

**HEATHER**

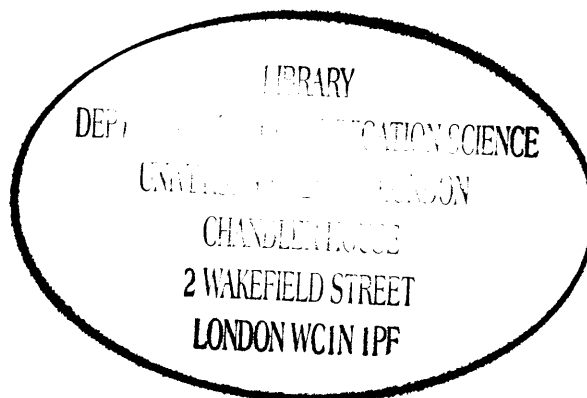
**FOR  
REFERENCE ONLY**



**Does sentence stress affect  
children's learning of new nouns  
and verbs?**

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## **ABSTRACT**

The study investigated the effects of prosody on children's learning of novel words. It was hypothesised that children would learn novel words that carried sentence-final stress more easily than those which did not. Thirteen pre-school children aged 3;0 to 4;6 were exposed to two novel nouns and two novel verbs during a picture-making activity over two sessions, one week apart. After the activity, each child was then tested for production and comprehension of the two novel words taught in the session. It was found that both syntactic category of word and sentence-final stress had an influence on comprehension scores. Significantly more children scored zero on comprehension of unstressed rather than stressed verbs, indicating that the unstressed verbs were significantly harder to learn. Also, significantly more children scored zero on comprehension of unstressed verbs in comparison with unstressed nouns, indicating that there was increased difficulty in learning verbs compared to nouns in the unstressed conditions. Only one child scored a mark for production when tested, and therefore the production data were insufficient for analysis. However, from the small number of spontaneous utterances produced, it was observed that the children followed similar patterns in production of the novel words as with comprehension. There were more spontaneous utterances of the stressed novel word than the unstressed novel word within each syntactic category, and there were more spontaneous utterances using nouns than verbs. The study suggests that sentence-final stress has a significant effect on children's ability to learn novel verbs.

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## INTRODUCTION

Many studies investigating the early acquisition of language have found that verbs tend to emerge later than nouns in children's productive vocabularies. For example, Gentner (1982) found that between the ages of 1;0 and 2;6 nouns make up 50%-85% of children's early lexicons, whereas verbs/predicates only make up 0% to 35%. Goldfield & Reznick (1990) found that of 13 children who evidenced vocabulary spurts, over three quarters of the words learned were nouns. This would suggest that nouns form the main core of children's early vocabularies.

Verbs also appear to be harder to learn and use in novel ways. Tomasello et al (1997) taught twelve children aged 1;6 to 1;11 two novel nouns and two novel verbs. The children combined the nouns with other already learned words a total of 145 times, whereas they combined the novel verb using the word as a verb only five times. When given the duplicate of a novel object and asked "What are these?", four of the children also produced the plural *-s* morpheme with at least one noun. However, no children produced the past tense *-ed* morpheme with the verbs when asked "What did you do?" or "What did I do?". This suggests that it is not just the learning of verbs that children find more difficult, but also working out how to then use those verbs in a creative way.

Using verbs seems to be particularly problematic for children with specific language impairment (SLI). Watkins, Rice & Moltz (1993) found that children with SLI used a more limited range of verbs than language-matched controls, even though there was no difference in their overall lexical diversity. Kelly (1997) compared children with SLI with language- and age-matched peers, finding that the children with SLI made significantly more semantic errors in verb use. Thordardottir and Weismer (2002) found that children with SLI used mostly correct but significantly less sophisticated verb argument structures than their age-matched normal-language peers. These difficulties would

suggest that there is something regarding the nature of verbs that makes them inherently more difficult for children to grasp than nouns.

So what are the factors that could make verbs more difficult? Most explanations so far have centred around differences in syntax and semantics. Verbs differ semantically from nouns in that they refer to actions, states or events, whereas nouns refer to 'things' that can be either concrete or abstract. Syntactically verbs differ from nouns because they take an argument structure. Pinker (1989) states that children must be able to align both syntactic and semantic information in order to use verbs in an adult-like way.

Let us look at semantics first. It could be that it is easier for children to perceive the meaning of nouns. Concrete nouns by definition have permanent referents that are often present when children hear a word and can be isolated perceptually from the child's surroundings, whereas verbs can refer to impending events, ongoing events or completed events when the utterance occurs (Tomasello & Kruger, 1992). This may mean children find verbs harder to learn because it is more difficult to work out what they refer to. If the child can see an object whilst hearing its label, he/she can then make the link between the two. However, when the label for an action is given, that action may have already finished before the word is heard. For example, if a parent says "You threw the ball!", how can the child intuitively know which action is being referred to? However, the nouns that young children use are not all concrete nouns with permanent referents. Nelson et al (1993) found that although nouns were acquired earlier and in greater numbers than other word classes, only 54% of those nouns were basic-level object classes (BLOCs). They conclude that 'the noun bias of early vocabularies is far from universal, and that it rests only in part on the acquisition of object names'. It should also be noted that children's early vocabularies include many relational words like 'there' or 'up'. The semantic theory cannot fully explain the presence of abstract nouns and relational terms such as 'birthday' or 'more' in early vocabulary.

Verbs are also more syntactically complex than nouns since they each have a specified argument structure. The verb tells us which entities in an event have to be mentioned and in which order they must go in the sentence (Marshall, Byng & Black, 1999). For example, the verb 'kill' involves an agent (the person doing the killing) and a patient (the person being killed). The agent must come before the verb, and the patient must come after the verb (e.g. Romeo killed Thibault). For a child to use verbs appropriately, he or she must not only understand the meaning of the verb but also the complexity of using that verb within a syntactically structured sentence. The child must know who or what is involved, and where they are placed within the sentence.

