

Reading Personalised Books With Pre-Schoolers Enhances Their Word Acquisition

Abstract

This study examined whether books which contain personalised features have the potential to enhance children's word acquisition more than books which are not personalised to a child.

In a within-participant experimental design, 18 three-year-olds were read a picture book which contained both personalised and non-personalised sections, with unknown target words embedded in each section. The book was read to the children on two occasions, with a one week gap between the sessions and children's knowledge of the new words was assessed with picture comprehension, definition and emotional valence tests at three testing sessions. There was a main effect of personalisation, an effect of testing session, and a significant interaction between the two. Post-hoc comparisons showed that words in personalised book sections were acquired more readily than words which were presented in context with no personal reference to the child, and that repeated readings during shared book reading enhanced this process.

INTRODUCTION

Personalisation and personalized books

Personalisation is a construct conceptually difficult to study, as it is often problematic to define and measure what qualifies as a personalised and what as a non-personalised phenomenon or learning context. Yet, personalisation and personalised approaches to learning have become widely employed concepts in school practice (Hartley, 2007) and a buzz-word across a number of technological applications (Oulasvirta and Blom, 2008). Broadly speaking, we could conceive of personalisation as a strategy to encompass any individualized or customized approach to the design or delivery of an activity. In this study, we were interested in a particular activity and a specific level of personalisation: the activity of shared book reading with personalised books.

In our definition, personalised books are books which are customized for a specific person; this can vary from highly personalised books that are written specifically for a particular child (e.g. Pakulski & Kaderavek, 2004) to books that have just some personal information about the child such as his/her name embedded in the narrative (e.g. Demoulin, 2001). With the advent of new technologies, the possibilities for embedding personalisation into children's reading materials have become more available and affordable (Kucirkova, Messer & Whitelock, 2010) and children's books which embed information that is personally meaningful to the child such as their name, favorite character or animal etc. are becoming more popular in their digital form with various story-making apps (e.g. Our Story). In addition, many family-centered, socio-culturally sensitive approaches to shared book reading foreground the personalised features of children's books as a way of recognizing the value of

parents' and children's' own literacy practices and the resources available in their homes (see Gonzalez, Moll & Amanti, 2006). Personalised books are thus increasingly part of naturally occurring shared book reading sessions with young children.

Shared book reading and children's word acquisition

Shared book reading is a widely researched and well-documented home activity (Nielsen, 2012), closely related to children's word acquisition. Children's books provide a rich source of new words embedded in meaningful contexts, and it is widely acknowledged that reading books with children (aka shared book reading) can play an important role in word acquisition (Kaderavek & Justice, 2002; van Kleeck, Stahl & Bauer, 2003), with a body of research interventions indicating that children's vocabulary development is enhanced through shared book reading (Becker, 2011; Senechal, Cornell & Broda, 2006). This evidence is significant because the size of children's vocabulary is one of the most important predictors of children's reading comprehension (Senechal, 2010; Wixson, 1986), reading proficiency (Beck, McKeown & Kucan, 2002) and later success at school (Snow, Griffin & Burns, 2005). By and large, the focus of such book reading programs and past research has been on supporting parents in using language-stimulating book reading styles, such as dialogic reading, the core of which is a frequent use of questions, repetition, praise and scaffolding (Whitehurst *et al.*, 1988). Research by Senechal and colleagues provides strong support for the value of these techniques in children's vocabulary development (Senechal, 1997). However, as research into book sharing has developed, the focus has become more contextualized and fine-grained (Evans, Reynolds, Shaw & Pursoo, 2011). It has been recognized that different social contexts produce considerable variation in parent-child interactional styles (van Kleeck, 2003; 2006) and that that specific book features may be also implicated in children's vocabulary gains (Pellegrini, Perlmutter, Galda & Brody, 1990; Potter & Haynes, 2000).

While advances in the study of dynamic influences in book reading (Fletcher & Reese, 2005), and in the field of personalised learning (Hartley, 2007), are being achieved at an exciting rate, controlled studies of the effects of personalised book features on children's word acquisition are lacking. We aimed to bridge this research gap and directly compare the effects of personalisation on children's word acquisition with a comparable control condition. In developing our hypotheses and designing the study, we drew on literature concerned with personalization benefits in domains related to word acquisition.

Relevant research to the present study

According to the psychological perspective on personalisation (Monk and Blom, 2007), personalisation can lead to cognitive outcomes through the process of recognition. The exact mechanisms are currently unknown but it is hypothesised that personalised contexts facilitate recognition through the reader's increased motivation and engagement in a task (Oulasvirta and Blom, 2008). This hypothesis offers several important questions for word acquisition research. Namely, it is well-established that word recognition is related to word comprehension (McCormic & Samuels, 1979) and that this relationship is related to variables such as students' engagement and intrinsic motivation in vocabulary learning (Elley & Mangubhai, 1983; Baumann, 1995). One could thus infer that through increased engagement in a task, children's word recognition will increase and be reflected in greater word acquisition. This premise has not been examined before. What has been established is that personalisation positively influences other cognitive outcomes. For example, early research has indicated that personalising simple stories by substituting the main story character with the reader's name could enhance the story comprehension of struggling readers (Bracken, 1982). Sheehy (2002) found that personalised mnemonic cues (representing an aspect of the children's own experience) were significantly more effective

