Radboud Universiteit

Word learning through songs:

The effects of the Noplica Energy Center on receptive word learning in L1 and L2 Dutch preschoolers at risk for language delay.

Monique De Nijs

4240707

21-08-2018

MA Thesis

Prof. dr. P. Fikkert

L. E. Hahn

Table of Contents

Abstract

The ChildTuition Foundation initiated the development of Noplica: games that help children learn a language using resources such as songs and physical activity. The present study examined one such Noplica game, called the Energy Center, that focuses on Dutch language learning. We investigated the effect of this game on the receptive vocabulary development of L1 and L2 Dutch preschool children at risk of Dutch language delays and problems. Furthermore, we examined if these children's receptive vocabulary would benefit from playing the songs from the Noplica game in the classroom, in addition to playing the game. Finally, the growth of the receptive vocabulary of L1 children at risk for language delay was compared to that of L2 children at risk for language delay risks. Fifteen 'at risk' preschool children (aged two to four), of which seven L1 Dutch speakers and eight L2 Dutch speakers, played in the Noplica Energy Center over the course of this study. Additionally, a subset of the songs from the Energy Center was played in the classroom during this period. A receptive vocabulary test was administered before and after this period to measure development in the children's recognition of the target words. The findings indicate that playing in the Noplica Energy Center positively affects the at risk L1 and L2 children to the same extent. Playing the songs in class affected the at risk L2 children more than the at risk L1 children.

1. Introduction

The number of immigrants and refugees coming to the Netherlands has notably increased in the last decades (Bevolkingsgroei, migratiesaldo en natuurlijke aanwas, 2016). From a linguistic perspective, this means that the number of people in the Netherlands that have limited or no knowledge of Dutch is growing. This phenomenon is clearly seen in (primary) schools where many immigrant and refugee children have a shortcoming in the Dutch language (SCP, WODC and CBS, 2016). Poor Dutch language skills have a drawback on the children's school performances. It is therefore important for teachers and schools to tackle Dutch language deficiencies. With this in mind, the ChildTuition Foundation has initiated the development of *Noplica*: a series of language learning games. The idea is that these Noplica games help children learn a language while playfully using resources such as songs and physical activity. Besides these two resources, the games have many more assets (e.g. team play, no supervision needed,

placed outside). In this study, we will focus on the songs and physical activity of the game 'Energy Center'. This game is the first Noplica game focusing on learning Dutch. It is located at the primary school Bloemberg and the daycare Pino in Nijmegen, the Netherlands. This location was targeted because of the considerable number of children (both L1 and L2 Dutch speakers) at risk of Dutch language delays and problems that go to this school and daycare (see paragraph *2.1 Participants*). The present study investigates whether this Noplica game helps improve the Dutch receptive vocabulary of children. We will focus on the L1 and L2 Dutch preschool children at risk of Dutch language delays and problems from daycare Pino. Furthermore, we will investigate whether the vocabulary learning of these 'at risk' L1 and L2 preschool children can be further improved when they hear the songs from the Noplica game in the classroom as well. The results of this study will lead to more insights in the vocabulary acquisition of preschool children in general and the benefit of the Noplica game in particular.

In the rest of the introduction, we will first discuss young children's vocabulary acquisition. Then, we will give a short literature review of the effect of songs on young children's vocabulary learning. This section is followed by a short literature review about the effect of physical activity on young children's language learning. The remainder of the thesis will address the present study and the research questions we will try to answer.

1.1 Young children's vocabulary acquisition

Children are known to acquire numerous new words at a young age. Especially around the age of three, children's vocabulary increases substantially (Scharlaekens, 2008). Young children acquire most of these words incidentally. That is, the children do not receive any explicit instruction when learning new words but acquire vocabulary implicitly from language input (Medina, 1993). Regardless of age, incidental vocabulary acquisition appears to take place in three steps: isolating a word from the language input, creating possible meanings to this isolated form, and eventually mapping the word form to the (correct) meaning (Rohde & Tiefenthal, 2000). This process is relatively effortless for young children (Clark, 1993). Young children can already acquire new words receptively after being exposed to them only once. This efficient process of acquiring new words with minimal exposure is referred to as *fast mapping*. In order to acquire new words not only receptively but also productively (i.e., the word can not only be understood but also produced), further exposure is required.

However, previous research suggests that the process of fast mapping only occurs in L1 vocabulary acquisition. Young children's acquisition of L2 vocabulary requires

much more effort. Ellis and Heimbach (1997) state that limited exposure to L2 input is not sufficient for young children to successfully acquire L2 vocabulary, receptively or productively. Likewise, Rohde and Tiefenthal (2000) found that preschool children were not capable of fast mapping of L2 words. However, they did find that preschool children were capable of acquiring part of the new words (e.g. part of the phonetic form or meaning) with minimal exposure. This process is referred to as *partial mapping*.

Thus, L2 children need more exposure to new words than L1 children in order to acquire them successfully. Yet, it is still fair to state that young children in general have a strong capability to learn new words. Despite this strong capability, vocabulary learning activities can still be rather challenging for young children, as they have short attention spans and a lack of metacognition (Muñoz, 2007). Teachers should therefore search for engaging resources to implement in their vocabulary learning activities in the classroom.

1.2 Songs and vocabulary learning

One example of an engaging resource that could be implemented in a vocabulary learning activity is songs. According to Cook (1997), songs can increase the learner's motivation in classroom settings, including a language learning setting. But it is not only motivation that makes songs a useful tool for language learning. Many studies have provided evidence for a *cognitive link* between music and language (Engh, 2013; Zeromskaite, 2014). Francois, Chobert, Besson & Schön (2012) explain this link by stating that music and speech are processed by the auditory system in a similar manner. Schön et al. (2010) took it a step further and claimed that music and speech share a common neural network. Although representations of music and language components may be stored in different domains, there might be a common network that interprets and structures both music and speech sounds. This cognitive link may have an important implication. Music practice will strengthen the system for music processing and improve musical abilities. However, since the musical system might also be used for or be similar to speech processing, language proficiency may improve as well (Kraus, Strait & Parbery-Clark, 2012). Since songs and music are inextricably linked and overlapping in their shape and structure, practicing songs might benefit a learner's language proficiency.

Though the cognitive link between music and language has been thoroughly researched, there is limited empirical evidence that practicing songs could improve the vocabulary acquisition of young children (Zeromskaite, 2014). Previous studies examining the effect of songs on children's vocabulary learning focus mainly on English as a Foreign

Language (EFL) learners. Coyle and Gómez Gracia (2014) researched whether songs can be used to enhance L2 vocabulary acquisition in preschool children. Twenty-five Spanish EFL learners (between the ages of five and six years old) participated in three 30-minute lessons. In these lessons the children were presented with songs in which the English target vocabulary was integrated. A vocabulary picture naming test and a vocabulary picture selection test were administered directly after the lessons and again after five weeks. The results suggest that songs can improve the receptive L2 vocabulary, but not the productive L2 vocabulary. A positive effect of songs on vocabulary learning was also found by Chou (2014), who examined the effect of songs, games and stories on English vocabulary learning of Taiwanese children (aged eight to eleven). However, a contradicting effect was found by Lesniewska and Pichette (2014). They compared the effect of songs on L2 vocabulary learning with the effect of stories on L2 vocabulary learning by preliterate children. Twenty-four French EFL learners (between the age of three and five) participated in four consecutive weekly workshops in which they were exposed to 57 English words. These words were either embedded in songs or stories. Vocabulary recall was assessed with a receptive vocabulary post-test directly administered after the workshops. The results showed that the children recalled more words from the stories than the songs, though the effects of songs and stories on the children's L2 vocabulary learning were both not significant. Lesniewska et al. explained the lack of effect from songs by stating that the ludic elements from the songs distracted rather than helped the children memorize the vocabulary.

1.3 Physical activity and language and vocabulary learning

Another example of an engaging resource that could be implemented in a vocabulary learning exercise is physical activity. Schilling et al. (2006) stated that movement boosts children's attention spans and facilitates learning. Carlsson-Paige (2008) reported that physical activity also has numerous advantages for child development, such as contributing to children's social, emotional and cognitive growth.

