Deaf children can make rhymes: evidence from a simple rhyme task

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Previous research has been equivocal about whether deaf children can develop rhyme awareness. The current experiment investigates the rhyme skills of deaf children (mean age 11 years). Deaf children's ability to make rhyme judgements was above chance, but poorer than that of their reading matched hearing controls. We conclude that deaf children do have a degree of rhyme awareness. We also discuss how deaf children might have developed rhyme awareness given their impoverished auditory and language environment.

Les enfants sourds savent faire des rimes :
constatation obtenue lors d'une tâche simple de rimes

Les précédentes recherches n'ont pas été très claires sur le fait de savoir si les enfants sourds peuvent développer une conscience des rimes. L'expérience actuelle examine la capacité des enfants sourds (âge moyen 11 ans) à analyser des rimes. La capacité des enfants sourds à analyser des rimes était plus que statistiquement significative, mais moins bonne que celle des enfants témoins entendants de même niveau de lecture. Nous en avons conclu que les enfants sourds avaient effectivement un certain degré de conscience des rimes. Nous avons également examiné la façon dont les enfants sourds pourraient avoir développé une conscience des rimes malgré la pauvreté de leur environnement auditif et linguistique.

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DEAF CHILDREN CAN MAKE RHYMES: EVIDENCE FROM A SIMPLE RHYME TASK

Introduction

Rhyme awareness is known to be an important predictor of reading development in English-speaking children (Bradley 1 Bryant, 1983; Bryant, Bradley, Maclean & Crossland, 1990). Some studies have concluded that deaf children do have phonological awareness of rhyme(Dodd & Hermelin, 1977; Hanson & Fowler, 1987; Hanson & McGarr, 1989). However, other studies find no evidence of phonological rhyming ability in deaf children (Campbell & Wright, 1988; Campbell & Wright, 1990).

Dodd & Hermelin (1977) showed that 13 year-old deaf children were able to make use of rhyme as a phonological cue to aid performance in a homophone-matching task. The deaf group made significantly fewer errors in matching homophonic word pairs (e.g., « reign-rain ») than non-homophonic word pairs that had three letters in common (e.g. « than-train »). However, the study did not include measures of reading age, intelligence or hearing loss. This makes it difficult to know whether this group of children was a representative sample of the deaf population as a whole.

In a second study that showed rhyme skills in the deaf, Hanson and McGarr (1989) asked a group of deaf college students to generate rhymes to a given target word. 30 % of the responses generated were non-orthographic rhymes (e.g. »blue-through »), indicating that this deaf group was able to generate the phonological forms of rhymes in this task. However, this result should be considered with caution, since the study did not work with a typical sample of deaf subjects (the deaf group in the study had a reading grade of 10.1 in comparison with a normal deaf grade average of 3-4). Thus Hanson and McGarr conclude that « the results of this study should not be taken to indicate... that rhyme ability is necessarily characteristic of deaf individuals. (pp.7) ».

The third study showing evidence of rhyme skills in the deaf was by Hanson and Fowler (1987). In one of their experiments, deaf college students had to make a forced rhyme judgement between sets of word pairs that rhymed (e.g., « wave-save »), or were non-rhyming but orthographically similar (e.g., « have-cave »). The deaf group performed at a level significantly above chance (62.4% correct), although they were much poorer at the task than the hearing controls (99,8% correct). While this study indicates that the deaf can use a phonological code, the deaf students participating in the study were some of the best educated of deaf individuals with advanced reading skills. Thus these results also may not be representative of all deaf children. When Waters and Doehring (1990) attempted to repeat Hanson and Fowler's study with oral deaf children, they were unable to replicate these performance levels.

Campbell and Wright (1988) also found that deaf teenagers did not have phonological rhyme skills. They used a simple rhyme judgement task with deaf children and groups of reading and age matched controls. The task involved sorting picture and word pairs into rhyming and non-rhyming piles. The deaf group was significantly worse then either of the hearing control groups at judging rhyme pairs, and was especially poor at matching rhymes that did not share deaf adolescents were not able to achieve reliable phonological orthographic form of word to solve the rhyme task. However, it is unclear how much instruction about rhyme was given to the deaf children, and whether they understood the concept of rhyme. A second problem is that Campbell and Wright did not pre-test the picture items used in the rhyme task with the deaf group. It may be that the deaf children were not using the correct picture names for the task.