than non-personalised cues in developing word recognition of children with severe learning difficulties. In a recent case study, Kucirkova, Messer and Whitelock (2012) showed that books customized by parents elicited positive book engagement behaviors in toddlers, including children's increased smiles, laughs and vocal activity. Demoulin's "*I like me!*" approach (1998) employed a similar approach to personalized books to that used by us,, by personalising key story elements such as the main characters or story setting and read with children in the pre-school (rather than at home by their parents). In Demoulin's study, one hundred and ninety-four children were randomly allocated to either an experimental group (using the personalised *I like me!* books) or two control groups (which consisted of traditional stories and stories similar to those of *I like me!* books, but with no reference to the child). Demoulin (1998) found that children who were read the books with personalised features made greater gains on a number of literacy and social skills measures, including reading comprehension and reading recall, than the children in the other two control groups. However, the overall contribution of personalisation to these outcomes is difficult to estimate because the study did not disentangle the effects of personalisation from a rich intervention package which focused on improving children's self-esteem and did not control for possible effects of the books' creation, implementation and subsequent reading in classrooms. More importantly, the potential effect of the personalised *features* of the materials, for example children seeing their own names in the books, could not be distinguished from the *process* of making personalisation accessible to children, i.e. the overall reading context in which children were exposed to their personalised books. Furthermore, children in the personalised condition also were exposed to positive images of themselves which were specifically designed to enhance self-esteem through the frequent use of positive "I" statements. Consequently, in Demoulin's study, the personalised content was not separated from the overall supportive personalised context of reading these books to children which, is a common

methodological difficulty raised by studies focused on personalized books and which we wished to avoid in the present study. More specifically, in our study, we aimed to pay close attention to the context in which children encounter their personalised books, and to disambiguate the effects of the book's customized content from an overall personally meaningful reading context. There were a number of important methodological issues pertinent to personalisation and assessing children's word knowledge, and we describe these together with further underlying theoretical assumptions next.

The present study

There is evidence to suggest that a personalised reading context can facilitate reading comprehension and word recognition. Given that both are commonly used as indicators of word acquisition (Wise, Sevcik, Morris, Lovett, & Wolf, 2007), we could hypothesize that facilitating word recognition through personalised books will positively impact on children's word acquisition. Furthermore, literature shows that the nature of typical word acquisition is gradual and incremental (e.g. Woodward, Markman & Fitzsimmons, 1994) and there is a body of research suggesting that repetition is propitious for word learning, especially in the context of shared book reading (Senechal & Cornell, 1993). Horst and colleagues (2006) argue that this effect is mostly due to familiarity, as with repeated exposures to a novel word, the word becomes more familiar and thus more readily accessible (Baddeley & Scott, 1971), and better remembered (Torgesen, 1985). Horst, Parsons and Bryan (2011) have examined the retention of new words by three-year old children in relation to repeated exposures to storybooks containing the target words. They found that children who heard the same stories repeatedly were more accurate on both the immediate recall and retention tasks than those children who heard different stories over the course of one week. In light of these and similar results pointing to the importance of repetition for word acquisition, we predicted that children in

our study will acquire more words after repeated readings. In addition however, we expected this to be the case especially for the personalised words. This is because personalised books contain, by definition, *familiar* concepts, and familiar contexts become more familiar with repetition. By the same token, one could argue that through repeated exposures to familiar concepts, these become more personal and that personal familiar concepts are superior to familiar only. Namely, there could be a personalised word without being familiar but there are familiar words which may not be always personalised. For example, a child may be familiar with the word 'dada' because she heard it in the nursery but for this particular child the word 'papi' has a greater familiarity and personal significance because it is how she addresses her dad. For this child we would therefore expect to readily recognise the word 'dada' but even more so the word 'papi', for which we would expect higher chances to learn and remember it. To investigate the possibility of repetition boosting children's acquisition of words presented in personalized books, we adopted an experimental approach which allowed for repeated readings and allowed us to evaluate the effects of book features on children's word gains, while controlling the nature of the content and type of social interaction between adult and child.

More specifically, children were read the same book on two occasions which were separated by a week. Children's word knowledge was assessed immediately after the first book reading session, just before the second book reading session (i.e. one week later) and lastly immediately after the second book reading session. We were uncertain about whether children's word knowledge would be preserved over a week (i.e. at the second testing point), but expected that repeated exposure would result in increases from the second to the third assessment (c.f. Horst, Parsons & Bryan, 2011; Morrow, 1988).

We chose a repeated-measures design so that each child participating in the study received a single novel book containing personalised and non-personalised sections. Within each section there were four words which were expected to be unfamiliar to the children. We predicted that new words encountered in a personalised reading context would be learnt more readily (children would show higher scores) than words encountered in a non-personalised context. We also expected that children would show higher scores in the personalised condition across the two different forms of vocabulary assessment and that this effect will be more pronounced over the repeated exposure to the words.

Gains in word learning are typically assessed by examining whether children can identify the relevant picture when they hear a target word. However, this only provides a limited assessment of any changes to the lexicon as children's receptive language encompasses several abilities, including auditory and visual processing and pragmatical understanding (Dockrell & Messer, 2004). To provide a more comprehensive view of children's word acquisition and improve overall confidence in documenting a so-far uninvestigated relationship, we used three tests of word learning: picture comprehension test, use of definitions and also asked children to identify the appropriate emotional valence of a word. We looked at changes to children's word acquisition at three time points and expected repeated readings to further facilitate recognition and thus enhance children's word acquisition on all three tests.