Tomlinson and Masuhara (2009) pointed out that many more studies report the benefits of physical activities. However, there seems to be a scarcity of references on physical activities affecting young children's language acquisition, let alone their vocabulary acquisition. Studies which do weigh in on this topic often discuss the effect of physical activities as part of a broader approach, such as drama, role-play, and games (Tomlinson & Masuhara, 2009). Asher (1977, 1989, 1994) pointed out that the approach called Total Physical Response

(TPR) could benefit and facilitate language learning. In this approach learners have to physically respond to the teacher's instructions. Cook (2000) demonstrated that young children's first language acquisition profits from games combining physical activities and language play. Tomlinson et al. (2009) stated that physical games benefit language learning. The games provide a learner with language in use (e.g. instructions of the game) and encourage interaction (communicating with teacher/players) in a contextualized and comprehensible way.

Finally, Forster (2006) made a point about the effect of physical activity on young children's vocabulary learning specifically. They state that combining movement and songs improves young children's vocabulary learning. Physically carrying out the song lyrics reinforces the meaning and facilitates the retention of the words in the song.

1.4 The current study

Though the results of previous literature are inconclusive, previous studies generally suggest a positive effect of songs (Coyle and Gómez Gracia, 2014; Chou, 2014) and physical activity (Schilling et al., 2006; Cook, 2000; Tomlinson et al., 2009) on vocabulary learning. In the Noplica game that is located at the daycare Pino in Nijmegen, both songs and physical activities are implemented. In this game, children play in a so-called *Energy Center*. In this Energy Center, handbikes are installed. Physical activity is needed to spin the wheels of the handbikes, which in turn leads to songs being played. The preschool children from daycare Pino, of which many are at risk of Dutch language delays, make use of this Energy Center. Some of the children are L1 speakers of Dutch and some of them are L2 speakers of Dutch. In the present study, we investigated the effect of the Noplica Energy Center on the vocabulary learning of these 'at risk' L1 and L2 preschool children. The following research question is underlying this study:

1. Does the Noplica Energy Center improve the receptive vocabulary of the L1 and L2 Dutch preschool children at risk of Dutch language delays and problems?

The idea is that the Noplica Energy Center provides children with an implicit way of language learning where no assistance from teachers or parents is needed (Noplica, n.d.). This could be sufficient to boost vocabulary acquisition. Nevertheless, teachers' assistance could prove valuable. Teachers could play the songs from the Energy Center in the classroom of the preschool children, which might reinforce and thus speed up their vocabulary learning. Therefore, a second research question was formed:

2. Does the receptive vocabulary of the at risk L1 and L2 Dutch preschool children improve more when the Noplica songs are also played in the classroom?

Finally, the Noplica Energy Center and playing the Noplica songs in the classroom might have different effects on the vocabulary learning of the at risk L1 and L2 children. This leads us to the third and last research question:

3. Are there any differences in receptive vocabulary improvement between the at risk L1 and at risk L2 Dutch preschool children?

In the current study, the at risk L1 and L2 Dutch preschool children will play in the Noplica Energy Center. Furthermore, the preschool children will listen to a subset of the Noplica Energy Center songs in the classroom during this period. Before and after this period, a receptive vocabulary test will be administered to measure possible improvements in the children's recognition of the target words. Firstly, we will measure whether the preschool children improve their recognition of the target words from the songs that are solely played in the Noplica Energy Center, which would indicate the effectiveness of the Noplica Energy Center. Secondly, we will measure if the preschool children improve their recognition of the target words more from the subset of songs that are played both in the Energy Center and in the classroom. This would indicate the effectiveness of playing the songs in class. Thirdly, the at risk L1 children's receptive vocabulary improvement can be compared with the at risk L2 children's receptive vocabulary improvement, to investigate possible differences in receptive vocabulary learning between at risk L1 and L2 preschool children.

1.5 Hypotheses

Playing in the Noplica Energy Center is expected to improve the at risk L1 and L2 Dutch preschool children's receptive vocabulary. The preschool children are expected to receptively acquire the words from the songs of the Noplica Energy Center implicitly, since young children are able to acquire words incidentally from language input rather effortlessly (Clark, 1993). The children's vocabulary learning is expected to be facilitated by the song component (Coyle and Gómez Gracia, 2014; Chou, 2014) and physical component (Schilling et al., 2006; Cook, 2000; Tomlinson et al., 2009) of the Noplica Energy Center. Secondly, it is expected that the receptive vocabulary of the at risk L1 and L2 children improves more when the Noplica songs are also played in class. More exposure to words, in this case by playing songs in class in addition to hearing them in the Energy Center, should benefit the children's receptive vocabulary learning.

Finally, the at risk L1 children are expected to improve their receptive vocabulary more than the L2 children. Previous research suggests that young L1 speakers acquire new words more easily than young L2 speakers (Ellis and Heimbach, 1997; Rohde and Tiefenthal, op.cit.).

2. Methodology

2.1 Participants

Sixteen preschool children (nine female) participated in this research. All children are illiterate, aged 2-4 ($M = 3.35$; $SD = 0.41$), and enrolled at the daycare Pino in Nijmegen, the Netherlands. None of the children have any reported hearing or sight impairments that could interfere with the testing. Consent from the daycare and passive consent from the parents was obtained for all participating children prior to the data collection (see Appendices A and B). One participant was excluded from the experiment. This participant was the only participant with no risk at language delays (see next subparagraph). The final sample thus consisted of fifteen children (eight female).

Daycare Pino is part of the program *Voor- en vroegschoolse educatie* [Pre- and early schooled education] (VVE). The goal of this program is to prepare toddlers and kindergartners with possible (Dutch language) delays for primary education by minimalizing their delays. The toddlers and kindergartners, who are enrolled in the VVE program, receive extra attention to their (language) development through a special curriculum (Wat is VVE?, n.d.). The program is meant for children at risk of Dutch language delays and problems. These children at risk could be either L1 or L2 speakers of Dutch. L2 children could be at risk because they receive minimal Dutch language input at home. L1 speakers could be at risk, for example, because their parents received low education. The consultation office identifies young children that are eligible for VVE. Enrollment into the VVE program of these eligible children is subsidized by the municipality. Children that are not identified for being at risk by the consultation office can still enroll into a VVE program, but they will not be subsidized (Voor wie is VVE?, n.d.).

The fifteen participating children are all identified for being at risk for language delays by the consultation office. The children are therefore referred to as *at risk children* in this study. This at risk group of children consists of a mix of L1/L2 Dutch children. Seven children are L1 speakers of Dutch and eight children are L2 speakers of Dutch. The L2

children have varying native languages. In Table 1, the participants' descriptives are displayed in detail.

Table 1. *Participants' descriptives*.

Participant	Age (y;m)	Gender	Language status	Native Language/ First Language
1	3	f	L1, at risk	Dutch
2	2;11	m	L2, at risk	Hindu
3	3;7	f	L2, at risk	Czech
4	3;7	m	L1, at risk	Dutch
5	2;11	f	L2, at risk	German, Afrikaans
6	2;7	m	L1, at risk	Dutch
7	3;7	m	L1, at risk	Dutch
8	2;11	m	L1, at risk	Dutch
9	3;4	m	L2, at risk	French
10	3;8	f	L2, at risk	Indonesian
11	3;9	f	L2, at risk	Indonesian, Arabic
12	3;5	f	L2, at risk	Pashto
13	3;5	m	L2, at risk	Turkmen
14	3;11	f	L1, at risk	Dutch
15	4	f	L1, at risk	Dutch

2.2 Materials

Songs

Twenty songs were developed for the Noplica project. The Noplica team wrote the songs originally in English. The songs are aimed for children aged two to six, and are differently themed. For the Noplica Energy Center in Nijmegen that is examined in this study, the twenty songs were translated into Dutch and adjusted accordingly by bachelor students and student assistants prior to this study. The complete set of twenty Dutch songs was implemented in the aforementioned Energy Center. Additionally, the children were exposed to a subset of the Dutch songs in the classroom. For this purpose, three songs were selected from the Noplica Dutch song collection (*kooklied*, *lichaam wassen* and *ziek zijn*). Other than the condition that the selected songs had to contain enough words that could be used as target vocabulary (see section on *Target words*), the songs were selected randomly.