In another study, Campbell and Wright(1990) concluded that deaf children (from 9;9 years to 14;6 years) were unable to make use of phonological cues when asked to sort or match rhyming picture pairs in a paired recall task. Rhyming picture pairs like « fly-eye » were recalled poorly by the deaf group. The deaf group also made no use of similar spellings (e.g., « cat-hat »). However, the deaf subjects did make use of semantic information in matching semantically related picture pairs (e.g., « knife-fork »). These negative results could reflect the fact that the chosen tasks provide a rather indirect measure of deaf poor global language skills they may need to be forced into using a phonological code, as in Hanson and Fowler's paradigm based on forced rhyme judgements.

Our rhyme experiment was designed to investigate whether deaf children develop rhyme awareness. We sought to avoid the various methodological drawbacks noted in previous rhyme studies with the deaf. We also tested a representative sample of deaf children rather than selecting high level academic deaf students (as in the Hanson and McGarr, and Hanson and Fowler studies).

Following Campbell and Wright, we used a picture judgement task to assess rhyme awareness. It was considered important that the rhyme task used pictures rather than words as deaf children have reading problems, and thus asking them to read words in a rhyme task may put them at a disadvantage. Also, if the words to be judged are presented orthographically, the deaf children would not need to convert the visual spelling form of the rhymes to a phonological representation. We used a matching-to-sample task, in which the children were asked to choose the item that rhymed with the target picture from two alternatives.

Our rhyme task differed from Campbell and Wright's (1988) task in three ways. Firstly, the children were given explicit instructions about what a rhyme was and were given opportunities to make rhyme pairs before participating in the experimental task. We also used a picture pre-test to ensure that the deaf children knew the spoken names of the pictures. Secondly, additional categories of distracter items were used. Distracter items varied in phonological and orthographic similarity to the target rhyme item, or shared similar lip-shapes with the target picture. The effects of the distracter items were intended to reveal more information about the

strategies used by the deaf children in this task. For example, if the deaf group showed poor performance for making rhyme judgements when the distracter item had a similar lip-shape to the target picture, then this would indicate that a lip-shape strategy was being employed to complete the task. Finally, the reaction times for the rhyme judgements were measured in order to gain a clearer picture about the pattern of performance for the deaf group.

Two sets of rhyming pairs were designed. One set of rhyming pairs were orthographically similar (e.g., « clock-sock ») while the other set consisted of pairs that were non-orthographically similar (e.g., « fly-eye »). It was predicted that, if the deaf children were able to make rhyme judgements about pictures with similar sounding names but different spellings, this would indicate phonologically-based rhyme skills.

Method

Subjects

Two groups of children took part in this study: a deaf group, and a reading matched control group. The fourteen deaf children were from two integrated units in London, and a residential deaf school in St. Albans. While all the deaf children had some experience of sign, 7 educated in an exclusively oral fashion, and 10 were in a total communication setting. All the children were profoundly deaf, and the amount of residual hearing on its own would not have allowed them to clearly differentiate speech inputs. The 16 hearing children were from a school in West London where one of the deaf units was situated, and formed the reading matched group.

All the children were given the Ravens Progressive Matrices to measure non-verbal intelligence, and the Group Reading Test (NFER-Nelson, 1985) to assess reading levels. Summary statistics of chronological ages, reading ages, and Igs for the groups are provided in table 1. The reading scores and the IQ percentiles for the deaf group and the reading matched controls were statistically compared using t-tests. this showed that there was no significant difference between the two groups for either reading score, $t(28)=.72$, or IQ percentiles, $t(28)=.87$.

Table 1 - see page 149

Design

The experiment used a within-subjects design. Each child from both the deaf group and reading matched hearing controls was seen several times in order to administer the IQ test, the reading test, the picture-naming pre-test, and the experimental task. These tasks were carried out on separate days.