METHOD

Participants

Eighteen (eight boys and ten girls) pre-school children (mean age three years ten months, range two years eleven months to four years eight months) were recruited from a local pre-school, serving middle-income families employed by a Higher Education Institution.

Children within the school came from a diverse range of ethnic backgrounds, but English was reported by the parents as the first language spoken by all the children. Prior to the shared book reading, the children's language ability was assessed using the British Picture Vocabulary Scale (Dunn, Whetton & Burley, 1997) to confirm that the children's vocabulary development was in the normal range. The mean standardized score for the sample was 97.78, with a range from 79 to 110. The pre-school teachers told us the children commonly experience shared book reading in the pre-school and in their homes.

Materials and equipment

Prior to data collection, we undertook a pilot study with three children of similar age to the study sample. The aim of the pilot study was to guide the final selection of words, calibrate the picture comprehension test, and to verify children's knowledge of synonyms used for the researcher-developed definition test. The pilot study confirmed that the target books, words selected and outcome measure instruments were a feasible procedure to follow.

Each child was given a picture book that contained a section that was personally relevant to him or her and an equivalent non-personalised section. In order to create the personalised part of the books, the researcher asked parents of children taking part in the study to supply three pictures which showed their child looking happy or playing outdoors. Parents were asked to select pictures featuring only their child (i.e. without the child's family or friends). To embed additional personalised features in each book, parents were asked a series of questions about their child's likes and interests via a Parent Questionnaire (e.g. the name of the child's favorite toy and breakfast food, what they liked doing in their free time or what

they liked to wear). For the non-personalised part of children's books, pictures were downloaded from an open-source photograph database and were matched to the pictures provided by parents. The matching was done by picture resolution, size and colors and object depiction (e.g. if the personalised part contained a picture of a happy girl, the non-personalised part would have a picture of a happy girl unknown to the child). An example of the personalised and non-personalised part in the book is provided in Appendix.

There were two sets of four unfamiliar target words, Group A and Group B, split between the personalised and non-personalised part of the book (see Table 1 for the list of target words and their allocation to Group A and Group B).

Target Words

Following other research in this area (e.g. Robbins & Ehri, 1994), we did not include a pre-test of children's knowledge of the target words because we wished to systematically control for the number of encounters with target vocabulary and did not want to alert children to the target words before they encounter them in the two conditions. In addition, the difficulties implied by repeated structured activities with young children influenced our decision to minimize the number of testing sessions with the children. All target words were taken from the British Picture Vocabulary Scale, which specifies that these words are typically not part of children's vocabulary under the age of 15 years (Dunn et al., 1997). We further checked the words' unfamiliarity to children through the pilot study we conducted.

Our choice of target words was influenced by the need to build an attractive and meaningful story for each child's book. Although we were not interested in any differences in personalisation effects for specific kinds of word, we decided to include target words which represent more than one part of speech and included a mixture of adjectives, nouns and verbs

(see Table 1 for the list of words),. This follows on previous research which established a difference in children’s identification and learning of nouns and verbs (McLeod & McDade, 2011) and our focus on ‘real’, or meaningful, reading contexts. When choosing the target words, we were mindful of children’s general language abilities at pre-school age. For instance, particular care was taken with the choice of verbs as target words. Given that children at pre-school age might not be completely familiar with the pictorial cues that depict motion, we selected verbs which were less vulnerable to this bias (embrace does not require motion; descending and departing have a directional sense that is conveyed in large part by the direction the person in the figure is facing and greeting has some well established stereotyped gestures).

Table 1 to be inserted about here

Table 1: Target words and reading protocol

<i>Target word</i>	<i>Technique used</i>	<i>Supporting research evidence</i>	<i>Support provided verbally by the researcher</i>
Culinary (group B)	Eliciting questions	Blewitt <i>et al.</i> , 2009	Researcher asks after presenting the target word: <i>do you know what culinary means?</i> And explains: <i>“culinary means very good food”</i>
Copious (group A)			researcher asks after presenting the target word: <i>“Do you know what copious means?”</i>

And explains: “*copious means lots of things*”

Attire (group A)	Repetition	Horst, 2011	When reading, researcher will read the sentence with target word twice, i.e. repeating the target word sentence two times
Fowl (group B)			When reading, researcher will read the sentence with target word twice, i.e. repeating the target word sentence two times
Descending (group A)	Embedded instruction;	Coyne et al., 2007	No clues given
Departing (group B)		Silverman, 2007	No clues given
Greeting (group A)	Interactive book reading	Penno et al., 2002	Researcher will act the target word out. After reading the target-word-sentence researcher will say: <i>So you see they greeted each other, they said: hello! and shook their hands like this</i> (researcher shakes hands with the child and says Hello)
Embracing (group B)			Researcher will act the target word out. After reading the target-word-sentence researcher will say: <i>So you see they embraced each other, gave themselves a hug, a cuddle, like this</i> (researcher will give the child a hug)

DRAFT

The target words appeared in each book in the same order and with the same level of pictorial and contextual representation, and the order of presentation of Group A and group B words was counterbalanced across individual children. There were two parts in each book and two groups of words, which resulted in the creation of four conditions; children were allocated systematically to one of the four conditions.