Noplica Energy Center

The Energy Center is placed in a colorful, wooden playhouse (Figure 1). In the Energy Center, three handbikes are installed (Figure 2). When the wheels of these handbikes are spun, songs are played through loudspeakers placed above the handbikes. Spinning the wheel of one handbike is already sufficient to produce a song. Each wheel produces a different instrument accompanying the song that is playing. The songs are played randomly and the order cannot be controlled. Furthermore, the spinning produces colorful and flashy lights which show up on a display placed above the wheels. The more actively the wheels are being turned, the more lights pop up on the display. Next to its own instrument, each handbike generates its own lights, independently of the other handbikes.

Figure 1. The Noplica playhouse at Pino.

Figure 2. The handbikes inside the Noplica Energy Center.

Songs played in class

During certain class activities (e.g. playing with puzzles, sitting in a circle), three songs from the Energy Center were played in the classroom of the children. The researcher played the songs from a Bluetooth speaker using a mobile device. No other materials were used during this activity.

Target words

From the set of twenty songs, thirty Dutch target words were selected. This selection was based on the following criteria: displayable, concrete noun, age appropriate, comprehensible semantic

concepts, yet not likely to be already known by too many of the preschool children. The *Basiswoordenschat Amsterdamse Kleuters* [Basic vocabulary of Kindergartners in Amsterdam] (Mulder, Timman and Verhallen, 2009) was consulted for the selection. The final selection of target words was determined by the preschool teachers. They judged each word on how likely it was known by the children, based on their knowledge of which words were discussed in class and their insight in the preschool children's vocabularies. The complete list of target words can be found in Appendix C.

Pre- and posttest

Receptive knowledge of the target words was measured with a picture selection task. In this receptive vocabulary test, participants are presented with four pictures and one target word. The objective is to select the picture that matches the target word. The test contains thirty trials (one trial for each target word) and two example trials. In each trial, the target word is approximately equally semantically distant to the three distractors. For example, for the target word 'rat' three other animals not too closely related to 'rat' were chosen as distractors. Additionally, it was ensured that the phonological complexity was roughly similar for the target word and the three distractors in each trial (e.g. number of syllables and sounds). The test was made appropriate and engaging for young children: after every ten trials a picture of a smiley is implemented. Every smiley indicates that the child can chose a sticker as a reward. Figure 3 shows an example of a trial from the receptive vocabulary test.

Figure 3. Example of a trial from the receptive vocabulary test (intented target word is *trap* [stairs])

2.3 Design

The preschool children played in the Noplica Energy Center over the course of the study. Furthermore, they listened to a subset of the Energy Center songs in the classroom for a half-day session during this course. In order to investigate if playing in the Energy Center and listening to songs in the classroom had any effect on the preschool children's vocabulary learning, the children's receptive vocabulary was measured before and after this period. Furthermore, the at risk L1 children's measured receptive vocabulary was compared to the at risk L2 children's measured receptive vocabulary.

A 2 x 2 x 2 mixed-design was applied in this study. The dependent variable is the number of recognized target words in the vocabulary test. The within-subjects independent variables are (1) the moment of testing (pretest versus posttest) and (2) the learning context (target words featured in Energy Center songs versus Energy Center + classroom songs). The between-subjects independent variable is the language status (at risk L1 speakers versus at risk L2 speakers).

Figure 4 shows an overview of the different experimental conditions. The at risk L1 and L2 children participated in the same pretest and posttest. The pretest and posttest contain the same 30 experimental stimuli: 15 stimuli containing target words that feature only in the Energy Center songs; 15 stimuli containing target words that feature in the Energy Center songs and classroom songs. We made two different versions of the receptive vocabulary test (pre- and posttest) in which the order of the stimuli differed: list 1 and list 2. In list 1, the stimuli were pseudo-randomized to ensure that the target words from the two types of learning contexts are equally divided over the list. List 2 was created by reversing all the stimuli of list 1. Each participant was randomly assigned to list 1 or list 2. Eight participants were assigned to list 1 and seven participants were assigned to list 2.
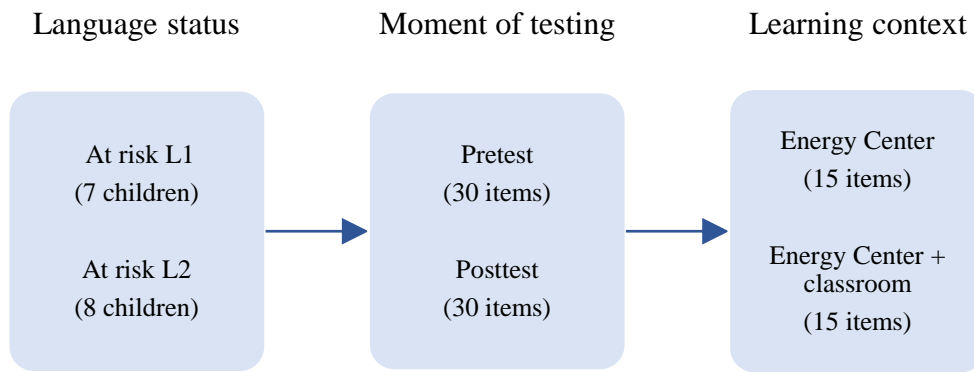
Figure 4. Overview of the experimental conditions.

2.4 Procedure

Data collection was carried out over a period of six weeks. In the first week, the pretest was conducted. In the four weeks following the pretest, the children played regularly in the energy center (see section *Playing in the Noplica Energy Center* for more details). At the end of these four weeks, three of the Energy Center songs were also played in the classroom (see section *Playing songs in the classroom* for more details). In the sixth week, data collection was concluded with the posttest. The time-laps of the experiment is summarized in Table 2.

Table 2. *Time-lapse of the experiment.*

Week	Date	Activity
1	24-5	pretest
2	31-5	Energy Center
3	07-6	Energy Center
4	14-6	Energy Center
5	21-6	Energy Center + songs in class
6	28-6	posttest

Pretest

For the pretest, a picture selection task was administered to measure the preschool children's receptive knowledge of the target vocabularies. All children were tested individually. Testing was conducted at the daycare in a corner of the room where all the preschool activities occurred. The corner was partially separated from the room, so that the children were not completely closed off from the rest of the group during the testing, yet cut off from main distractions. The

test was administered on a laptop. During each trial, the child saw four pictures. Then the researcher named the target word, and asked the child to point at the picture that matched the target word. Two practice trials were run prior to the 30 test trials. The researcher kept track of the answers manually. When the child did not respond, the researcher repeated the target word one or two times. If there was still no response after that, the researcher continued to the next trial. Two children were too shy and afraid to be tested alone, therefore the preschool teacher joined the test session. During these sessions, the preschool teacher remained on the background almost the entire time. During two trials, she (accidently) influenced the testing, so these trials were excluded in the data analysis. After every tenth trial, a smiley appeared on the laptop screen, indicating that a sticker could be picked by the child as a reward. The picking of the stickers took place after the test. The researcher helped the children to put the stickers on a 'diploma'. The pretest lasted approximately ten minutes per child.

Playing in the Noplica Energy Center

In the following four weeks, the preschool children played in the Noplica Energy Center. During this period, the Energy Center was only available for them on Thursdays as most of the participating children were only present at the daycare on that particular day of the week. The Noplica Energy Center is placed on the schoolyard outside the preschool. On the days agreed upon, one of the preschool teachers would take three or four children at a time to the Energy Center. The children played each time for about ten minutes (in which two or three songs were completed) and were supervised by the preschool teacher at all times. Most children were very eager to spin the wheels of the handbikes to generate the songs and did not need any instructions. However, when the children did not start spinning or stopped spinning rather quickly, the preschool teacher would encourage the children to play. The children responded in different ways to the songs of the Energy Center. Some children kept quiet during the playing time, while other children noticeably reacted to the songs (e.g. dancing, repeating words/phrases). During the four weeks of playing in the Noplica Energy Center, each participating child visited the Energy Center between four to eight times. The preschool teachers were unable to give the children equal playing time, due to the varying presence and mood of the preschool children, the availability of the preschool teachers, Energy Center malfunctions, etc. Table 3 shows an overview of the estimated playing time each participating child was given.