The experimental task consisted of 50 rhyme judgement trials based on five different word sets. Each word set had a different category of distracter and consisted of ten picture triplets, made up of two rhyming words and a distracter item. The distracter types were :

(1) totally dissimilar to the target, (e.g., « bed »- »sock »)

(2) a similar lip-shape with the target, (e.g., « moon » - « boat »)

(3) shared initial consonant with the target, (e.g., « witch »- »wall »),

(4) shared initial consonant cluster with the target, (e.g., « snowman »- »snake »),

(5) shared initial onset-vowel with the target, (e.g., « bricks »- »bridge »).

Five of the rhyming pairs in each set shared similar orthography (O+, e.g., « clock-sock »), while the other five rhyming pairs had different orthography (O-, e.g., « fly-eye »). In each trial, the child saw three pictures. The target picture was presented above the two picture choices, and was bounded by a red frame. The correct rhyme match and the distracter item were each bounded by a blue frame. If a picture was coloured to provide clearer semantic cues, then the other two pictures were also coloured. The 50 trials were split into two sessions, as it was felt that the children would not be able to do 50 trials in one session. The order of the two sessions was counterbalanced across both groups. The trials within each session were presented in random order. Accuracy and reaction time were the two dependent variables measured.

The average word frequency for each word set, and for the 0+ and 0- rhyming pairs within each set, were matched using the U-frequency scores from Carroll, Davies & Richman (1971). The word sets used in this experiment can be seen in the appendix.

Procedure

There was pretest session before the experimental task was given. In the pretest, the children were shown picture of all the words that were going to be used in the experimental task. The pictures were printed on A4 sheets of paper, with two pictures to a page. Once the child correctly named the picture, they turned the page to the next pair of pictures. If the child did not know the name of the picture, they were told its name, and asked to remember it. The children were then retested on these picture names, and if any child could not recall a name, they were excluded from the task. There were a few instances where a deaf child was able to sign the name of the picture, but not produce an oral response. This was considered as incorrect. After children were excluded, there were 14 children in the deaf group, and 16 children in the RA controls.

The experimental task was given across two sessions. In the first experimental sessions, the children were asked to define the meaning of 'rhyme'. None of the hearing children had any problem with this and so they continued with the next part of the task: the practice session. The deaf group (with the exception of two children) could not adequately explain what a 'rhyme' was, so the concept had to be explained carefully and slowly to them. The following was a typical conversation:

« I am going to teach you a new word - rhyme give sign, voice word, and write it down, and write down meaning.] *This is when two words sound the same at the end. I want you to try and think about the sound that words can make. I know that you are deaf and might find this difficult, but there are ways of thinking about it.*

[Write down « bat » and « cat ».] *Do you know what these words are ? What do you notice about them ?*

That's right, they have the same letters at the end. Often rhyming words that sound the same will have the same letters like « bat » and « cat ». Can you think of any other words with « at » (or « a »- »t ») at the end?

Good. These words also have the same lip-shape at the end. [Say « bat », « ball » to emphasise lip-shape.] *Can you see that they have a different end, so these two words do not rhyme? And think about the sound at the end. « Ball » has an « ll » sound and « bat » has a « t » sound.*

Once the children understood this explanation, ten practice picture card triplets were shown. Two of the picture cards were rhyming words, and the other picture was a distracter that shared a similar initial consonant with the target. Five of the rhyme pairs from the ten practice triplets had similar orthography (e.g., « sun-gun »), while the other five did not (e.g., « walk-fork »). If the child chose the wrong picture to match the rhyme cue, then additional explanations were given to the child.

For example (for rhyme pair « walk »- «fork » and distracter « wheel »). *That is not the right choice. « Walk » and « wheel » do not sound the same at the end. They do not rhyme.* [Write down the three words.] *Look at the words. Can you tell me what the last sound is for each word? That's right, « wheel » has an « l » sound, while both « walk » and « fork » have a « k » sound.*
Make sure that you think about the end sound, and not the beginning. Some rhymes, or words that sound the same, don't have the same spelling. This will it a little bit harder, so think carefully about it. »

In this set of instruction, special mentions was made of the spelling of the rhyming pairs, and the fact of sometimes they did not look alike. In the practice section of the experimental task, all subjects had to make 8 out of 10 correct rhyme judgements before going on to the computer practice task and then the main task. In the computer practice task, the computer was shown, and the children accustomed themselves to the button box. The computer task was explained to the children, and they had to complete six more practice trials before moving on to the rhyme-matching task. All the children were able to fulfil the practice criteria.