To control for possible variations in reading style the researcher followed a set of rules, based on previous studies that included the use of repetition or elaboration of the target words during reading (see Table1 for details). In addition, the overall emotional context of each word in personalised condition was matched to that in the non-personalised condition, with an equal distribution of 2 positive, 1 neutral and 1 negative descriptions for Group A and Group B words. To illustrate, below is an example of the target verb ‘descending’ as used in a negative context:

*As Xy was descending the hill, he/she was feeling pain in knees and started crying.
He/she was much happier when she had descended the hill, came down and walked towards home. Descending is always harder than going up!*

The overall narrative and illustrations was viewed as sufficient to provide information and support for children to infer meaning about the unknown words. The information was equivalent across all four conditions in terms of storyline but as mentioned, differed in terms of how personal it was to the child. The interest and appropriateness of the story plot to children of this age range was assessed through our pilot study and was found to engage children reasonably well

Assessment of children’s knowledge of the new words

To assess children's knowledge of the target words two researcher-developed comprehension tests were used:

1. The *Picture Comprehension Test* contained ten sets of four drawings, similar to those in the British Picture Vocabulary Scale. In addition to the eight unknown target words, there were two additional words that were familiar to the children, to give children a sense of achievement and maintain their motivation during the test. Similar to the testing procedure of the British Picture Vocabulary Scale, children were asked to select the target word (as spoken by the researcher) from the set of four pictures. Children's correct answers were scored as one point per answer, yielding an overall maximum score of four per condition.

2 The *Definition Test* assessed children's understanding of the target words by providing them with two simple definitions of a word, one correct and one incorrect, with 10 questions for each set of words. For example, to define the word fowl, children were asked: 'Does fowl mean a fish or a bird?'. The order of the questions was the same for all children, with the order of presentation of the correct and incorrect answers for each question was balanced across the 10 questions.

3. The *Emotional Valence Test* was based on ten questions about the emotional context that accompanied the use of a target word. The same order of questions was used for all children. To help children answer these questions, children were presented with three cards: smiley, sad and a neutral face, and were asked to say and/or point to the face which depicted the correct answer (i.e. happy, neutral or sad emotion). For instance, children were asked: 'Can you point to one of these pictures to show me if *'the name of the character'* felt happy, or sad, or a bit sad and a bit happy when wearing her/his attire?' The 'name of the character' was substituted with that of the appropriate character from the book i.e. either child's name if in personalized condition or a fictional character's name if the word appeared in non-

personalized condition. If the target word was, for instance, represented as negative in the book and the child pointed to a negative face, a score of 1 was given, yielding an overall score of five per condition (chance probability 30%).

Procedure

Prior to data collection, the first author spent approximately two weeks in the pre-school setting, in order to familiarize children with her presence and make them feel less conscious about the observation and testing process. During the experiment, the researcher worked with the children in a quiet area of the pre-school. First, children were administered the BPVS test. The researcher then read with each child the book developed for the purpose of the study, with a personalised and non-personalised part. This interaction was video recorded and later checked for consistency of the researcher's reading style. Immediately following the reading, the children were assessed on three comprehension tests. After one week, a delayed post-test was administered to check whether children's knowledge of target words had changed. This was followed by a second book reading session. Immediately after second reading, children were given both assessments again.

After data collection, the researcher's consistency in following the pre-established instruction rules for all children and across personalised and non-personalised condition was checked by assessing 10 randomly selected video sessions. For testing fidelity to protocol, a checklist using a coding frame with a simple 3-point format was used. A score of 3 was assigned if the reading protocol was fully followed, score of 2 if there were some deviations for the protocol and score of 1 if there was a substantial difference between the reading of the story and the instructions in the reading protocol. The fidelity to protocol was checked by another researcher who calculated an 'instruction-fidelity-ratio' by totaling the number of points she

awarded for each observed session, dividing it by the maximum possible score of 30 and multiplying by 100. The score obtained was 90%, which represents a high fidelity score.

Before proceeding with the comparisons of personalised versus non-personalised conditions, we checked whether Group A and Group B words were comparable in difficulty. This was an important check to ensure that the groups of target words were well-balanced across the two conditions. To this end, a repeated-measures ANOVA: Group allocation (Group A or B) x speech part (adjective, noun, positive or negative verb) was carried out. We used data from the first session for both tests and found a non-significant main effect of the Group allocation and no significant interaction effect between the type of word and the word's group allocation. This allowed us to proceed with the analysis as planned, i.e. investigating children's word gains based on the differences between personalised and non-personalised condition.

RESULTS

The data and analyses for each of the three types of tests are presented in separate sections. In each section, there is a comparison of the number of correct responses to the number expected by chance, calculated for each of the three sessions. This is followed by analyses of the effects of condition (i.e. personalised versus non-personalised) and of the testing session on the number of correct responses.

Picture Test

The mean number of correct responses to the picture test in both conditions and across the three testing sessions are shown in Figure 1. A one sample t-test was used to compare the actual and the expected number of correct responses in this test. As there were 4 questions

and there were 4 possible responses for each question the expected number of correct responses for each condition at each testing point was 1. At testing session 1, which occurred immediately after the first book reading, the mean of correct responses for the personalised and non-personalised words was significantly greater than expected by chance (personalised $t(17) = 3.500$ $p < .003$; non-personalised $t(17) = 3.010$, $p < .008$).