A study by Olguin and Tomasello (1993) highlights the relative difficulty that children have in using novel verbs and placing them in a correct argument structure. They taught children aged 2;1 four transitive verbs for novel actions. Each verb was taught in a progressive form, but in a different syntactic structure: only agent expressed (in sentence-initial position), only patient expressed (in sentence-final position), both agent and patient expressed, and no arguments expressed. Almost 90% of the time, children used the same syntactic structure they had heard when producing the verb in new ways. However, when the children did use a known object label in combination with the novel verb, they did not use word order to distinguish semantic roles, for example they would be equally likely to place the agent before or after the verb. However, when children were taught novel nouns, they were able to use them productively in a number of ways, including placing a noun learnt in the role of agent into the role of patient. This suggests that when children first learn new words they can place nouns creatively and accurately, but have difficulty doing the same with verbs.

We have seen that current theories which attempt to account for the predominance of nouns in children's early vocabularies centre around semantics and syntax. A strong challenge to these theories is put forward by Choi & Gopnik (1995), who studied the language of nine monolingual Korean-speaking children from 1;2 to 1;10. Seven out of nine of the children showed a verb spurt around 1;7, and six of the seven children had a verb spurt before

their first noun spurt (verbs spurts have not been found in English data). There was also no significant difference between the proportion of nouns and verbs in their vocabulary at the 50-word mark or at the end of the study. These findings could be explained in terms of phonological factors. Nouns in English typically occur at beginning or end of sentences, but verbs tend to occur in the middle. This happens because the typical word order of most English sentences is Subject Verb Object (SVO). Therefore the verb tends to be embedded in the middle of the sentence. In contrast, Korean is a Subject Object Verb (SOV) language, which means that verbs tend to occur at the end of sentences. Verbs are also obligatory in Korean and can occur alone as complete utterances. The greatest stress in a sentence is usually on the final stressed word, due to sentence final lengthening (Black & Chiat, 2003). Therefore, nouns tend to be most salient in English, whereas verbs are more salient in Korean. Children may pay attention to those words in a sentence with most stress placed on them. This would explain the difference between Choi and Gopnik's findings and English studies. However, there are other possible explanations for these findings. Choi and Gopnik also analysed the differences between language used by Korean and American mothers with their children. They found that the Korean mothers used more action verbs and fewer object nouns than American mothers, and also engaged in more activity-oriented discourse. Therefore frequency of input and pragmatic factors could also have influenced the findings.

We know from other studies that phonology is important in terms of child language development. For example, Echols (1996) found that children used stressed syllables to locate word units, and phrase- and clause- final lengthening to locate word boundaries. Similarly, Cutler (1996) found that children use the characteristic rhythm of their own language to identify lexically significant chunks. Children in English-speaking countries tend to assume that any strong syllable is a word unit. Therefore, we know that children are sensitive to the prosodic aspects of sentences and use these from a very early age to make sense of language.

Further cross-linguistic evidence suggests that children must use phonology to identify the relevant semantic properties of the verbs they hear. English children's early verbs are usually those that focus on direction of movement and combine with particles such as *on* and *in*, e.g. *put on*. In contrast, Korean children do not focus on direction but tightness of fit between objects in contact, because Korean requires a different verb depending on tight or loose contact (Choi, 1997). As Chiat (2001) comments, it does not seem likely that any semantic cues could alert children as to whether their language requires them to focus on direction or tightness. Therefore, it must be that the phonology of the language tells the child the significant feature to focus on, since it is only by noticing what is in common between scenes in which the same phonological form is heard that the child can identify a common meaning.

As mentioned above, children with SLI have problems with using verbs. In particular, they appear to find it difficult to use the grammatical morphemes that are used in combination with verbs (e.g. *-ed* for past tense). However, a study by Moore & Johnston (1993) indicates that the reason for this difficulty is due to phonological rather than semantic or syntactic factors. They found that children with SLI were more delayed in their use of temporal inflections (e.g. past tense) than temporal adverbials (e.g. yesterday, ago). Since both refer to something that occurred in the past, it could not be argued that this is due to semantics. What is noticeable is that temporal inflections are phonologically much weaker than temporal adverbials. Temporal inflections do not carry stress. This supports the hypothesis that prosody impacts upon children's language production.

A recent study by Childers and Tomasello (2001) may further support the hypothesis that phonological factors contribute to the relative difficulty of verbs. This study investigated the linguistic representations underlying fifty young children's productions of transitive utterances. Half the children were trained with verbs in utterances using full nouns as agent and patient (e.g. "Look! The bird's swinging in the bathtub. See? The bird's swinging in the bathtub"). The other half were trained with verbs in utterances using full nouns

and pronouns (e.g. "Look! The cow's pulling the chair. See? He's pulling it"). The children who heard pronouns during training produced almost twice as many transitive utterances in the test trials as the children who heard only nouns. Furthermore, only the children who had been trained with pronouns were able to produce a creative transitive utterance with a novel verb on testing. Childers and Tomasello explain these findings by suggesting that in order for children to use verbs effectively they need to hear the verbs provided across different syntactic constructions. However, a different explanation based on the prosody of the utterances heard could also be put forward. The children who only heard utterances containing full nouns were never exposed to the verb when it was carrying sentence-final stress, since this was always placed on the final noun (e.g. "The bird's swinging in the BATHTUB"). However, the children who heard utterances containing pronouns were exposed to the verb when carrying sentence-final stress (e.g. "The cow's PULLING it"). This does not give us direct evidence regarding acquisition of verbs and its relation to prosody, since Childers and Tomasello were investigating the production of transitive structure rather than production of verbs in any form. However, it is possible that the children in the 'pronouns' condition were more likely to form their own transitive constructions because the utterances they had heard focussed their attention onto the stressed transitive verb.