For the second session, the deaf children were asked about what a 'rhyme » was. Most children were able to answer this easily, and all children could answer when reminded of some of the previous instructions. All children did the computer practice task before continuing with the second block of trials of the main rhyme judgement task.

RESULTS

The mean number of correct rhyme judgements and the reaction times for both groups are shown in table 2. Inspection of the table shows that the deaf group performed better with the orthographic rhyming pairs (O+) both in terms of reaction time and accuracy. This was not the case for the hearing children, who performed equally well with both sets of rhyme pairs.
Table 2 : see page 149

Analysis of accuracy scores

In order to investigate whether the dead children performed above chance level in rhyme judgement task for orthographic and non-orthographic rhyme pair, a z score analysis was computed for each. The analysis showed that the deaf group performed significantly above chance in the selection of correct rhymes for both orthographic (z=12.29, p<.00) and non orthographic pairs (z=8.71, p<.00).

The scores for both groups were then entered into a 2(Group: Deaf, RA controls) X 2 (Condition: Orthographic, Non-orthographic) analysis of variance, with condition as the within subjects variable. There was a significant effect of group, $F(1,28)$=13.94, p<.01, as well as a significant effect of condition, $F(1,18)$=7.50, p<.01. The group by condition interaction was also significant, $F(1,28)$=4.40, p<.05. The main effect of group was due to the RA controls making significantly more accurate rhyming judgements than the deaf group. The main effect of condition arose because performance with orthographically similar rhyme pairs (e.g., « sock-clock ») was significantly better than performance with non-orthographically similar rhyme pairs (e.g., « fly-eye »). A simple effects analysis of the interaction between group and condition showed that orthographic similarity had no effect for the RA controls, $F(1,28$=.22, but a highly significant effect for the deaf group, $F(1,48)$=10.96, p<.01. The deaf children made significantly more accurate rhyme judgements in the O+ condition. The hearing group did not show the same pattern of performance, although this may have been due to a ceiling effect.

Table 3 - see page 149

Table 3 shows the accuracy scores in each of the word sets for both groups. In order to analyse the effect of distracter type on performance for both groups, the scores were entered into a 2 (Group: Deaf, RA controls) X 5 (Distracter type) analysis of variance, with distracter type as the within subjects variable. There was a significant effect of group, $F(1,28)$=13.94, p<.01, as well as a significant effect of distracter type, $F(4,112)$=14.3, p<.01. There was also a significant group by distracter type interaction, $F(4,112)$=6.68, p<.01. A simple effects analysis of the interaction between group and distracter type showed that the effect of distracter type was restricted to the deaf group, $F(4,112)$=18.93, p<.01. A Neuman-Keuls post-hoc analysis showed that rhyme judgement performance varied with the nature of the distracter. Performance on the word sets where the distracter item shared a similar onset-vowel (e.g., « bricks-bridge ») or initial consonant (e.g., « witch-wall ») with the cue was significantly worse (p<.01) than performance on the word sets where the distracter item was non-similar (e.g., « bed-sock ») or shared a similar lip-shape (e.g., « moon-boat ») or shared a similar initial consonant cluster (e.g., « tree-train »).It is interesting to note that the lip-shape distracter item did not have a strong adverse effect on the deaf children's ability to make rhyme judgements. This suggests that they were using a phonological strategy in the matching task that did not depend on information from lip-shapes.

Analysis of reaction times

The reaction times for both groups were entered into a 2 (Group, Deaf, RA controls) X 2(Condition; Orthographic, Non-orthographic) analysis of variance, with condition as the within

subjects variable. There was a significant effect of group, $F(1,28)=11.20$, $p<.01$, as well as a significant effect of condition, $F(1,28)=8.93$, $p<.01$. The group by condition interaction was also significant, $F(1,28)=7.41$, $p<.01$.

A simple effects of analysis of the interaction between group and condition showed that there was no effect of orthographic similarity for the RA controls, $F(1,28)=p<.01$. The reaction times of the deaf group for the orthographically similar rhyme pairs (e.g. O+, « sock-clock ») were significantly faster than the reaction times for the orthographically different rhyme pairs (e.g., O-, « fly-eye »). These results suggest that orthographic similarity was supporting the rhyming judgements of the deaf group. The RA controls were not susceptible to an orthographic effect, although, as noted previously, this could have been a ceiling effect.