Table 3. *Overview of the estimated playing time in the Noplica Energy Center of each child.*

Participant	Playing time in minutes
1	60
2	40
3	60
4	60
5	60
6	50
7	60
8	60
9	60
10	60
11	70
12	70
13	80
14	80
15	60
16	80
17	70
M (*SD*)	63,53 (10,57)

Playing songs in the classroom

After four weeks, the researcher visited the preschool to play some of the Noplica Energy Center songs in the classroom. The three selected songs *kooklied*, *lichaam wassen* and *ziek zijn* were each played 3 – 5 times to the children. The duration of the songs varied between one to two minutes (Table 4). The songs were played throughout the whole day and were meant not to intervene but to compliment the usual daily activities. The songs were played in different contexts, varying from passive to semi-passive. In a passive context, the songs were merely played as background music while the children were playing games. The children seemed mostly focused on the games then. However, some children would occasionally repeat words or phrases from the songs and say something about them ("Bubbles? Like in the bathtub at home!"), indicating they might be listening subconsciously. When the context was semi-passive, the children were sitting together in a circle while the music was being played. The group would listen to the songs while also performing other activities (washing hands, eating, drinking, etc.). The preschool teacher would sometimes act out some of the song lyrics and/or discuss them afterwards. The children responded differently: some started dancing along, some

repeated words and phrases from the song, some remained quiet, and some minded other things. The songs were mostly played plenary. However, when the children were playing outside, small groups of three or four children at a time were sent back inside to play games with the songs being played in the background. In those cases, the researcher ensured that the children roughly listened to the songs an equal amount of time. Table 4 gives an estimation of the number of times each song was played in the classroom per context.

Table 4. *Estimation of the number of times each songs was played in the classroom per context.*

Song	Song duration in minutes	Passive context	Semi-passive context	Total
kooklied	1:51	2	2	4
lichaam wassen	1:24	2	3	5
ziek zijn	1:20	2	2	4

Posttest

In the sixth week, the posttest was conducted. The posttest was administered in the same manner as the pretest.

2.5 Data analysis

The receptive vocabulary tests (pretest and posttest) were scored by awarding a point every time a child identified an image that matched the target word correctly. The scores, thus, indicate the number of recognized words. The raw scores are documented in Appendix D. Subsequently, statistics were applied to the scores using IBM SPSS Statistics (Version 25). A three-way mixed-design ANOVA was used to compare the children's mean number of recognized words (1) before and after the four weeks of playing in the Noplica Energy Center and listening to songs in the classroom and (2) from songs that were and were not played in the classroom. Furthermore, the receptive vocabulary growth of the at risk L1 children was compared with the receptive vocabulary growth of the at risk L2 children. Kolmogorov-Smirnov and Shapiro-Wilk's tests of Normality, Levene's test of Equality of Variances, Mauchly's Test of Sphericity, Q-Q plots, and scatterplots were applied to confirm that our data matches the requirements to apply a mixed-design ANOVA.

3. Results

3. 1 Descriptive statistics

Table 5 shows the mean number of recognized words for each learning condition in both the pretest and posttest for the at risk L1 and at risk L2 children. Both groups of children recognized more words in the posttest ($M = 22.60$, $SD = 4.10$) than in the pretest ($M = 18.00$, $SD = 7.68$), regardless of their language status. Furthermore, the at risk L1 children recognized more words in the pretest ($M = 21.00$, $SD = 7.53$) and in the posttest ($M = 24.57$, $SD = 3.69$) than the at risk L2 children ($Mpretest = 15.38$, $SD = 7.25$; $Mposttest = 20.88$, $SD = 3.83$).

Both groups of preschool children performed better in the posttest than in the pretest in both learning contexts. The children recognized more words from the Energy Center songs in the posttest ($M = 11.93$, $SD = 2.06$) than in the pretest ($M = 9.87$, $SD = 3.64$). Additionally, the at risk L1 children recognized more words from the Energy Center songs in the pretest ($M = 11.14$, $SD = 3.40$) and posttest ($M = 13.43$, $SD = 1.51$) than the at risk L2 children ($Mpretest = 8.75$, $SD = 3.65$; $Mposttest = 10.63$, $SD = 2.26$). Both groups of children recognized more words from the Energy Center + classroom songs in the posttest ($M = 10.67$, $SD = 2.19$) than in the pretest ($M = 8.13$, $SD = 4.21$). Furthermore, the at risk L1 children recognized more words from the Energy Center + classroom songs in the pretest ($M = 9.86$, $SD = 4.18$) and posttest ($M = 11.14$, $SD = 2.34$) than the L2 children ($Mpretest = 6.63$, $SD = 3.86$; $Mposttest = 10.25$, $SD = 2.12$).

On average, both groups of children acquired 4.60 words over the course of the study. The at risk L1 children acquired 3.57 words and the at risk L2 children acquired 5.50 words over the course of the experiment (see table 5 for more details). The number of recognized words for each learning condition in the pre- and posttest are graphically shown for the at risk L1 and L2 children in figure 4 and 5, respectively.

Table 5. *Mean number of recognized words of the at risk L1 children (7 subjects) and at risk L2 children (8 subjects) for each learning context in the pretest and posttest.*

Learning context	Language status	Pretest M (SD)	Posttest M (SD)	Growth (posttest-pretest)
Energy Center songs	At risk L1 children	11.14 (3.4)	13.43 (1.51)	2.29
(15 items)	At risk L2 children	8.75 (3.65)	10.63 (2.26)	1.88
	Total	9.87 (3.64)	11.93 (2.37)	2.06
Energy Center + classroom songs	At risk L1 children	9.86 (4.18)	11.14 (2.34)	1.28
(15 items)	At risk L2 children	6.63 (3.86)	10.25 (2.12)	3.62
	Total	8.13 (4.21)	10.67 (2.19)	2.54
Total	At risk L1 children	21.00 (7.53)	24.57 (3.69)	3.57
(30 items)	At risk L2 children	15.38 (7.25)	20.88 (3.83)	5.50
	Total	18.00 (7.68)	22.60 (4.10)	4.60

3.2 Three-way mixed-design ANOVA findings

Main effects of moment of testing, learning context, and language status
A three-way mixed design ANOVA indicated a significant main effect of the moment of testing on the number of recognized words, $F(1, 13) = 13.79$, $p < .01$, $\eta^2_G = .27$, implying that the number of recognized words was significantly larger in the posttest than in the pretest. Likewise, there was a significant main effect of the type of learning context on the children's number of recognized words, $F(1, 13) = 13.79$, $p < .01$, $\eta^2_G = .14$, indicating that the number of recognized words from the Energy Center songs was significantly larger than the number of recognized words from the Energy Center + classroom songs. This latter effect requires more close examination and will be analyzed in the discussion section. Finally, there was no effect of language status on the number of recognized words, indicating that the number of recognized words was similar for at risk L1 children and at risk L2 children. The F-values, p-values, and effect sizes of the measured effects are summarized in Table 6.

Two-way interactions of moment of testing, learning context, and language status
No interaction effects were found between the moment of testing and language status, nor between the learning context and language status. This means that the at risk L1 and L2 children did not differ significantly in the number of recognized words on the pretest and posttest and the number of recognized words from the Energy Center songs and the Energy Center + classroom songs. Furthermore, there was no significant interaction between the moment of

testing and the learning context, indicating that the number of recognized words from the pretest and posttest did not differ according to whether the words came from Energy Center songs or from Energy Center + classroom songs. See again Table 6 for the F-values, p-values and effect sizes.

Three-way interaction effect of moment of testing, learning context, and language status
Finally, there was a significant three-way interaction between the moment of testing, the learning context, and the language status, $F(1, 13) = 17.07$, $p < .01$, $\eta^2_G = .03$. The at risk L1 children improved their number of recognized words from the Energy Center songs more and the words from the Energy Center + classroom songs less than the at risk L2 children (see Table 5). Figure 5 shows that the at risk L1 children's number of recognized words improves more in the Energy Center learning context than in the Energy Center + classroom learning context. For the at risk L2 children, however, this effect is reversed: figure 6 shows that the at risk L2 children's number of recognized words improves more in the Energy Center + classroom learning context than in the Energy Center learning context. Again, all F-values, p-values and effect sizes are summarized in Table 6.