After one week, at testing point 2, there was a dip in performance and the number of correct responses in the personalised condition was marginally significantly above chance, and the number of correct responses in the non-personalised condition was marginally significantly below chance (personalised $t(17) = 1.844$, $p < .083$; non-personalised $t(17) = -2.051$, $p < .056$). After the second reading of the book at testing point 3, there was an increase in the number of correct responses. For the personalised words this resulted in a significant difference from chance ($t(17) = 6.872$, $p < .001$), with a mean $X=2.66$ but only a marginally significant difference from chance for the non-personalised words ($t(17) = 1.844$, $p < .083$), with a mean 1.33. Thus, for the personalised words the children showed performance significantly above chance at testing points 1 and 3, and a marginally significant difference above chance at testing point 2. In contrast for the non-personalised words there was less convincing evidence of performance significantly greater than chance, performance was significantly greater than chance at testing point 1, below chance at testing point 2, and a marginally significant difference from chance at testing point 3.

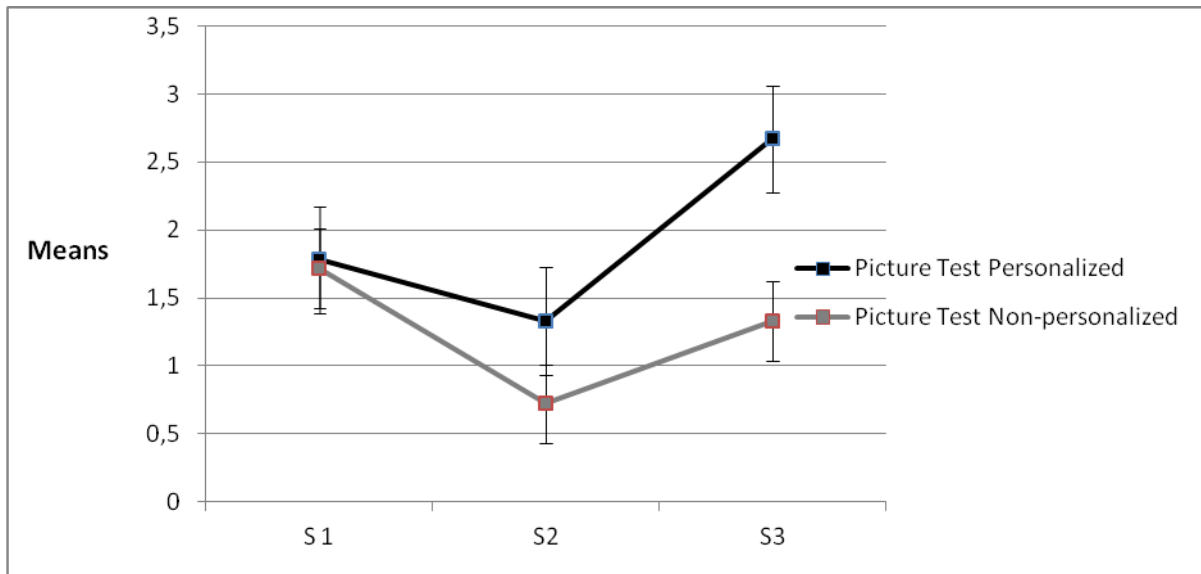
We were interested in whether there was an effect of personalisation on children's word knowledge as it developed across time. To this end, we conducted ANOVAs involving the 2 conditions and 3 testing sessions. Mauchly's test indicated that the assumption of sphericity had been violated for the picture test, $\chi^2(2, N=18) = 9.157$. Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\epsilon = .696$). There was a

main effect of condition ($F(1,17) = 23.54, p < .001, \eta p^2 = .581$), a main effect of testing session ($F(1.39, 23.68) = 13.77, p < .001, \eta p^2 = .448$) and a significant interaction between the two ($F(1.77, 30.05) = 14.04, p < .001, \eta p^2 = .452$).

Next, we used related t-tests to compare the personalised versus non-personalised condition at each time point. In these and subsequent repeated t-tests analyses, to reduce the number of post-hoc tests so as to avoid type two errors (Tabachnick & Fidell, 2007), comparisons were only carried out where there was a minimal overlap of the standard deviations between the two variables (Field??). The first set of analyses involved a comparison of the two conditions at each time point. Figure 1 shows there was almost identical scores at testing point 1 and no post-hoc test was conducted. However, there was little or no overlap between the standard deviations at testing points 2 and 3 and there were significantly more correct responses for personalised than non-personalised words at testing point two ($t(17) = 4.267, p = .001$) and at testing point three $t(17) = 7.376, p < .001$.

Figure 1 to be inserted about here

Figure 1: The mean number of correct answers to the picture comprehension test at the three testing points



S1 = testing point1, S2 = testing point2, S3 = testing point3.