Analyses of possible non-phonological strategies

Even though these results suggest that orthographic similarity does not provide a complete explanation of deaf children's performance in the rhyme judgement task (given the above chance-level performance with the O- pairs), it was felt to be important to examine whether other non-phonological strategies could explain the performance levels of the deaf children with the orthographically dissimilar rhyme pairs.

a. Analysis of similarity of final letters

As the deaf children had been instructed to focus on the ends of the words in order to make rhyme matches, it is possible that the deaf group made their rhyme judgements by comparing the last letters of the rhyming pair words. The possibility that successful judgements were made on the basis of this orthographic strategy was examined by analysing the deaf group's performance on the non-orthographic rhyme pairs. Thirteen of these rhyming pairs had similar final letters (e.g., « chair-pear »), while twelve rhyming pairs had different final letters (e.g., « box-socks »). If the deaf children were utilising a final letter strategy, we would expect superior performance on the rhyming pairs with similar final letters. The performance scores of the deaf group were recalculated into percentages for each of these rhyme pair types. The mean percentage accuracy for rhyming pairs with similar letters was 68.13% (SD 22.95), and for rhyming pairs with different final letters the mean percentage was 72.53% (SD 16.45). A t-test of these scores showed non significant differences between these two categories of rhyme pairs, $t(26)=.58$ (one-tailed) indicating that the deaf group were not using a final letters orthographic strategy for rhyme matching.

b. Analysis of orthographic overlap between non-orthographic rhyme pairs

An alternative orthographic strategy for the deaf children would have been to make rhyme judgements by selecting the word with the highest proportion of letters that overlapped with the target picture name. In order to investigate this possible strategy, the non-orthographic rhyme pairs were categorised into three word sets. The first word set consisted of word triplets in which the rhyme had greater overlap with the target than the distracter, as in target: « light », rhyme: « kite », distracter: « bag » (R>D, 10 items). The second word set consisted of word triplets in which the distracter item had greater overlap with the target that the rhyme, as in

target: « four », rhyme; « saw », distracter: « car » (D>R, 11 items). The use of an orthographic overlap strategy would be indicated by superior performance with the R>D set. The remaining word triplets consisted of rhyme and distracter items that had the same proportion of orthographic overlap with the target (R=D, 4 items).
The accuracy scores of the deaf group were recalculated into percentages for each of these sets. The mean percent correct for the R>D word set was 86.43%. For the D>R word set, the mean percent correct was 63.64%. As performance with the R>D set is superior, these percentages indicate that the use of an orthographic overlap strategy may have supported the deaf children's rhyme judgements to some extent. However, a z score analysis for the deaf group on the D>R set showed that performance accuracy was still significantly above chance, $z=3.38$, $p>.01$. Additionally, a z score analysis for the chance level, $z=2.67$, $p<.01$. In the D>R and R=D cases the deaf children could not rely on orthographic overlap to support rhyme judgements.

Discussion

The results of the rhyme experiment showed that the deaf children were able to make rhyme judgements at a level significantly above chance for both orthographic and non orthographic rhyming pairs of words. However, the deaf group did show a performance difference between orthographic and non-orthographic rhyme pairs. They were significantly more accurate and faster when the rhyming words shared a similar spelling. This indicates that the deaf children were making use of orthographic similarity to support their rhyme judgements whenever this was possible. This may partly reflect the pre-training, which emphasised the different ways of making rhyme judgements, including thinking about the spelling of the rhyme words.
A series of different distracter types were used in order to try and investigate the strategies used by the deaf children in the rhyme judgement task. Only the deaf group was differentially affected by the different types of distracter items. Distracter items sharing similar onset-vowel spellings or similar onsets (single consonant) with the target picture significantly depreciated rhyme judgement accuracy. The distracter items that had no orthographic or phonological similarity to the target picture name had little effect on accuracy. Surprisingly, the lip-shape distracter also had little effect on rhyme judgement accuracy. This suggests that when the deaf group were making rhyme judgements for non-orthographic rhyme pairs such as « door-saw », they were not using phonological information gained from lip-reading cues.
In an attempt to estimate the extent to which orthographic strategies were used to make rhyme judgements about non-orthographic rhyme pairs, two further analyses were carried out. One investigated whether the deaf children compared the final letters on the rhyme word with the target item. The results suggested that this was unlikely to have occurred. The second investigated whether the deaf group could have used an orthographic strategy based on the degree of orthographic overlap between the target and the rhyme. The results of the orthographic overlap analysis indicated that performance was better for those word pairs in which the rhyme had greater orthographic overlap with the target picture than the distracter item (R>D). However, the deaf children's performance was still significantly above chance level for the D>R and R=D word pairs. This would not be predicted if the deaf children had relied exclusively on an orthographic overlap strategy. This provides evidence that the deaf children