Table 6. *F-values, p-values, and effect sizes for all measured effects.*

		F-values	p-values	Significance	Effect sizes (η^2_G)
Main effects	Moment of testing	13.79	.00	***	.27
	Learning context	13.79	.00	***	.14
	Language status	2.82	.12		.09
Two-way interactions	Moment of testing * language status	.62	.44		.02
	Learning context * language status	.39	.54		.03
	Moment of testing * learning context	1.27	.28		.00
Three-way interactions	Moment of testing * learning context * language status	17.07	.00	***	.03

Figure 5. Number of recognized words from Energy Center songs and Energy Center + classroom songs for the pretest and posttest by the at risk L1 preschool children.
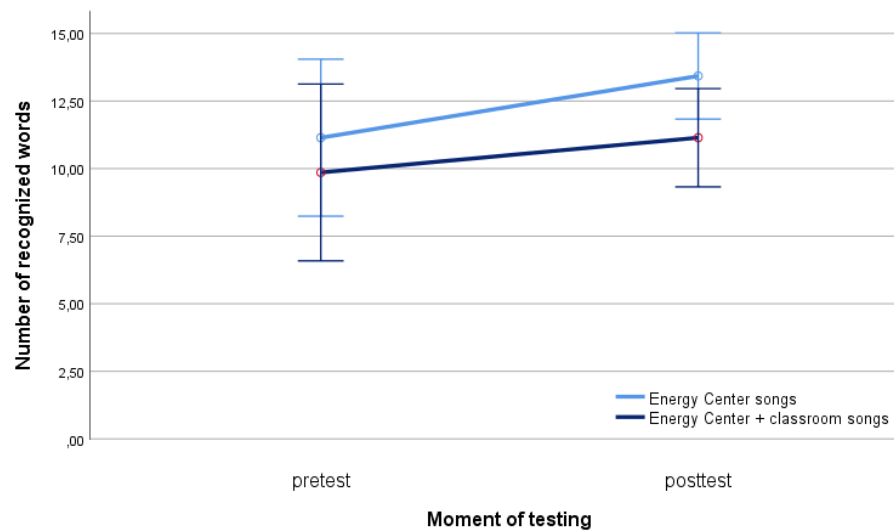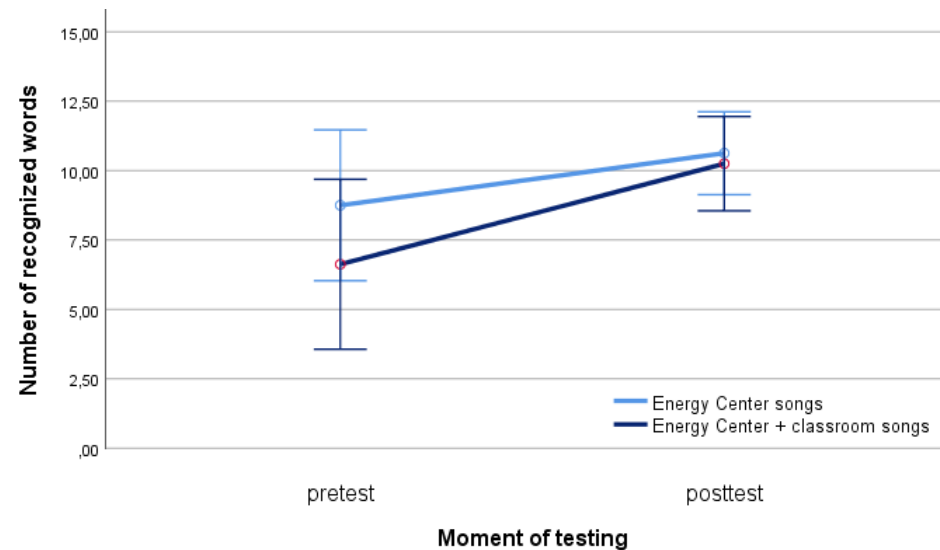

Figure 6. Number of recognized words from Energy Center songs and Energy Center + classroom songs for the pretest and posttest by the at risk L2 preschool children.

4. Discussion

The present study investigated whether L1 and L2 Dutch preschool children with at risk of Dutch language delays improve their receptive vocabulary by playing in the Noplica Energy Center. Furthermore, this study examined if the children's receptive vocabulary would improve even more when also listening to a subset of the Energy Center songs in the daycare center. Finally, a comparison was made between the improvement in receptive vocabulary between the at risk L1 children and the at risk L2 children.

4.1 The findings

The preschool children recognized more vocabulary in the posttest ($M = 22.60$, $SD = 4.10$) than in the pretest ($M = 18.00$, $SD = 7.68$). Furthermore, the learning context (whether the songs were heard only in the Energy Center or in the Energy Center and in the classroom) had no effect on the receptive vocabulary improvement of the preschool children *in total* (at risk L1 and L2 children combined). Therefore, playing in the Noplica Energy Center improves the preschool children's receptive vocabulary. This effect is not amplified by additional exposure to the songs in the classroom.

Furthermore, the number of recognized words on the pretest and posttest did not differ between the at risk L1 and L2 children. This indicates that the possible effects from playing in the Noplica Energy Center and/or playing the songs in class did not affect the *overall* receptive vocabulary (vocabulary from both learning contexts combined) of one group of children more than the other.

In addition, the at risk L1 children improved more in words from the Energy Center songs and less in words from the Energy Center and classroom songs than the at risk L2 children. The at risk L2 children improved in words from both learning contexts, but more in words from the Energy Center and classroom songs than in words from the Energy Center songs. This indicates that playing in the Noplica Energy Center has an effect on the receptive vocabulary of this group (otherwise the at risk L2 children would not have improved in words from the Energy Center songs). Furthermore, it indicates that playing the songs in class has an enhancing effect on the receptive vocabulary of the at risk L2 children (despite the finding that playing the songs in class has no enhancing effect on the preschool children in total). The at risk L1 children also improved their receptive vocabulary in both learning contexts. But in contrast to the at risk L2 children, the at risk L1 children improved more in words from the

Energy Center songs than the Energy Center and classroom songs. Therefore, playing in the Noplica Energy Center has a positive effect on this group's receptive vocabulary, yet playing the songs in class seems to have a smaller effect on the at risk L1 children's receptive vocabulary compared to the at risk L2 children.

All in all, the at risk L1 and L2 children were similarly affected by playing in the Noplica Energy Center. Playing the songs also in the classroom improved the at risk L2 children's vocabulary more than the at risk L1 children's vocabulary.

4.2 The effect of the Energy Center

It was expected that the preschool children's receptive vocabulary would improve by playing in the Noplica Energy Center. Young children presumably acquire vocabulary incidentally from (limited) language input (Clark, 1993). Therefore, the preschool children were expected to learn new words from the songs played in the Energy Center. Besides, the musical components (Coyle and Gómez Gracia, 2014; Chou, 2014) and physical components (Schilling et al., 2006; Cook, 2000; Tomlinson et al., 2009) of the Energy Center were also expected to facilitate the learning of new words, although this was not explicitly tested. As expected, playing in the Noplica Energy Center improved the preschool children's receptive vocabulary. This finding thus provides further evidence that young children can incidentally acquire vocabulary from (limited) input (Clark, 1993) and that musical and physical language learning activities can contribute to vocabulary learning (Coyle and Gómez Gracia, 2014; Chou, 2014; Schilling et al., 2006; Cook, 2000; Tomlinson et al., 2009). In addition, they prove the overall functionality of the Noplica Energy Center and their overall positive effect on children's vocabulary.

However, a number of additional factors might play a role in the improvement of vocabulary we observed: For one, the children might have acquired the target vocabulary merely by accident, for example through exposure to Dutch at home or at school. The preschool teachers agreed not to teach any target words at the daycare during the period of data collection. Nonetheless, even at the daycare, complete avoidance of the target words can naturally not be guaranteed. Another explanation for the children's receptive vocabulary improvement could be that the posttest showed a learning effect from the pretest. The children were exposed to all the target words at least once in the pretest (sometimes the target words were even repeated several times if the child did not respond). Assuming that the children had no further exposure to the target words between the pre- and posttest, the children would still have been more frequently

exposed to the target words in the posttest than the pretest. Little exposure can already be sufficient for young children to acquire vocabulary (Clark, 1993).