Definition test

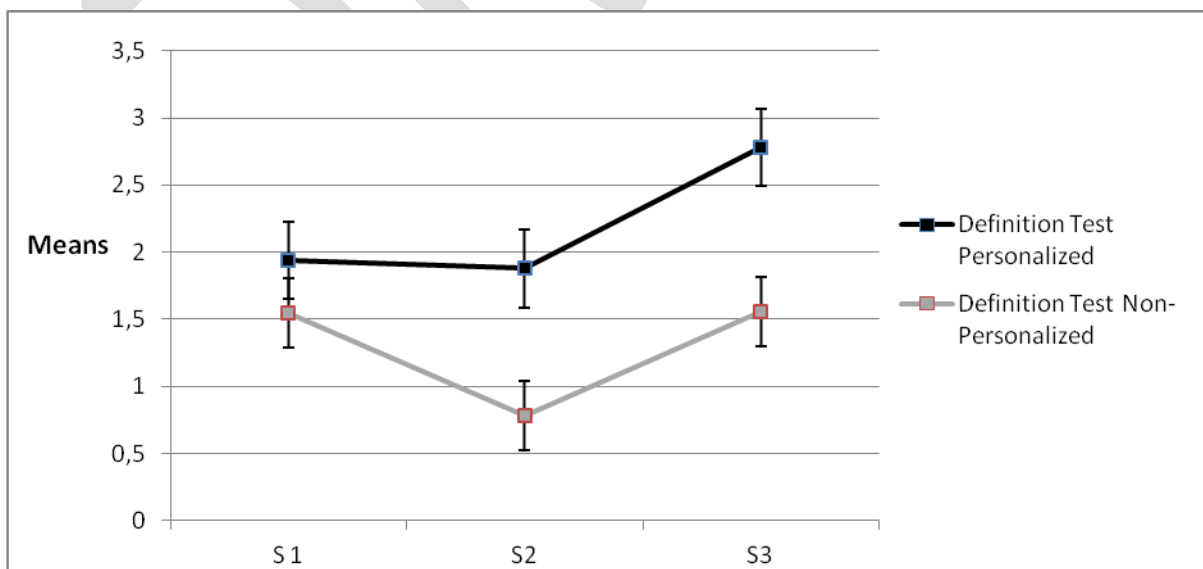
Similarly to the picture test analyses, we first carried out a one sample t-test to compare the actual and the expected number of correct responses in this test. For this test, there were 2 possible responses for each question, so the test value for the definition test was 2, chance probability 50%. At testing session1, the number of correct responses for the personalised and was not different from what would be expected by chance ($t(17) = -2.790 p = .790$). For the non-personalised condition the number of correct responses was marginally above chance levels $t(17) = -2.204, p < .042$. At testing point2, the difference between children's actual performance and that expected by chance was again not significant for the personalised condition ($t(17) = -.461 p = .651$) but was significant for the non-personalised condition ($t(17) = -5.500 p < .001$). With a mean $X = .778$, this indicates that children performed worse than by chance at this testing session. At the third testing point, the tests were significant for

both personalised: $t(17) = 2.830$ $p = .012$ and non-personalised condition ($t(17) = -2.204$ $p = .042$), but the mean was above 2 only for the personalized condition ($X=2.778$).

Repeated measures ANOVA showed main effect of condition ($F(1, 17) = 22.77$, $p < .001$, $\eta p^2 = .572$), testing session ($F(1.46, 24.81) = 7.370$, $p < .006$, $\eta p^2 = .302$) and interaction between the two ($F(2, 33.99) = 4.862$, $p < .001$, $\eta p^2 = .221$). Paired samples t-test indicated that children's performance in the personalised condition was not significantly different from their performance in the non- personalised condition ($t(17) = 1.800$ $p = .090$). However, the difference was statistically significant in favour of the personalised condition at both the second and third testing sessions ($t(17) = 3.986$, $p < 0.001$; $t(17) = 4.653$, $p < .001$ respectively).

Figure 2 to be inserted about here

Figure 2: The mean number of correct answers to the definition comprehension test at the three testing points



S1 = testing point1, S2 = testing point2, S3 = testing point3.

Emotional valence test

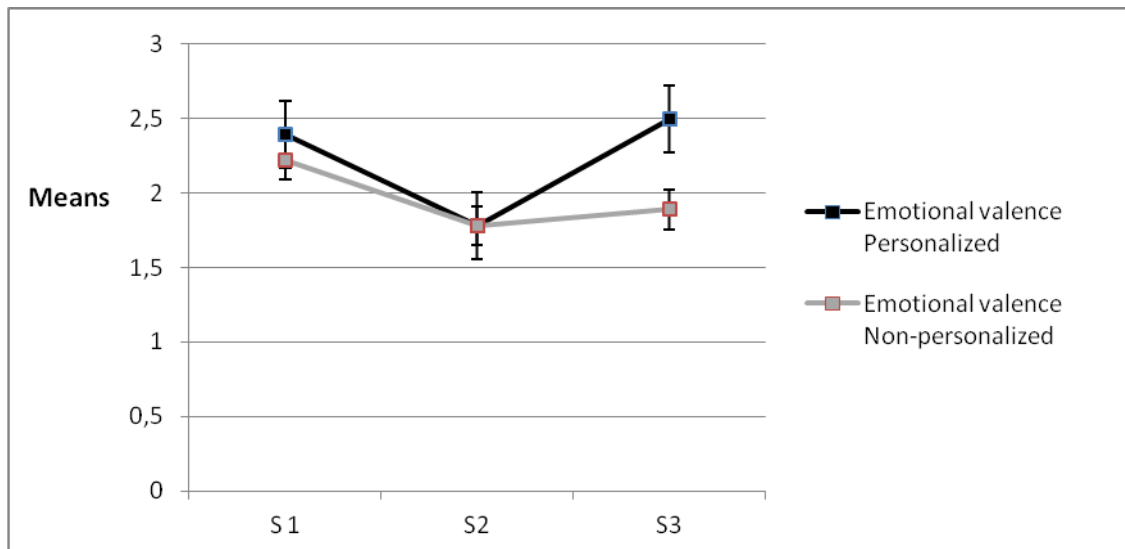
First, a one sample t-test was carried out to compare the actual and the expected number of correct responses in this test. For this test, there were 3 possible responses for each question, so the test value for the definition test was 1.3, chance probability 30%. The means were higher than 1.3 for both personalized and non-personalized conditions and the one-sample t-test checking chance probability levels was statistically significant at each testing session, indicating that at this test, children performed significantly above chance.