were making at least some phonological rhyme judgements. The current experiment thus suggests that deaf children are able to make rhyme judgements in a simple rhyme matching task when task demands are low.

We attempted to rule out possible orthographic explanations for performance on the rhyme tasks. We used two sets of word pairs: orthographic rhymes and non-orthographic rhymes. Although the deaf children were more accurate at making judgements about orthographic rhymes, they were still able to make accurate judgements about non-orthographic rhymes. The positive results of this tasks does contrast with the negative results reported by some of the other studies investigating phonological skills with deaf children and teenagers. For example, Waters and Doehring (1990) found no phonological effect in their lexical decision task, and Campbell and Wright (1988) found that deaf children did not use a phonological strategy in a rhyme judgement task.

One explanation of our finding is that the deaf children were forced utilise a phonological strategy by this simple rhyme task. The children were also given explicit instructions about rhymes and how to do this task. Phonological awareness is clearly not readily or automatically available to the deaf child. However, it seems that when the task demands force a phonological strategy and the child is given additional task-relevant training, then deaf children can show an awareness of phonological structures.

We can only speculate on how deaf children might be able to have rhyme awareness. Charlier and Leybaerth (submitted) have shown that deaf children given cued speech training can have rhyme awareness, however the children in the current study had not received any specific language and phonologically training. The possible ways in which these deaf children may have gained some phonological awareness including lip shapes, reading, kinaesthetic, residual hearing, and living in an oral language environment.

Lip shapes: Evidence from the current rhyme task suggests that this was not factor for making judgements -but this may have been due to problems in the word set. This issue needs to be further investigated.

Reading : Reading does feed into phonological development, and deaf children could picking up phonological cues from the orthography. This would seem to be supported by the improved performance on the orthographic rhyme pairs. This might have implications for the teaching of reading to deaf children. This needs to be further explored with further studies that involve a rhyme-training and word structure analysis intervention with deaf children.

Kinaesthetic : Motor movements involved in pronunciation of words could aid rhyme judgement. This could explain the poorer performance of the deaf group for the word sets that had initial consonant distracter items.

Residual hearing: This might support some phonological development (e.g., syllables), but it seems unlikely that any residual hearing would enable these profoundly deaf children to differentiate rhymes.

Oral language environment: About 90% of deaf children are born to hearing parents, the vast majority of whom do not learn sign language (Jordan & Karchmer, 1986). This means that deaf children inevitably experience the oral language environment despite it being impoverished. This will provide some minimal phonological cues.

The deaf children in this study may have picked up enough oral language and its phonological cues to do this simple rhyme task. Future word needs to look at the nature of phonological coding and to examine whether it is modality specific. There is already much work on the phonological characteristics of sign languages (e.g., Bellugi, van Hoek, Lillo-Martin & O'Grady, 1993), but very little about the relation ship between sign and oral language phonology. Liberman and Mattingley (1985) discuss the idea of phonological categories being a process of developing segmenting skills, and are in fact « linguistic gestures » existing independent of modality. If this is the case, then the issue of which language modality (i.e., oral or sign) is insignificant ion comparison to the necessity of a fulfilling rich and intensive language environment.