4.3 The effect of playing the songs in class

We expected that the preschool children's receptive vocabulary would improve even more when the Noplica songs were also played in the classroom in addition to playing in the Noplica Energy Center. Vast exposure to new words, for example through playing songs in the classroom in addition to playing them in the Energy Center, should be beneficial for learning new words. We found that playing the Noplica songs in the classroom did not reinforce the receptive vocabulary learning of the total group of preschool children (at risk L1 and L2 combined). However, when analyzing the two groups of children separately, we found that playing the songs in class did reinforce the children's receptive vocabulary learning, although differently for the at risk L1 and L2 children. We will discuss these group effects in more detail in the next paragraph.

      Before moving on to these group effects, we give two possible explanations of why playing the songs in class did not seem to reinforce the vocabulary learning of the total group of preschool children. First of all, it could be that the target words from the Energy Center and classroom songs are more difficult to acquire than the target words from the Energy Center songs. The preschool children recognized more words from the Energy Center songs on the pretest ($M = 9.87$, $SD = 3.64$) than from the Energy Center and classroom songs on the pretest ($M = 8.13$, $SD = 4.21$), indicating that these latter words could have been more difficult to learn. A one sample t-test indeed indicated a significant difference in the number of recognized words on the pretest between the two learning contexts ($t(14) = 3.93$; $p < .01$). The additional exposure of the words from the Energy Center and classroom songs might not to have been sufficient to overcome the difference in learnability between the words from the two learning contexts. The reason why the words from the Energy Center and classroom songs would be harder to acquire is unknown. Possibly, the words from the Energy Center and classroom songs are less frequent in Dutch language use than the words from the Energy Center songs (see Appendix C). A second explanation of why playing the songs in class did not seem to amplify the total group's vocabulary learning, is that the context in which the songs were played in the classroom was too passive. In the method, it is mentioned that the preschool children mostly listened to the songs in the classroom whilst involved in other activities. The children might have been too focused on these other activities to incidentally acquire any vocabulary from the songs.

4.4 Differences in receptive vocabulary improvement between at risk L1 and L2 children

It was expected that the receptive vocabulary of both at risk L1 and at risk L2 children would be positively affected by playing in the Noplica Energy Center and playing the songs in the classroom. In addition, we expected the L1 group to always outperform the L2 group. After all, L1 speakers acquire new words incidentally from language input more easily than L2 speakers (Clark, 1993) and the at risk L2 children would thus be able to acquire vocabulary from the songs in the Energy Center and classroom more easily.

Differences in the effect of the Noplica Energy Center between at risk L1 and L2 children
Both the at risk L1 and L2 speakers were able to benefit from the Energy Center similarly. This is surprising given that it is more difficult to acquire new words in an L2 than in an L1 (Clark, 1993). Possibly, the at risk L1 children needed less exposure to the words in the songs in the Energy Center than the at risk L2 children in order to acquire them, and thus the at risk L1 children learned the target words quicker. Yet, the period of time in between the pretest and posttest was possibly long enough for the at risk L2 children to be exposed further to the target words and eventually match the at risk L1 children's receptive vocabulary improvement.

Secondly, the at risk L1 children might have more actual language delays and problems than the at risk L2 children. Although all the participating children are labeled as children at risk of (Dutch language) delays and problems, it is unclear if and to what extend the children actually have these delays and problems. Furthermore, the possible Dutch language delays and problems of the L1 and L2 group could be of a different nature and severity. The L1 children could have more severe language problems (e.g. language development disorder), whereas the L2 children could have less severe language problems or problems with a non-linguistic nature (e.g. social, motoric, or numeracy deficits). The possibly more frequent and severe language problems of the at risk L1 children could have prevented them from acquiring new words from the Energy Center more easily than the at risk L2 children. Due to privacy reasons, the daycare did not release the exact details of the delays and problems of the children.

Differences in the effect of playing songs in class between at risk L1 and L2 children
Playing the Noplica songs in the classroom reinforced the at risk L2 children's receptive vocabulary development more than the at risk L1 children's receptive vocabulary development.

This is surprising, considering that L1 children acquire new words more easily than L2 children (Clark, 1993). Possibly, the at risk L1 children's receptive vocabulary did not enhance as much due to a ceiling effect. The at risk L1 children recognized more words ($M = 21.00$, $SD = 7.53$) than the at risk L2 children ($M = 15.38$, $SD = 7.25$) on the pretest, indicating that the at risk L1 children knew more target words than the at risk L2 children at the start of the experiment. The at risk L1 children could thus improve their receptive vocabulary less than the at risk L2 children. However, there was still some room for improvement on the pretest in target words from the Energy Center and classroom songs for the at risk L1 children (a.k.a. no ceiling effect): only one of the at risk L1 children recognized all 15 target words from the Energy Center and classroom songs in the pretest. Yet, the words from the Energy Center and classroom songs may be more difficult to acquire than the words from the Energy Center songs (see previous paragraph). Some of the target words from the Energy Center and classroom songs were possibly too difficult to learn for any of the children. The remaining target words from the Energy Center and classroom (that might not be too difficult to learn), may have been largely known by the at risk L1 children already in the pretest. Thus, the at risk L1 children could possibly not improve on these 'learnable words' from the Energy Center and classroom. Hence, a possible ceiling effect. When observing the scores from the pre- posttest, some target words from the Energy Center and classroom songs (e.g. *enkels* [ankles], *beschuit* [type of cracker]) were indeed recognized by very few children on both the pretest and posttest. However, an item analysis should be performed to validate whether some target words were truly too difficult to acquire.

4.5 Limitations

Although the results are striking, we are aware of the fact that the scope of our results is limited for a number of reasons. First of all, we were only able to obtain data from 15 participants. This small sample size inevitably limits the statistical power of this research. More research is needed to validate whether the pattern of results observed in this study withholds larger sample sizes.

Secondly, the experimental design would ideally have included another control group of children that do not have access to the Energy Center and its songs. That way, possible beneficial effects of the Energy Center can be endorsed or rejected dependent on the findings in the control condition. When the experimental group would improve more on receptive vocabulary than the control group, then we would know that the children's vocabulary

improvement is most likely due to the Energy Center and/or playing songs in class. When the receptive vocabulary improvement of the experimental group and the control group would be similar, then we know that the children's vocabulary improvement is due to other external factors.

Additionally, there might have been differences in learnability between words from the Energy Center songs and words from the Energy Center and classroom songs: the selected target words from the Energy Center and classroom songs might be more complex than the selected target words from the Energy Center songs. The at risk L1 children improved more on the words from the Energy Center songs than the words from the Energy Center and classroom songs. It is unclear if this finding is the aftermath of not having words with an equal learnability across the two learning contexts or a lack of effect of playing the songs in class. Ideally, the same set of target words would have been used in both learning contexts but with a different group of children. Then the differences between experimental conditions could not have been attributed to differences in target words.

Finally, the variety of delays and problems in the investigated population should ideally have been controlled. It is unknown if and to what extend the children have (language) delays and problems. The nature and severity of these possible delays and problems is also unknown. The children might thus highly vary in this area. These possibly large individual differences could have influenced the data (e.g. one group of children could have more delays and problems of a different severity and nature than the other group, thus influencing the data to a different extend). Future studies should therefore control for the children's delays and problems (e.g. children with similar language and non-linguistic problems).

4.6 Follow-up studies

It is of great interest to examine which components of the Noplica Energy Center contribute to the positive effect on vocabulary learning. Would merely listening to songs in the Energy Center already improve the children's receptive vocabulary? Would this possible receptive vocabulary improvement be enhanced by adding the physical component to the Energy Center (spinning the wheels of the handbikes)? Secondly, further research could explore the effects of the Noplica Energy Center on productive vocabulary or other linguistic domains (such as syntax, phonology). Thirdly, follow-up studies could research whether the effects of playing in the Energy Center and playing the songs in class would reinforce vocabulary learning when

giving the children instructions about the target words (a.k.a. matching meaning to the target words). Thus, not only incidental vocabulary learning would be measured, but also intentional vocabulary learning. Fourthly, future studies could control for possible item effects. This way, it can be avoided that some items are too difficult or easy to learn for the children or one group of children. Finally, it would be interesting to examine whether children of different ages (e.g. preschool, kindergarten, primary school) benefit from playing in the Energy Center and playing the songs in class to equal degrees.