This study explicitly examines the theory that one reason for the disparity in children's acquisition of nouns and verbs is the prosody of English. Although other studies as outlined above provide evidence that this may well be an influencing factor, this is the first study to focus exclusively on prosody. In order to investigate prosodic position on children's learning of new words, both syntactic categories (nouns and verbs) were analysed separately. The acquisition of a novel noun carrying sentence-final stress was compared with a novel noun that did not, and the acquisition of a novel verb carrying sentence-final stress was compared with a novel verb that did not. This design ensured that other factors such as semantics and syntax did not influence the results. It was hypothesised that children would learn the novel words carrying sentence-final stress more easily than those that did not.

## METHOD

### *Design*

Thirteen pre-school children aged 3;0 to 4;6 were exposed to two novel nouns and two novel verbs over two sessions, one week apart. The experiment investigated the effects of prosody on the children's learning of these novel words. It was hypothesised that children would learn novel words that carried sentence-final stress more easily than those which did not. The two independent variables in the experiment were the category of novel word (noun or verb) and the amount of stress placed on it (carrying sentence-final stress or not). A within-subjects design was used in order to counterbalance these variables. Each child was placed in one of four groups in order to control for order of presentation and which word in each pair carried sentence-final stress or not:

#### **Group A**

Session 1: Noun 1 (*yom*) in stressed position, Noun 2 (*pib*) in unstressed position.

Session 2: Verb 1 (*tef*) in stressed position, Verb 2 (*wug*) in unstressed position.

#### **Group B**

Session 1: Verb 1 (*tef*) in stressed position, Verb 2 (*wug*) in unstressed position.

Session 2: Noun 1 (*yom*) in stressed position, Noun 2 (*pib*) in unstressed position.

#### **Group C**

Session 1: Noun 1 (*yom*) in unstressed position, Noun 2 (*pib*) in stressed position.

Session 2: Verb 1 (*tef*) in unstressed position, Verb 2 (*wug*) in stressed position.

## **Group D**

Session 1: Verb 1 (*tef*) in unstressed position, Verb 2 (*wug*) in stressed position.

Session 2: Noun 1 (*yom*) in unstressed position, Noun 2 (*pib*) in stressed position.

Half the children in each condition were exposed to *yom/tef* first, and half the children were exposed to *pib/wug* first. This ensured that any differences observed in testing were not due to primary or recency effects.

The novel words used all have a CVC structure. All phonemes used are sounds which normally developing three year olds have acquired (Crystal, 1976). Production and comprehension of the novel words was assessed after each session.

### *Participants*

The participants were drawn from one nursery school in Guildford and one in London. Written information regarding the study was provided for parents and the nurseries. Written consent was then obtained from each child's parent(s), and it was explained that the child could be withdrawn from the study at any time. Prior to the experiment it was established from discussion with nursery staff that none of the children had a diagnosis of any language or communication disorder, that there were no concerns about their language development and that the children spoke English as their first language. Thirteen girls and two boys aged 3;0 to 4;6 took part in the study (for full details see Appendix 1). Two children did not attend the second session due to illness, and therefore thirteen children completed the study.

### *Materials*

A picture-making activity was carried out in each session with each child. The child and the experimenter each had a piece of coloured card with the outline



of a fish on it. The experimenter demonstrated how to follow the outline with a decorated glue pen. The child and the experimenter then outlined the fish on the coloured card with glue. The child and the experimenter then poured glitter onto the glue and shook off any excess. The experimenter demonstrated using a wooden doorknob with a foam shape attached to it to put into coloured paint and then print onto the fish. The child and the experimenter then decorated their fish using the doorknobs and paint. Half the children did the same activity in reverse. They decorated the fish with the doorknobs and paint first, and then outlined the fish with glue and glitter second.

For the picture-making activity:

Coloured card

Decorated glue pens (*yoms*)

Glitter

Paint

Wooden doorknobs with foam shapes attached for printing (*pibs*)

To assess comprehension and production:

Materials listed above

Two familiar CVC objects (ball, cup)

Four unfamiliar items (ceramic tools)

Similar item to *yom* (undecorated glue pen)

Similar item to *pib* (black metal doorknob with foam shape attached)

*Procedure (i): exposure to novel nouns*

The experiment was conducted by Heather (Guildford nursery) and Watson (North London nursery). Prior to the experiment, the experimenters visited each nursery to give staff information regarding the purpose of the experiment and outlining the procedure to be used. Parents were given information and invited to complete written consent forms, which gave permission for each child to take part in the experiment and to be videoed during both sessions. Children were tested individually in a familiar room of the nursery.

A picture-making activity involving the two novel objects and two novel verbs was carried out with each child. During this activity, the child was given a decorated glue pen and asked to draw along an outline with it. In sessions where novel nouns were being taught, the glue pen was labelled a *yom* by the experimenter. In sessions where novel verbs were being taught, the action of drawing along the lines with the glue pen was labelled *teffing*. The child was also given a handmade stamp to use to print with paint. In sessions where novel nouns were being taught, the stamp was labelled a *pib* by the experimenter. In sessions where novel verbs were being taught, the action of printing with the paint was called *wugging*.