Table 1 : Subject characteristics for the deaf and hearing groups
Caractéristiques des sujets composant les groupes d'enfants sourds et entendants

	Deaf / Sourds	RA / entendants
Number / nombre	14	16
Gender / sexe	7 girls / filles	8 girls / filles
	7 boys / garçons	8 boys / garçons
	Mean(Range) Moyenne (fourchette)	
Chronological Age / Age réel (months / mois)	124 (88-150)	92 (87-97)
Reading Age / Age de lecture (Months / mois)	94 (72-126)	91 (81-102)
IQ / QI (Percentiles)	65 (5-95)	66 (25-95)

Table 2 : Mean performance scores and reaction times (seconds) for both groups
Scores et temps de réaction (secondes) moyens pour les 2 groupes

	Accuracy(max 25) / Exactitude		Reaction Times (sec) / Temps réaction	
	O+	O-	O+	O-
Deaf group / Groupe sourds	20.71 (3.69)	18.36 (4.62)	6.36 (1.69)	7.48 (2.61)
RA controls / Groupe témoin	23.81 (2.43)	23.50 (2.1)	4.69 (1.52)	4.75 (1.57)

O+: orthographic rhyme pairs / paires de rimes orthographiques
O-: non-orthographic rhyme pairs / paires de rimes non orthographiques

Table 3 : Performance scores for both groups across the 5 distracter types
Scores des 2 groupes pour les 5 types de distracteurs

		Score (max.10)			
Dist.Type / type distracteur	Non-similar / Non similaire	Lip-shape / Position lèvres	Init. C. / Consonne init	Init. CC. / Groupe cons initial	Head / Début
Deaf group / Groupe sourds	9.00 (1.11)	8.36 (1.45)	7.00 (2.39)	8.50 (1.70)	6.21 (2.22)
RA controls / Groupe témoin	9.81 (.40)	9.50 (1.03)	9.31 (1.20)	9.50 (.82)	9.19 (1.76)

List of word sets used in the rhyme judgement task

O+: orthographic rhyme pairs / paires de rimes orthographiques
O-: non-orthographic rhyme pairs / paires de rimes non orthographiques

Word set 1
Dissimilar distracter items to the target
Distracteurs différents de la cible

Type	Cue	Rhyme	Distracter item				
O+	sock	clock	bed	O+	snail	tail	bridge
O+	spoon	moon	feet	O+	pear	bear	glove
O+	ship	zip	heart	O-	fly	eye	hat
O-	four	saw	car	O-	light	kite	bag
O-	plane	rain	key	O-	drum	thumb	leaf

Word set 2
Similar lip-shape distracter items to target
Distracteurs présentant une image labiale identique à celle de la cible

Type	Cue	Rhyme	Distracter item				
O+	boat	coat	moon	O+	house	mouse	owl
O+	book	hook	man	O+	king	ring	cheese
O+	phone	bone	van	O-	whale	snail	stairs
O-	rope	soap	comb	O-	box	socks	pig
O-	ghost	toast	cloud	O-	bear	hair	pie

Word set 3
Similar initial consonant distracter items to target
Distracteurs présentant une consonne initiale identique à celle de la cible

Type	Cue	Rhyme	Distracter item				
O+	wall	ball	witch	O+	tap	map	ten
O+	run	gun	ring	O+	bag	flag	book
O+	fan	van	fox	O-	goal	bowl	gate
O-	bed	head	boat	O-	kite	light	key
O-	door	saw	dog	O-	fruit	boot	fish

Word set 4
Similar initial consonant cluster distracter items to target
Distracteurs présentant un groupe de consonnes initiales identiques à celles de la cible

Type	Cue	Rhyme	Distracter item				
O+	snake	cake	snowman	O+	train	chain	tree
O+	star	car	stool	O+	fridge	bridge	frog
O+	sweet	feet	swing	O-	plane	rain	plug

O-	shoe	blue	ship	O-	chair	pear	church
O-	three	key	thumb	O-	cry	tie	cross

Word set 5

Similar onset-vowel distracter items to target

Distracteurs présentant des voyelles de début identiques à celles de la cible

Type	**Cue**	**Rhyme**	**Distracter item**				
O+	bridge	fridge	bricks	O+	clown	brown	clock
O+	star	car	stamp	O+	bat	cat	bag
O+	cake	snake	camel	O-	bed	head	belt
O-	chair	pear	chain	O-	shoe	blue	shorts
O-	goal	bowl	goat	O-	boot	suit	book

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