5. Conclusion

In conclusion, playing in the Noplica Energy Center had a positive effect on the preschool children's receptive vocabulary learning. This effect was similar for the at risk L1 and L2 children. Furthermore, playing the songs in the classroom had a more positive effect on the at risk L2 children than the at risk L1 children. Other than that, the children seem to genuinely enjoy playing in the Energy Center.

The positive effect of playing in the Noplica Energy Center on the at risk L1 and L2 children's vocabulary learning and the positive effect of playing the songs in class on the at risk L2 children's vocabulary learning support the idea that preschool children are able to acquire new words incidentally from minimal language input (Clark, 1993) and that musical and physical language learning activities can contribute to vocabulary learning (Coyle and Gómez Gracia, 2014; Schilling et al., 2006; Cook, 2000; Tomlinson et al., 2009). The latter positive effect of playing the songs in class on the at risk L2 children's vocabulary learning indicates that further exposure to the target words influences vocabulary learning.

The positive effect of the Noplica Energy Center on the children's vocabulary learning provides first scientific evidence for the effectiveness of the Energy Center in a real-life context. The Energy Center in particular and Noplica in general could truly serve as a helpful vocabulary learning tool for children in general and even for children at risk of language delays. Furthermore, these effects can in principle be amplified by additionally playing the songs from the Energy Center in a classroom environment.

References

Asher, J. F. (1977). *Learning another language through actions*. Los gatos, Ca: Sky Oaks.

Asher, J. F. (1989). *Brainswitching*. Los gatos, Ca: Sky Oaks.

Asher, J. F. (1994). *The Total Physical Response: a stress free, brain compatible approach to learning*. SEAL, Autumn.

Bevolkingsgroei, migratiesaldo en natuurlijke aanwas (2016). Retrieved at August 8th, 2018, from https://www.cbs.nl/nl-nl/nieuws/2016/04/bevolking-groeit-vooral-door-immigratie.

Carlsson-Paige, N. (2008). Reclaiming play: Helping children learn and thrive in school. *Exchange: The Early Childhood Leaders' Magazine Since*, 1978, 180, 44-48.

Chou, M. (2014). Assessing English vocabulary and enhancing young English as a Foreign Language (EFL) learners' motivation through games, songs, and stories. *Education 3 13: International Journal of Primary, Elementary and Early Years Education*, 42(3), 284-297.

Clark, E. V. (1993). *The Lexicon in Acquisition*. Cambridge: Cambridge University Press.

Cook, G. (1997). Language play, language learning. *English Language Teaching Journal*, 51(3).

Cook, G. (2000). *Language play, language learning*. Oxford, UK: Oxford University Press.

Coyle, Y., & Gomez Gracia, R. (2014). Using songs to enhance L2 vocabulary acquisition in preschool children. *ELT Journal*, *68*(3), 276-285.

François, C., Chobert, J., Besson, M., & Schön, D. (2012). Music training for the development of speech segmentation. *Cerebral Cortex,* 23(9), 2038-43.

Forster, E. 2006. 'The value of songs and chants for young learners'. *Encuentro,* 16, 63-8.

Ellis, R. and R. Heimbach. 1997. 'Bugs and birds: children's acquisition of second language vocabulary through interaction'. *System*, 25(2), 247-59.

Engh, D. (2013). Why use music in English language learning? A survey of the literature. *English Language Teaching,* 6(2), 1916-4742.

Kraus, N., Strait, D. L., & Parbery-Clark, A. (2012). Cognitive factors shape brain networks for Auditory skills: Spotlight on auditory working memory. *Annals of the New York Academy of Sciences*, 1252, 100-107.

Leśniewska, J., & Pichette, F. (2014). Songs vs. stories: impact of input sources on ESL

Vocabulary acquisition by preliterate children. *International Journal of Bilingual Education and Bilingualism*, (February 2015), 1-17.

Medina, S. L. (1993). The effect of music on second language vocabulary acquisition. *National network for early language learning,* 6(3).

Mulder, F., Timman, Y., & Verhallen, S. (2009). *Basiswoordenlijst Amsterdamse Kleuters* [Basic Vocabulary of Kindergartners in Amsterdam]. Amsterdam: Drukkerij De Raat & De Vries.

Muñoz, Carmen. 2007. "Age-related Differences and Second Language Learning Practice." *In Practice in a Second Language*, edited by Robert M. DeKeyser, 229-255. Cambridge: Cambridge University Press.

Noplica (n.d.). Retrieved at March 10th, 2018, from http://www.noplica.nl/#product.

Rohde, A. and C. Tiefenthal. 2000. 'Fast mapping in early L2 lexical acquisition'. *Studia Linguistica*, 54(2), 167-74.

Scharlaekens, A. M. (2008). "De differentiatiefase (twee en een half – vijf jaar)." *De taalontwikkeling van het kind.* Groningen: Noordhoff Uitgevers.

Schilling, T., McOmber, K., Mabe, K., Beasley, g., Funkhouser, S., & Martinez, L. (2006). Promoting language development through movement teaching. *Elementary Physical Education*, 17(6), 39-42.

Schön, D., Gordon, R., Campagne, A., Magne, C., Astés-ano, C., Anton, J. L., & Besson, M. (2010). Similar cerebral networks in language, music and song perception. *NeuroImage*, 51(1), 450-461.

SCP, WODC en CBS (2005). *Jaarrapport Integratie 2016*. Den Haag/Voorburg: Sociaal en Cultureel Planbureau (SCP), Wetenschappelijk Onderzoek en Documentatiecentrum (WODC), Centraal Bureau voor de Statistiek (CBS).

Tomlinson, B. & Masuhara, H. (2009). Playing to learn: a review of physical games in second language acquisition. *Simulation & Gaming*, 40(5), 645-668.

Voor wie is VVE? (n.d.) Retrieved at August 16th, 2018, from https://www.kion.nl/kinderopvang/voorschoolse-en-vroegschoolse-educatie

Wat is VVE? (n.d.) Retrieved at August 16th, 2018, from https://www.onderwijsinspectie.nl/ onderwijssectoren/voor-en-vroegschoolse-educatie/wat-is-voor-en-vroegschoolse-educatie

Zeromskaite, I. (2014). The Potential Role of Music in Second Language Learning: A Review Article. *Journal of European Psychology Students*, 5(3), 78-88.

Appendices

Appendix A
Consent form for the daycare

Baby & Child Research Center
Postbus 310, 6500 AH Nijmegen

Bezoekadres
Montessorilaan 3, 6525 HR Nijmegen
024 36 11 203 | brc@ru.nl

INFORMATIEDOCUMENT EN TOESTEMMINGSVERKLARING KINDERDAGVERBLIJF

Van 24 mei t/m 28 juni zal er bij kinderdagverblijf Pino een onderzoek naar *het Noplica Engergy Center* plaatsvinden. Het Noplica Energy Center is een spel in een speelhuisje dat kinderen helpt om een taal te leren (http://www.noplica.nl/). Het onderzoek zal worden uitgevoerd door studente Monique De Nijs onder leiding van Prof. Paula Fikkert van de Radboud Universiteit. In deze brief geven we u informatie over dit onderzoek.

Uitleg onderzoek
We zullen in dit onderzoek kijken of het speelhuisje jonge kinderen (2-4 jaar) helpt om woordjes in een tweede taal te leren. In het speelhuisje worden liedjes afgespeeld wanneer er aan een rad gedraaid wordt. Dat liedjes kunnen helpen bij het leren van taal is reeds bekend, maar we zouden graag willen weten of het speelhuisje jonge kinderen ook helpt om woordjes in een *tweede taal* te leren. Daarom doen we dit onderzoek.

De deelnemende kinderen zullen twee keer meedoen aan een woordherkenningstaak: de eerste keer op 24 mei (ochtend en middag) en de tweede keer op 28 juni (ochtend en middag). De eerste keer wordt gemeten hoeveel woorden uit de speelhuisliedjes de kinderen aanvankelijk kennen. Na vijf weken meten we dat nog een keer. Tussen de twee meetmomenten zullen de kinderen in het speelhuisje spelen en op 7 juni (ochtend en middag) zullen de kinderen enkele liedjes nog eens in de klas te horen krijgen. Het meten gebeurt spelenderwijs en is geen 'test'. Ook worden de resultaten van de kinderen alleen op groepsniveau geanalyseerd en niet individueel. Er wordt geen gebruik gemaakt van audio- of video-opnames.