During the activity the experimenter used each of the two novel words taught (either two nouns or two verbs) ten times. The scripts used during the activity were as follows:

Table 1: Scripts for novel nouns

<b>Novel Noun 1: Yom</b>	
<i>Stressed condition</i>	<i>Unstressed condition</i>
This is a yom.	A yom is a special pen.
Do you want to choose your yom?	Which yom do you want?
You've got the pink/yellow yom.	Your yom is pink/yellow.
What colour is my yom?	What colour yom have I got?
Yes, I've got the pink/yellow yom.	Yes, my yom is pink/yellow.
Follow the line with the yom.	Use your yom to follow the line.
Is glue coming out of your yom?	Is your yom working?
Try to squeeze the yom.	Squeeze the yom like this.
Give me your yom.	Give your yom to me.
We've finished with the yoms.	Now we can put the yoms away.
<b>Number of morphemes: 60</b>	<b>Number of morphemes: 56</b>
<b>Novel Noun 2: Pib</b>	
<i>Stressed condition</i>	<i>Unstressed condition</i>

We decorate our fish with pibs.	We use pibs with paint.
This is how we use a pib.	To use a pib we do this.
What colour is my pib?	Is my pib red?
Now I put on the pib.	Now I put the pib on the fish.
What shape is your pib?	What shape does your pib make?
I have the star-shaped pib.	My pib is star-shaped.
Put paint on the pib.	Put the pib in the paint.
Use the other pib.	Use the pib with a different shape.
Where will you put your pib?	Where will your pib go?
Cover your fish with the pib.	Put your pib over there.
<b>Number of morphemes: 58</b>	<b>Number of morphemes: 60</b>

Table 2: Scripts for novel verbs

<b>Novel Verb 1: Tef</b>	
<i>Stressed condition</i>	<i>Unstressed condition</i>
Now we can tef.	Now we can tef our fish.
First I'll tef.	I'll tef first.
I'm teffing it.	I'm teffing this line.
Can you tef it?	Can you tef as well?
Use this to tef it.	Tef with this.
Which line will you tef?	Will you tef here?
Careful when you tef it.	Tef the fish carefully
Let's both tef.	Let's tef together.
What have you teffed? Lots of lines!	Have you teffed lots of lines? Yes!
You teffed it! Well done!	You teffed that well!
<b>Number of morphemes: 50</b>	<b>Number of morphemes: 49</b>
<b>Novel Verb 2: Wug</b>	
<i>Stressed condition</i>	<i>Unstressed condition</i>
Now we can wug.	Now we can wug on the paper.
First I'll wug.	I'll wug first.
I'm wugging it.	I'm wugging with blue paint.

Can you wug it?	Can you wug as well?
You wugged it! Well done!	Wug with your hand.
Let's both wug.	You wugged that well.
How fast can you wug?	Can you wug quickly?
Use your hand to wug it.	Let's wug together.
Press hard to wug it.	Wug on the paper firmly.
What have you wugged? Lots of shapes!	Have you wugged lots of shapes? Yes!
<b>Number of morphemes: 51</b>	<b>Number of morphemes: 52</b>

It was not possible to match sentences across conditions exactly, since it was also important to keep the scripts naturalistic. However, the sentences in each condition were matched as far as possible on pragmatic, syntactic and semantic factors. This ensured that any differences observed were due to the prosody of the sentences rather than any other factor. The following factors were matched across the conditions:

- Pragmatics

There are three questions, four statements and three imperatives per condition.

- Semantics

The vocabulary used has been kept as similar as possible, e.g. "Follow the line with the yom" becomes "Use your yom to follow the line".

- Syntax

The total number of morphemes per novel word condition is approximately the same across the stressed and unstressed conditions. The sentences are closely matched in terms of numbers and types of phrases, and the number of sentences containing embedded verb phrases.

### *Procedure (ii): testing of production and comprehension*

After the activity, each child was then tested for production and comprehension of the two novel words taught in the session. Production was always assessed first, to avoid giving focussed exposures to the novel words through the comprehension test.

To test production of nouns, the child was shown two familiar CVC objects (cup and ball), a *yom* and a *pib*. The experimenter pointed to each object and asked "What's this?" The experimenter asked for familiar items first to check that the child had understood the task, and modelled the answer if the child did not understand. The child scored one mark for each novel noun produced. In order to test whether the child had generalised the novel nouns, the child was then shown a similar item to a *yom* (an undecorated glue pen) and a similar item to a *pib* (made from black metal rather than wood) and asked "What's this?". The child scored one mark for each novel noun produced. If the child produced the novel nouns, production of plurals was also tested for a third mark. The experimenter would hold two *yoms/pibs* and say "I've got another one, now I've got two..." The child scored a mark if the sentence was completed with a correct plural.

To test production of verbs, the experimenter demonstrated a familiar action by throwing and catching a ball and asking "What am I doing?" If the child did not respond with an appropriate verb such as throw or catch, the experimenter modelled the correct answer. The experimenter then demonstrated *teffing* and *wugging* and each time asked the child "What am I doing?" The child scored one mark for each novel verb produced. The experimenter then prompted the child to carry out each action by giving the correct materials and saying "Now it's your turn." The experimenter then asked "What are you doing?" The child scored one mark for each novel verb produced. If the child produced a correct verb, he or she was then tested on ability to produced an *-ed* ending by the experimenter saying "I/You've finished it now, what did I/you do?" The child scored a third mark for each verb if an *-ed* morpheme was produced.