Next, ANOVA was conducted to check for main effect of personalization $F(1, 17) = 3.359, p = .084, \eta p^2 = .165$, testing session $F(2, 34) = 3.114, p = .057, \eta p^2 = .155$) and interaction between the two $F(2, 34) = 2.502, p = .097, \eta p^2 = .128$). The marginally significant effect for personalization ($p=.084$) was further corroborated when comparing the personalized and non-personalized condition at the three individual testing points. Paired sample t-tests showed that the only significant difference between personalized and non-personalized condition was at the third testing session, with $p=.007$, in favour of the personalised condition. When looking across the three testing sessions, there was no evidence of learning taking place over time in the non-personalized context. However, for the personalized condition, there was a significant difference between testing point1 and testing point2 ($p=.030$) and testing point2 and testing point3 ($p=.008$), but no significant difference between testing points3 and 1 ($p=.651$).

Figure 3 illustratew the results and details the number of correct responses for the test across the three testing sessions.

Figure 3 to be inserted about here

Figure 3: The mean number of correct answers to the emotional valence comprehension test at the three testing points



S1 = testing point1, S2 = testing point2, S3 = testing point3.

Children's scores in the personalised condition were not related to children's general vocabulary scores as measured by BPVS in neither of the three tests ($p > .10$).

DISCUSSION

This study was designed to experimentally investigate whether words appearing in books personalised for a particular child will facilitate this child's acquisition of new words. In the supportive context of shared book reading, children were exposed to both personalised and non-personalised books on two occasions, and their acquisition of new words embedded in the books was tested at three testing points, with a picture, definition and emotional valence comprehension tests. Results showed that for the picture test, children performed at or above

chance levels for both personalised and non-personalised conditions at all three testing points and that at testing point 2 and testing point 3, children performed significantly better for the personalised than non-personalised condition. Evidence for children's acquisition of the personalised words was provided by comparing children's responses at the individual testing points and this comparison showed that children's performance in the personalised condition at test point 3 was significantly higher than the performance at test point 1 and 2, while little, if any, learning occurred of the words which appeared in the non-personalised condition. As for children's performance on the definition test, children's performance for both conditions was above chance levels only at the third testing point, with significantly more correct responses in the personalised than non-personalised condition. Children's comprehension of the emotional valence of the target words showed that they performed above chance at all testing sessions, but there was a significant difference between personalized and non-personalized condition at the third testing session. Thus, our hypothesis that children's acquisition of novel words can be enhanced through personalised books over repeated exposure, was confirmed.

In a study design that is probably the closest to our experimental parameters, Senechal and Cornell (1993) tested children's words acquisition of 10 target words, with 80 four- and 80 five-year olds. Their hallmark study investigated the effects of four types of parents' instruction (questioning, recasting, word repetition, verbatim reading), at two ages and across four sessions. To test for word gains, Senechal and Cornell also used a self-developed measure, with immediate and one week delayed post-test of children's specific word acquisition, and like in our study, children were asked to select one illustration from an array of four illustrations for each target word. In contrast to our experimental design, Senechal and Cornell checked children's understanding of the target words with a pre-test, which is a

procedure we purposefully avoided in our study (the researcher was instructed to only repeat each target word as often as specified in the ‘reading protocol’). Similarly to our results, children’s vocabulary scores in Senechal and Cornell’s study were higher when measured on a delayed post-test. As for children’s rate of word learning in the individual testing conditions, Senechal and Cornell found that out of a maximum of ten target words, four-year-old children learnt in the word repetition condition 3.15 words as measured at the immediate posttest. In the present study, at the third testing point (immediate post-test after second reading), children answered correctly on average 2.67 words (above chance level and out of possible four target words), which is a relatively high learning rate. More importantly for our focus, in the non-personalised condition children answered on average only 1.45 words correctly at the third testing point which is very close, or even below, chance levels. Due to the differences in the datasets and methodologies, we cannot compare our with Senechal and Cornell’s data. However, we can conclude that the rate of acquisition of personalised words by the children in our study was relatively high, as compared to what would be expected by chance and by previous similar research.