Informatievoorziening
De ouders/verzorgers van alle deelnemende kinderen zullen op 17 mei van de uitvoerende onderzoeker (Monique De Nijs) een informatiedocument ontvangen met daarin uitleg over het onderzoek. In dit document wordt tevens gevraagd om toestemming voor de deelname van het kind. Mochten de ouders/verzorgers geen toestemming willen verlenen, dan kunnen ze dit aangeven door vóór 24 mei een email te sturen naar monique.nijs@student.ru.nl.

Vertrouwelijkheid van de onderzoeksgegevens
De gegevens die in dit onderzoek worden verzameld, zullen door wetenschappers gebruikt worden voor een masterscriptie, artikelen en presentaties. Natuurlijk worden deze gegevens volledig anoniem gemaakt en bewaard volgens de aan de Radboud Universiteit geldende richtlijnen. Uitgangspunt is dat de geanonimiseerde data tenminste tien jaar ten behoeve van de wetenschappelijke gemeenschap opvraagbaar zijn.

Nadere inlichtingen

Voor vragen of verdere informatie over het onderzoek kunt u contact opnemen met de uitvoerende onderzoeker Monique De Nijs (tel.: 0654612295; e-mail: monique.nijs@student.ru.nl) of de verantwoordelijke hoogleraar Prof. Paula Fikkert (e-mail: p.fikkert@let.ru.nl).

Toestemming

Ik geef de onderzoeker(s) van de Radboud Universiteit toestemming het onderzoek uit te voeren op kinderdagverblijf Pino

Naam school/instelling ……..

Naam en functie…….

Handtekening:……

Datum: ………

Appendix B
Passive consent form for the parents

Max Planck Instituut voor Psycholinguïstiek
Radboud Universiteit

Baby & Child Research Center
Postbus 310, 6500 AH Nijmegen
Bezoekadres
Montessorilaan 3, 6525 HR Nijmegen
024 36 11 203 | brc@ru.nl

INFORMATIEDOCUMENT VOOR OUDERS/VERZORGERS

Geachte ouders/verzorgers,

Binnenkort zal er bij het kinderdagverblijf van uw kind een onderzoek naar het *Noplica Engergy Center* plaatsvinden. Het Noplica Energy Center is een spel in een speelhuisje dat kinderen helpt om een taal te leren (http://www.noplica.nl/). Het onderzoek zal worden uitgevoerd door studente Monique De Nijs onder leiding van Prof. Paula Fikkert van de Radboud Universiteit.

Het onderzoek zal in de vorm van een spel worden gedaan en kinderen vinden het vaak leuk om aan een onderzoek mee te doen. Het onderzoek vindt plaats op het kinderdagverblijf en natuurlijk houden we rekening met eventueel geplande activiteiten op de betreffende dagen. De leiding van het kinderdagverblijf van uw kind stemt in met deelname van uw kind aan het onderzoek naar het Noplica Energy Center en verleent haar volledige medewerking.

In deze brief geven we u informatie over dit onderzoek. Uw kind zal aan het onderzoek deelnemen van 24 mei t/m 28 juni. Indien u niet wilt dat uw kind aan het onderzoek meedoet, kunt u dat vóór 24 mei aan de uitvoerende onderzoeker (monique.nijs@student.ru.nl) doorgeven.

Doel en procedure van het onderzoek
Zoals u wellicht gemerkt heeft, is er recentelijk een speelhuisje op het schoolplein van de Bloemberg gebouwd waarin kinderen liedjes te horen krijgen als ze met de handfietsen spelen. Ook Pino maakt gebruik van dit speelhuisje. Dat liedjes kunnen helpen bij het leren van taal is reeds bekend, maar we zouden graag willen weten of het speelhuisje jonge kinderen ook helpt om woordjes in een tweede taal te leren. Daarom doen we dit onderzoek.

Uw kind zal twee keer meedoen aan een woordherkenningstaak: de eerste keer wordt gemeten hoeveel woorden uit de speelhuisliedjes uw kind aanvankelijk kent. Na vijf weken meten we dat nog een keer. Tussen de twee meetmomenten zal uw kind in het speelhuisje spelen en een enkele keer de liedjes in de klas te horen krijgen. Het meten gebeurt spelenderwijs en is geen 'test'. Ook worden de resultaten van uw kind alleen op groepsniveau geanalyseerd en niet individueel. Er wordt geen gebruik gemaakt van audio- of video-opnames.

Risico's en ongemakken
Er zijn bij dit onderzoek geen risico's voor de gezondheid of de veiligheid van uw kind.

Vertrouwelijkheid van de onderzoeksgegevens

De gegevens die we in dit onderzoek verzamelen, zullen door wetenschappers gebruikt worden voor een masterscriptie, artikelen en presentaties. Natuurlijk maken we deze gegevens volledig anoniem en bewaren we ze volgens de aan de Radboud Universiteit geldende richtlijnen. De anoniem gemaakte data bewaren we tenminste tien jaar zodat ze voor andere onderzoekers opvraagbaar zijn.

Vrijwilligheid

Uw kind kan altijd weigeren om mee te doen of op elk gewenst moment tijdens het onderzoek stoppen. Alle gegevens die we bij uw kind verzameld hebben, worden dan definitief verwijderd. Ook na het onderzoek (tot 24 uur na deelname) kunt u dit aan ons doorgeven.

Nadere inlichtingen

Als u graag verdere informatie over het onderzoek wilt hebben, nu of in de toekomst, kunt u contact opnemen met Monique De Nijs (e-mail: monique.nijs@student.ru.nl) of Prof. Paula Fikkert (p.fikkert@let.ru.nl). Voor eventuele klachten over dit onderzoek kunt u contact opnemen met:

Prof. Dr. J. P. M. Fikkert, hoogleraar Nederlandse Taal en Cultuur
Radboud Universiteit
Postbus 9103
6500 HD Nijmegen
Tel: 024- 3612669
p.fikkert@let.ru.nl

Appendix C
The selected target words

Table A1. *Target words of both learning contexts and their English translation.*

	Target words Energy Center songs	English translation	Target words Energy Center + class songs	English translation
1	ei	enkles	enkels	egg
2	trap	chin	kin	stairs
3	brood	back	rug	bread
4	cadeaus	toes	tenen	present
5	pan	fingers	vingers	pan
6	kwast	broom	bezem	brush
7	maan	witch	heks	moon
8	spin	tail	staart	spider
9	planten	stomach	buik	plants
10	kist	doctor	dokter	chest
11	helm	fruit	fruit	helmet
12	boot	throat	keel	boat
13	gitaar	rat	rat	guitar
14	badpak	ghost	spook	bathing suit
15	snorkel	snorkel	beschuit	type of cracker

Appendix D

The raw scores of the at risk L1 and L2 preschool children

Table B1. *Participants' scores.*

Participant nr.	Score pretest Energy Center	Score pretest Energy Center+classroom	Score total pretest	Score_posttest Energy Center	Score posttest Energy Center+classroom	Score total posttest	List nr.	Age (y;m)	Gender	Language status	L1
1	9	9	18	12	10	22	1	3	f	at risk L1	Dutch
2	4	0	4	8	7	15	2	2;11	m	at risk L2	Hindu
3	8	6	14	9	8	17	2	3;7	f	at risk L2	Czech
4	12	11	23	13	12	25	1	3;7	m	at risk L1	Dutch
5	11	9	20	12	10	22	2	2;11	f	at risk L2	German, Afrikaans
6	7	4	11	12	10	22	1	2;7	m	at risk L1	Dutch
7	14	11	25	15	12	27	2	3;7	m	at risk L1	Dutch
8	7	5	12	12	7	19	1	2;11	m	at risk L1	Dutch
9	10	10	20	9	12	21	1	3;4	m	at risk L2	French
10	4	2	6	10	11	21	1	3;8	f	at risk L2	Indonesian
11	14	11	25	15	13	28	2	3;9	f	at risk L2	Indonesian, Arabic
12	7	8	15	10	12	22	1	3;5	f	at risk L2	Pashto
13	12	7	19	12	9	21	2	3;5	m	at risk L2	Turkmen
14	14	14	28	15	14	29	1	3;11	f	at risk L1	Dutch
15	15	15	30	15	13	28	2	4	f	at risk L1	Dutch