To test comprehension of nouns, six items were placed on the table: *yom*, *pib*, two unfamiliar distracter items (ceramic tools), an object related to the activity (glitter) and a familiar item (ball). The experimenter asked “Where’s the ball?” first to check that the child had understood the task, and modelled pointing to the object if the child did not understand. The experimenter then asked “Where’s the *yom/pib*?” The test was then repeated, except the objects were placed in a bag and the child was asked to find each item. One mark was awarded if the child pointed to the correct object in both tests. The distracter items ensured that there was a likelihood of only 6.25% that the child would choose the correct item twice by chance. In order to test whether the child had attached the novel nouns to a meaning category, he or she was then presented with a similar item to a *yom* (an undecorated glue pen) and a similar item to a *pib* (made from black metal rather than wood), two different distracter items (ceramic tools) and two familiar items (ball, cup). Again, the experimenter asked “Where’s the *yom/pib*?” The child scored one mark for each correct answer.

To test comprehension of verbs, the following objects were placed on the table: ball, *yom*, *pib*, coloured card with fish outline drawn on it, paint, distracter item (glitter). The experimenter asked the child “Can you show me rolling?” and modelled rolling the ball if necessary. The child was then asked to show the experimenter *teffing* and *wugging*. One mark was awarded for each correct action. A further test assessed whether the semantics of the verb had generalised to a slightly different situation. The child was again asked to show the experimenter some more *teffing* and *wugging*, but the *pib* was replaced with a black metal *pib*, and the card with a fish drawn on it was replaced with a card with a diamond drawn on it. One mark was awarded for each correct action.

Each child was given a score out of two for comprehension and out of three for production for each novel noun and verb.

### *Pilot study*

The design described above was the finalised design. As a consequence of a pilot study with six children from another London nursery, the number of exposures per novel word was increased from six to ten, since no production was elicited. The picture-making activity was also changed. *Pib* was originally used to label a scrunched piece of tissue, and the verb *wug* was used to describe scrunching the tissue to form the *pib*. However, the children had already learned the verb 'scrunch' and therefore the activity was changed to a more novel action.

## RESULTS

The children responded well to the picture-making activity and remained attentive throughout the sessions. All the children complied with the testing procedures. However, only one child scored a mark for production when tested, and therefore the production data were insufficient for analysis. Qualitative observations regarding production can be found after the analysis of the comprehension scores.

### *Comprehension*

The raw scores for each participant can be found in Appendix 2. All the following scores are for comprehension only. It should be noted that the range of possible scores was limited, i.e. each child could score between 0 and 2 marks for comprehension. However, the data still show some distinct trends:

Table 3: Descriptive statistics for each condition

	<b>Stressed Nouns</b>	<b>Unstressed Nouns</b>	<b>Stressed Verbs</b>	<b>Unstressed Verbs</b>
<b>Mean</b>	1.07	0.67	0.92	0
<b>Median</b>	1	0	0	0
<b>Mode</b>	2	0	0	0
<b>Std Dev</b>	0.88	0.9	1.04	0

It is clear from this table that there are some differences between the scores for stressed and unstressed conditions. A simple comparison of the means tells us that the participants scored higher on stressed nouns compared to unstressed nouns, and on stressed verbs compared to unstressed verbs.

The following histograms represent the spread of scores for each noun condition:



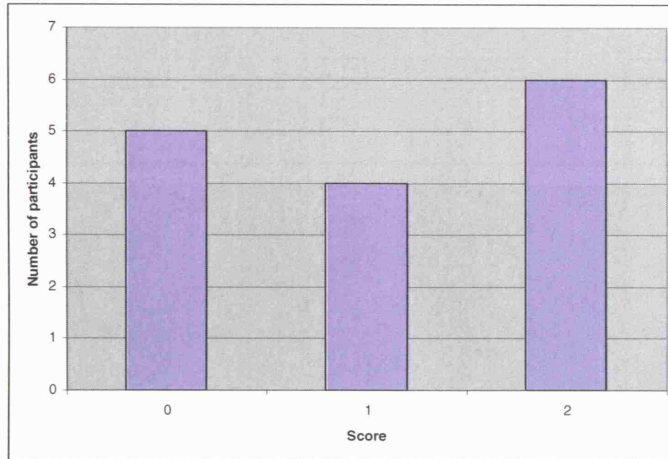


Figure 1: Scores for comprehension of stressed nouns

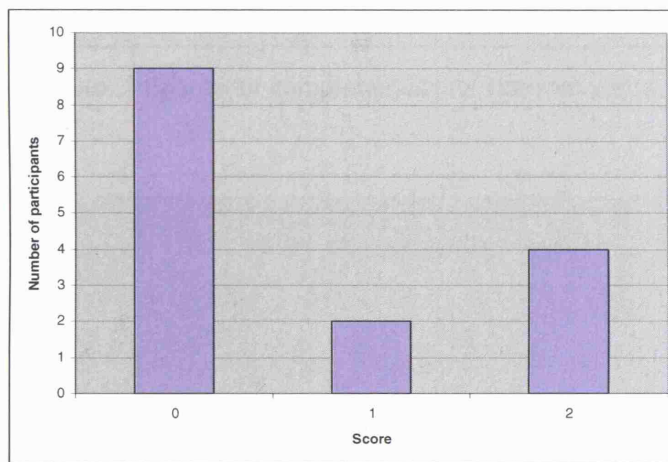


Figure 2: Scores for comprehension of unstressed nouns

It is clear that the data are not normally distributed. In the unstressed condition, more than half the participants scored zero.