The exact mechanisms associated with children’s word acquisition through personalisation are unknown and our study did not directly compare the possible processes leading to the measured word acquisition scores. However, our findings support the theoretical insights by Oulasvirta and Blom (2008) that personalisation affects cognitive outcomes through internal and individual rather than external environmental factors. This concerns our finding that differences in word acquisition occurred in relation to specific book features rather than a specific book reading style or reading technique. Previous work on children’s word learning has been predominantly concerned with establishing the difference between various interactive strategies parents and caregivers use during shared book reading

to increase children's attention or engagement in the activity and through this engagement, their learning (e.g. Justice, Meier & Walpole, 2005; Penno, Wilkinson & Moore, 2002). In our study, the researcher followed a reading protocol which specified the support for each target word (e.g. questions for adjectives, repetition for nouns). Because we found no differences between children's word acquisition rates for the individual words as verified by the comparison of GroupA versus GroupB in our preliminary data checks, we can conclude that the effects of personalisation seem to be independent of the adult's reading technique. Consequently, it would appear that personalisation can provide significant assistance to vocabulary development irrespective of contextual factors surrounding shared book reading (cf Whitehurst et al., 1988), and therefore extends our understanding of the factors influencing children's word learning when sharing a book with adults

Another major factor influencing the rate of new words acquisition is children's general vocabulary. Horst et al (2009), found a significant relationship between the general vocabulary level of 4- to 18-month-old toddlers (as measured by the MacArthur-Bates Infant CDI) and performance on a categorization task of a set of objects, with children with larger vocabularies being more sensitive to the dimensions of categorization. Similarly, with older, six-year-old children, Robbins and Ehri (1995) established that children with generally higher vocabulary scores (as measured by the PPVT-R test), acquired on average more words than children with smaller entering vocabularies. In contrast, in our study, there was no association between the general vocabulary (assessed by the BPVS) and acquisition of personalised words of children as assessed by the three word comprehension tests, indicating that the effects of personalisation might be independent of children's general vocabulary scores. It could be that for young children, personalising new vocabulary items is an effective instruction technique regardless of language abilities.

What are the possible mechanisms here? It could be that words appearing in a personalized context are more in accordance with younger children's mental representations and support young children's assimilation of new knowledge into their existing understanding knowledge of the world (see Piaget, 1975). All three assessment tests were designed to tap into children's ability of associative learning, i.e. children were expected to associate the target words with either their pictorial representation, or our-provided definition or emotional valence of the word. The three tests were designed to verify children's ability for processing semantic information presented in visual (picture test), auditory way (definition test) as well as further sensitivity and specificity of newly acquired words (emotional valence test). To do well on all three tests, children needed to draw on their memory of the additional context in which each target word was presented in the test, and this was incongruent with the presentation of the target words in the books (the pictures and definition of the target words in the books were different from those in the assessment tests). While in the picture test children had to choose the correct word out of four possible answers (chance probability 25%), in the definition test the chance probability was double (i.e. 50%), and yet, it was still the definition test which seemed to be harder for children to complete, with scores not significantly different from chance levels until the third testing point. It was at the third testing point that we found a significant, above chance difference between the personalised and non-personalised condition and for the emotional valence test the difference between personalized and non-personalized condition occurred only at the third testing session. It could therefore be that the more children became familiar with the personalised words, the more they were able to draw on their general knowledge of words and draw inferences between the novel and already known words. As such, our findings concur with the well-

established association between familiarity and word recognition (Gernsbacher, 1984) and recent evidence from Gampe and colleagues (2012) whose study showed that in complex situations, eighteen-month-olds employ various learning strategies for acquiring new words. It is important to note here that the emotional value associated with the target words in our study was arbitrary and it is plausible that the results of our test were influenced by children's own emotions or previous experiences of the concepts being depicted (see Schouten-Van Parreren, 1989). Future studies could investigate other possible learning strategies in the word assimilation process in relation to personalized reading contexts and specific aspects of words. In our related work, we have found that children's spontaneous speech was greater when they were read books with personalised features than books without personal meanings (Author, forthcoming), highlighting the complex set of possible relationships at stake here.

As for the relationship between repetition and personalisation, it would appear that personalisation of the reading material reduced the degree of decline in children's knowledge of the target words over a period of a week, and subsequently boosted their knowledge after repeated exposure to the reading context. This is an important finding and adds to our understanding of how children's knowledge of new words may develop over time and with repeated readings when presented in a personalised context. Previous research showed that repetition has a major impact on children's word acquisition rates: Horst and colleagues (2011) have tested experimentally the effect of contextual cueing and repetition and found that children who were read the same book on several occasions did better on both immediate recall and retention task than children exposed to different books over the course of experiment. Children in the same stories condition also showed increasing benefits with each book exposure, whereas there was no effect of book exposure for children who were read different books on each occasion. These observations together with results of our study

indicate that repeated readings of the same book and personalised book features bring about positive outcomes and it is likely that their combined influence on children's word acquisition was accentuated in our study. A testing point⁴ measurement, which could for example happen after a second or third week-delay would have revealed how children's scores are maintained over time and how personalisation and repetition might work in tandem to add to the 'right conditions' for vocabulary learning to take place. We therefore recommend that future studies investigate the longer term (i.e. more than one week) retention of new words presented in a personalised context. Another issue to explore further is the role of personalised reading contexts in children's ability to make words' meanings part of their active and expressive vocabulary.

In conclusion, our findings contribute to the extant literature on shared book reading and the emerging evidence for the influence of personalisation on children's learning. More specifically, our findings suggest that personalising books for young children can be viewed as a positive means to support young children's vocabulary development during shared book reading. Personalised books are frequently used as part of socio-culturally relevant reading programs (Kucirkova et al., 2010) and with children with special educational needs (e.g. Pakulski and Kaderavek, 2004), where the need to support early vocabulary is typically the greatest. This, we hope, gives our results a direct practical value.

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