (ACTRN12616000133437).

2.2. Stimulus materials

Picture book. The picture book "Rabbit's brave rescue" for preschoolers (De Droog et al., 2014) was adapted for toddlers by removing difficult words (i.e., Dutch words that toddlers not yet understand, such as "neurië n" [humming]), and adjusting dimensional pictures. The embedded message in the book was that "eating carrots makes you strong". *Rabbit*, the main character in the story, is able to rescue his friend only after eating carrots to make him strong. The book was printed in A4-size and consisted of a cover page and 11 picture pages. The backsides of the pages contained the text and the interactive reading questions for the storyteller. The questions were based on the dialogic reading method for 2-3-year-olds (Zevenbergen & Whitehurst, 2003), moving from simple questions regarding the pictures at the start (e.g., "What kind of animal do you see on the front page?") to more difficult recall- and open-ended questions as the week progressed (e.g., "Can you remember why Rabbit has to eat carrots?", "Now it's your turn: can you tell me what is happening on this page?").

Puppet. Hand puppets were developed that resembled the physical appearance of the main character in the picture book (see Fig. 1). A puppet manual was compiled for the storyteller that described the movements and the text of the puppet for every page of the book (Möller, 2009). For instance, the storyteller would have the puppet listen to the story, pointing out pictures in the book, imitating the movements shown in the pictures, and speak Rabbit's lines from the book. Children were allowed to give the puppet a (plush) carrot and to feel his biceps (to stress that Rabbit gets strong from eating carrots). Finally, the puppet was introduced at the beginning of each reading session, and said goodbye to the children at the end (Möller, 2009).

2.3. Design and procedure

The study had a 2 (reading style: interactive vs. passive) x 2 (puppet use: with vs. without puppet) between-subjects design. Toddlers were assigned randomly to one of these four conditions. During the interactive reading sessions, children were asked questions about the story, whereas during the passive reading sessions no questions were asked (De Droog et al., 2014). Both types of reading were either performed with a puppet or without a puppet.

Reading sessions were conducted in a quiet room within the nursery school during one workweek. Because Dutch nursery schools are closed on Wednesday afternoons, the readings took place on Mondays, Tuesdays, Thursdays, and Fridays. The reading sessions were being held in small groups of 3–5 toddlers, and took about ten minutes. On the first day, the storytellers picked up the children from class in order of the name list provided by the school, and randomly assigned them to one of the four reading conditions, ensuring balance in gender. Toddlers were given name stickers, which facilitated observers to fill out a checklist of children's behaviors shown during the reading sessions. Moreover, name stickers facilitated the storyteller to ask questions to the children during interactive reading. After the fourth reading session (on Friday), the dependent variable was measured with an eating task, in which toddlers individually could eat snacks freely for five minutes. Children who were not present on this final day were excluded from the analyses.

For the reading sessions, four women with a pedagogical education were recruited and trained to perform all the different reading styles and puppetry conditions. These storytellers were teamed up with four female experimenters who observed the toddlers during the readings. With each team being allocated to a specific day of the week, all the toddlers in the study were exposed to all the storytellers and observers. The observers were trained in filling out the checklist. To prevent session disruptions, they observed the children from a distance (at around 2 m hearing distance, looking at children's faces from the side). During the first week of the study, a second observer was present to code the same children (parallel to all other observers). The intercoder reliability was excellent: Kalpha = . 996 (Hayes & Krippendorff, 2007). The experimenter conducting the eating task was blinded to group assignment, because the reading sessions and eating tasks took place in different rooms.