The following histograms represent the spread of scores for each verb condition:

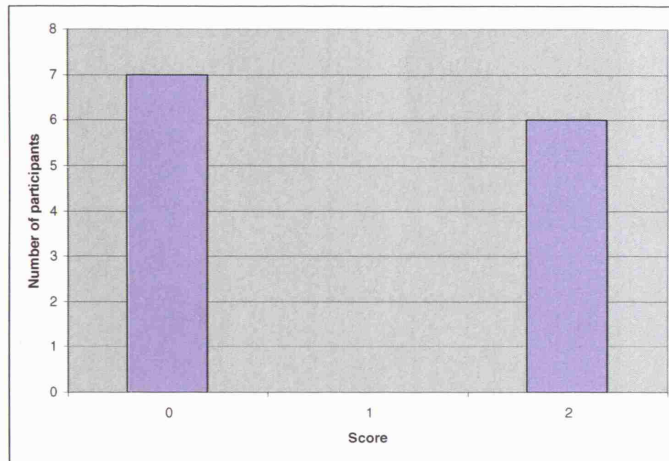


Figure 3: Scores for comprehension of stressed verbs

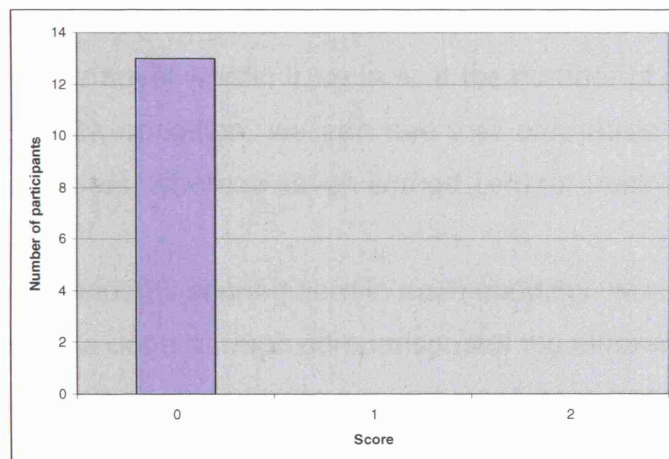


Figure 4: Scores for comprehension of unstressed verbs

The histograms for the comprehension of verbs are even more striking, because there is a floor effect for unstressed verbs. No child scored a mark for comprehension of unstressed verbs, whereas almost half (6 out of 13) scored two marks for comprehension of stressed verbs. It should also be noted that whereas some children scored half marks (1 out of 2) for comprehension of both stressed and unstressed nouns, no child scored partial marks on comprehension of stressed verbs.

The following histogram shows a comparison of the distribution of total scores for stressed and unstressed words (i.e. nouns and verbs together):

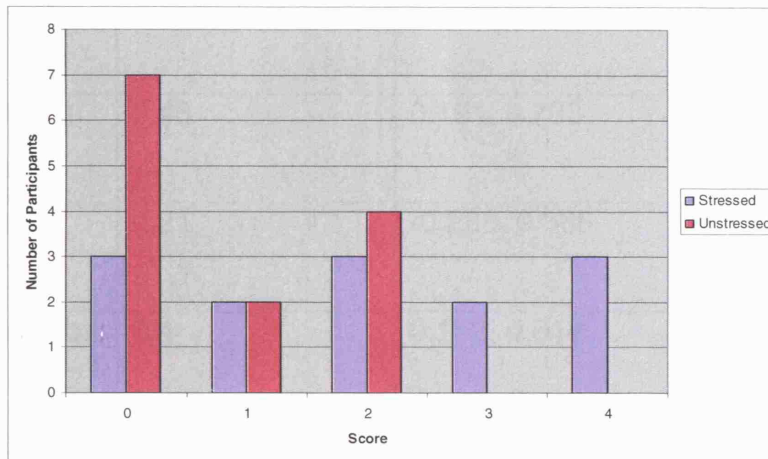


Figure 5: Scores for comprehension of stressed and unstressed words

This gives a clear representation of the effect of stress on the children's understanding of the novel words. If we look at the number of participants who scored zero for each condition, we can see that only three children scored zero for stressed words, whereas seven scored zero for unstressed words.

The number of participants scoring zero in each condition was analysed statistically. This was done through comparisons of the difference between the proportions of participants scoring zero marks in each condition (Wild & Seber, 1993). The 95% confidence intervals shown for each comparison estimates the likelihood that the population difference lies between the two values. If the confidence interval contains zero, it is possible that the population difference could be zero (i.e. there is no difference between the conditions) and therefore the difference is not significant. If the confidence interval does not include zero, it is 95% likely that the population difference is not zero and therefore there is a significant difference.

Table 4: Difference between proportions of participants scoring zero

Conditions	Difference	95% CI	Significance
Unstressed and stressed nouns	0.27	-0.203, 0.737	Not significant
Unstressed and stressed verbs	0.46	0.191, 0.733	<b>Significant at the 5% level</b>
Stressed verbs and nouns	0.21	-0.226, 0.666	Not significant
Unstressed verbs and nouns	0.4	0.152, 0.648	<b>Significant at the 5% level</b>

Both independent variables (i.e. syntactic category of word and stress) had an influence on the comprehension scores. Firstly, let us look at the effect of whether the novel words carried sentence-final stress or not. We can see that significantly more children scored zero on unstressed rather than stressed verbs, indicating that the unstressed verbs were significantly harder to learn. However, this effect did not apply to stressed and unstressed nouns. If we look at the effect of syntactic category of word, we can see that significantly more children scored zero on comprehension of unstressed verbs in comparison with unstressed nouns, indicating that there was increased difficulty in learning verbs compared to nouns in the unstressed conditions. However, this effect did not apply to stressed novel nouns and verbs.

### *Production*

During testing for production, a number of children used alternative words to label the novel words. For example, some labelled the *yom* (decorated glue pen) as 'glue' and the action *tef* (tracing a line with the *yom*) as 'glueing'. Some children labelled the *pib* (wooden doorknob with foam shape attached) as 'doorknob' and the action *wug* (printing onto paper with the *pib*) as 'printing', 'painting' or 'stamping'. Others used more general verbs to describe the actions, such as 'putting it on the fish', or 'putting paint on the fish'. This

use of alternative words suggests that these children had understood the testing procedure, but had not acquired the novel words into their productive vocabularies. Other children did not make any response in the testing of production, which could be due to not learning the novel words or other factors such as shyness or misunderstanding what was required.

Although only one child scored a mark during testing for production, six children (all from the London nursery) used the novel words spontaneously during the picture-making activity. The following table includes all the spontaneous utterances produced using the novel words correctly:

Table 5: Spontaneous production of novel words for each condition

	<b>Stressed noun</b>	<b>Unstressed noun</b>	<b>Stressed verb</b>	<b>Unstressed verb</b>
Child 1	"That's the yom..."	"..and that's the pib."		
Child 2			"I wugged it."	"I tef it."
Child 3	"You got the yom lid."		"Don't wug on mine."	
Child 4	"This is a yom."* "I'll get the yoms for you."** "I want the yellow yom."**	"This is the pib."		
Child 5		"It's a heavy pib."		
Child 6	"My yom is finished."			
<b>Number of utterances</b>	6	3	2	1

\* These utterances were made in the session following initial word learning

In addition, a number of children used the novel nouns as verbs to describe the actions carried out with the novel objects. One child said “You’re yom on the paper” to describe the *teffing* action in testing. Another child described the *teffing* action by saying “You’re yomming it” (the stressed noun) before the experimenter had modelled the novel verb. However, when he saw the *pib* (the unstressed noun) he asked “What was this again?” This gives a further qualitative indication that stressed nouns were acquired over the unstressed, since the child remembered and used the stressed noun *yom*, but could not remember the unstressed noun *pib*.

From this small number of spontaneous utterances, we can see that the children are following similar patterns in production of the novel words as with the comprehension. There are more spontaneous utterances of the stressed novel word than the unstressed novel word within each syntactic category, and there are more spontaneous utterances using nouns than verbs.

## DISCUSSION

### *Summary of results*

It was hypothesised that children would learn the novel words carrying sentence-final stress more easily than those that did not. This hypothesis was supported in relation to the comprehension of verbs, since significantly more participants scored zero on unstressed rather than stressed verbs. It was particularly striking that no child scored any marks for comprehension of unstressed verbs. However, there was not a significant difference in participants' learning of stressed and unstressed nouns (although the mean score for stressed nouns was higher than the mean for unstressed).

It was also clear from the results that syntactic category of word had an influence on the acquisition of novel words. Significantly more children scored zero on comprehension of unstressed verbs in comparison with unstressed nouns, although there was no significant difference for stressed verbs and nouns. These results indicate that when there were no prosodic markers to aid comprehension, the children found verbs more difficult to learn than nouns.

It is unclear which variable (syntactic category or stress) influenced acquisition the most. Each variable had a significant impact on comprehension of the novel words. However, there are indications that stress may have had a stronger influence. If syntactic category had more influence, we would predict that the children would have learnt the unstressed nouns more easily than the stressed verbs, but this was not the case. The mean score for stressed verbs (0.92) was higher than for unstressed nouns (0.67). In addition, the difference between zero scores for unstressed and stressed nouns (0.27) was marginally higher than for stressed verbs and nouns (0.21). If syntactic category influenced acquisition more than stress, it would be expected that these results would be reversed. However, it must be noted that this is a small sample and these are only observations rather than statistically analysed differences.

## *Implications*

Our results support the view that prosodic factors influence the acquisition of new words, more specifically verbs. However, there was not a significant difference between stressed and unstressed nouns, and the scores for novel nouns were generally higher than for novel verbs. This suggests that prosody influences the acquisition of novel words that the child finds particularly hard to learn and therefore need to be made more salient. If verbs are semantically and syntactically more complex than nouns (Tomasello & Kruger, 1992, Olguin & Tomasello, 1993), it is possible that children only require the additional support of prosodic factors to acquire verbs. This may explain why no children comprehended the unstressed verb, but all those who comprehended the stressed verb did so fully (i.e. scored 2 out of 2 marks). It appears to be a complex interaction of semantics, syntax and phonology that enables children to learn novel words.

This supports the theory that Choi and Gopnik's (1993) findings were at least partially due to prosody. The presence of verb spurts in the Korean-speaking children's developing vocabularies, and the fact that the children's early vocabularies contained a roughly equal proportion of nouns and verbs are in keeping with the results of this study. The novel unstressed verbs were significantly harder for children to learn than novel stressed verbs. The results of this study would therefore predict that Korean-speaking children would learn verbs more easily than English-speaking children, since they would generally be exposed to them carrying sentence-final stress.

The results of this study also lend weight to the theory that Childers and Tomasello's (2001) findings could have been due to prosodic factors. Since sentence stress clearly had an impact on children's acquisition of verbs, it would therefore seem feasible that it would impact on children's ability to identify the way verbs are used within a sentence and then to use them appropriately. Therefore the pronoun condition, which exposed the children to the novel verb whilst carrying sentence-final stress, may well have enabled



the children to focus their attention onto the transitive verb and helped them to form their own transitive constructions.

If prosody does have a significant impact on verb acquisition, this has implications for children with Specific Language Impairment (SLI). As discussed earlier, children with SLI find acquiring and using verbs particularly problematic (Watkins, Rice and Moltz, 1993, Kelly, 1997, Thordardottir and Weismer, 2002). Current Speech and Language Therapy for these children generally consists of multiple exposures to target verbs. Therapy may focus on the semantics of the verb, its syntactic structure, or both. It is therefore likely that therapy could be more effective for these children if care were taken to ensure that exposures to taught verbs carried sentence-final stress. This would make the target verbs more salient and may therefore impact on acquisition.

#### *Limitations of the study*

Only one child scored a mark in the testing of production, and therefore the scores for production could not be analysed. This could have happened due to a number of reasons. It may have been that ten exposures to the words were not enough to elicit production. However, some children used the novel words during the picture-making activity. Therefore we know that at least some children were able to use the words correctly. One participant produced a novel noun at the beginning of the second session, which means that he must have recalled it from the week before. However, the participant had not scored any marks for production in the first session. This suggests that the testing procedure itself did not enable the children to perform to their highest ability, and the results are not a true reflection of the children's ability to produce the novel words. It may have been that if the testing procedure had been made more naturalistic or turned into a game, the children would have been able to produce at least some novel words.

Some of the children used words that they had already acquired to label the novel nouns and actions. For example, some labelled the noun *yom*

(decorated glue pen) as 'glue' and the verb *tef* (tracing a line with the glue pen) as 'glueing'. Some children labelled the noun *pib* (wooden doorknob with foam shape attached) as 'doorknob' and the action *wug* (printing onto paper with the doorknob) as 'printing', 'painting' or 'stamping'. However, although this may have affected some children's comprehension and production scores, it should not have biased the results. Even if previously known words affected one novel word more than another, the study counterbalanced each novel word so that half the children were exposed to the word as stressed, and the other half as unstressed.

No child scored a mark for comprehension of the unstressed verb, which meant that there was a floor effect for this condition. This was problematic for statistical analysis. An ANOVA could not be performed since the data were not normally distributed. However, this is a highly relevant result, since all participants scored zero for the condition that was hypothesised to be the most difficult. This certainly suggests a strong influence of prosody in the acquisition of verbs.

The range of possible scores was limited, since each child could only score between 0 and 2 marks for comprehension. This did not allow for a great deal of differentiation between each child. The nature of the study restricted the scope of the scoring, as only a limited number of novel nouns and verbs could be taught and a limited number of ways in which comprehension could be tested.

Due to time limitations and difficulties obtaining parental consent, the sample size for the study was small (thirteen children completed both sessions), which was again problematic for statistical analysis. This means that although there appears to be a strong influence of sentence stress in the results, no firm conclusions can be drawn at this point. It would be interesting to see if the results were replicated if carried out with a larger number of participants.

It is possible that there may have been some subconscious researcher bias during the novel word exposures and testing procedures. The experimenters

designed the experimental procedure and were therefore fully aware of the purpose and expectations of the study. This could have subconsciously altered the way that the experimenters stressed the novel words during the picture-making activity and testing sessions. It was beyond the practicalities of this study to train others to carry out the activities with the children.

### *Suggestions for further research*

As discussed above, there was little production of the novel words elicited in this study. A further study could use slightly older children, who are more likely to learn the novel words and may also have more confidence to use them in a testing situation. This would hopefully give enough data to analyse production scores.

The results of this study suggest that sentence stress impacts on word acquisition. However, it did not examine whether it has a lasting impact. There is little value in teaching children new words using this technique if it only affects the initial acquisition of words in a short session. Would children be affected by sentence stress in the long term? This could be done through multiple exposures of the novel words over a number of sessions and testing comprehension and production not just immediately after the final session, but at specified time intervals (e.g. one week, one month, six months) after the sessions have finished.

This study looked at the effect of sentence stress on English-speaking children only. A further study could be done with children who speak a different language where verbs carry sentence-final stress, such as Korean (Choi, 1997). If the difference between early vocabularies in English-speaking and Korean-speaking children is due to which category of words tend to carry sentence-final stress, then it would be expected that stress would also have an impact on Korean-speaking children, but possibly a more marked impact on their learning of nouns rather than verbs.

A further study could investigate the comparative influence of prosody on different verb-learning situations. For example, would it have more impact on verbs referring to anticipatory, ongoing, or completed events? Tomasello & Kruger (1992) found that children found it easier to comprehend verbs referring to impending actions, and learned to produce novel verbs best when modelled on the impending condition. It may be that sentence stress may enable children to comprehend ongoing or completed events more easily since the verb would be more salient.

It has also been suggested that these results may have implications for children with SLI. This should be explored further. The study could be replicated with children with SLI, using an increased number of exposures per novel word. If sentence stress were found to have a significant impact on learning of new verbs, this could then be used in the development of speech and language therapy programmes for children with SLI.

*(Word count: 7754)*

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## APPENDIX 1: PARTICIPANTS

Child	Gender	Age	Notes
1	F	3;11	
2	F	3;8	
3	F	3;2	
4	M	4;6	
5	F	4;0	
6	F	3;0	
7	F	3;3	
8	F	3;4	
9	F	3;4	
10	F	3;3	
11	F	3;11	
12	F	3;0	Did not complete second session
13	F	3;10	Did not complete second session
14	F	3;8	
15	M	3;8	



## APPENDIX 2: RAW SCORES

Child	Noun Stressed	Noun Unstressed	Verb Stressed	Verb Unstressed
1	1	2	2	0
2	2	2	2	0
3	0	0	2	0
4	2	2	2	0
5	1	0	0	0
6	0	0	0	0
7	0	0	0	0
8	1	1	0	0
9	2	0	0	0
10	2	2	2	0
11	2	0	0	0
12	0	0	-	-
13*	3	0	-	-
14	0	0	0	0
15	1	1	2	0
<b>Total</b>	<b>17</b>	<b>10</b>	<b>12</b>	<b>0</b>

\* Child 13 was the only child to score a mark for production, hence the score of 3 for the stressed noun condition.