

Proper-Name Identification

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Abstract

In a series of three experiments, we investigated whether proper names (like *John*, *Anna*, *Henry*) are more easily identifiable in spoken language than common nouns. In the first two experiments, participants listened to utterances in an unfamiliar language, and had to guess which of two words was a name. In the third experiment, listeners had to select whether a missing word in a spoken sentence was a name or a noun. Together, the results of the three experiments indicated that 1) names may be distinct acoustically from nouns; 2) this distinction interacts with the word's position in the sentence; and 3) the information is probably not in the word's context, but in the word itself.

Index Terms: proper nouns, names, common nouns

1. Introduction

Proper names (PNs) constitute a substantial part of the mental lexicon, and are in many ways distinct from regular common nouns (CNs). In the field of morphosyntax, PNs are different in the sense that they are not preceded by articles and usually they are not inflected, at least in many languages. Semantically, PNs are unlike CNs in that they have so-called token reference, rather than type reference. In other words, a PN usually refers to a specific person (town, place), whereas a CN more often refers to a category of objects (*table*, *horse*, *child*). Phonologically, the prosodic pattern of PNs has been shown to be distinct from that of CNs, at least for English [1]. Psycholinguistically, CNs have also been shown to represent a qualitatively different class; tip-of-the-tongue phenomena, for instance, are significantly more common for PNs than for CNs [2]. Electrophysiologically, it has been shown that PNs elicit larger N1 and P2 responses than CNs [3].

Taken together, then, PNs constitute a class of their own in a language. They exist in all languages, and are among the first words that children acquire [4]. This could either be due to their special characteristics or could be a cause for these. They form a dynamic class to which new members are added continuously across a speaker's lifetime. Nonetheless, little is known about their (special) phonetic characteristics.

In this paper, we present the results of three phonetic perception experiments in which we tried to establish whether there are certain phonetic features which make PNs more prominent or different, and therefore more easily identifiable, than CNs. In Experiments 1 and 2 we tested the hypothesis that CNs are phonetically distinct from PNs. For this purpose, listeners had to identify PNs in utterances in an unknown language. Since we found preliminary support for the hypothesis tested in the first two experiments, we also ran a third experiment in which we tested the hypothesis that the acoustic information is located in the context of the noun, rather than in the noun itself. In this experiment, listeners had to guess whether the missing word in a series of utterances was either a PN or a CN.

2. Experiments

2.1. Experiment 1

The purpose of the first experiment was to find evidence for the existence of acoustic information specific for PNs.

2.1.1. Experiment 1: Design, material and participants

The first experiment was a forced-choice listening task. A group of Swedish participants were asked to identify one of two words in a set of 60 Korean sentences as a PN or a CN. As part of the requirements to participate in the experiment, the participants had no knowledge of Korean. The target words occurred in subject position and object position, one of which was the CN and the other the PN. The PNs and CNs were matched in syllable length. Most were disyllabic. The sentences were read by a native speaker of Korean who was not aware of the purpose of the experiment.

All utterances had the same syntactic structure, consisting of subject-particle-object-particle-verb. Two example sentences are given in the table below. The PNs are indicated by shading.

Table 1: Example sentences from Experiment 1

subject		object		verb
No-In	eun	Woo-Chan	eul	bu-reo-wo-han-da
('An old man envies Woo-Chan')				
Yong-Gu	neun	Ak-Gi	reul	yeon-ju-han-da
('Yong-Gu plays the instrument')				

All sentences were presented using the speech editing program Praat [5]. A transcription of the utterance was displayed in Latin alphabet on the computer screen. The two target words between which the participants had to choose were shown beneath the sentence. The spoken utterances were presented over headphones at a comfortable listening level. Participants responded by clicking on one of the two target words, and subsequently marked the confidence in their answer on a five-point scale. The order of the presentation was randomized. Participants were instructed to listen carefully, and if they wanted, they could listen to an utterance for up to five times. As a control against bias in the experimental materials, we ran two versions of the experiment, one with sound, and one without sound. The silent version was identical to that with sound, except for small differences in the instructions.

We expected an overall higher proportion of correct identifications for the responses to the stimuli with the sound than to the silent stimuli. While we did not have any particular a priori expectations as to whether the sound effect would be the same for the target words in subject position or in object position, we did not exclude the possibility that this might be the case, and also included a possible interaction effect of sound by position in the analysis. While the primary results of

the experiments were the proportions of overall correct responses, we also looked at confidence ratings. Our expectations for confidence ratings parallel those for error rates, that is, we expected higher confidence for stimuli with sound than without sound, and a possible interaction of sound and position.

2.1.2. Experiment 1: Results

A total number of 63 listeners participated in Experiment 1, 33 of whom did the experiment with sound, and 30 without sound. They were 29 women and 34 men with a mean age of 35.1 years. None of them reported any active or passive knowledge of Korean. Two participants in the experiment with sound were excluded from the analysis for lack of variation in their responses: they selected the subject words and gave the same confidence rating for all items.

The proportions of correct responses are given in Table 2. The proportions show that there were only minor differences between the sound and the silent versions of the experiment, but there was a general tendency that words in subject position were classified correctly more often than words in object position. As for the confidence ratings, there were only minor difference as well. Contrary to expectations, the average confidence ratings were somewhat higher in the silent condition than in condition with sound.

Table 2: Results of Experiment 1. Figures represent proportions of correct responses and average confidence ratings, respectively.

	object	subject
sound	0.533 – 2.18	0.661 – 2.24
silent	0.564 – 2.42	0.673 – 2.36

The results were analysed using multilevel regression models, with target-word position (subject or object) and experimental version (sound or silent) as the main predictors, including their interaction, and participant and item as random factors. For the proportions of correct responses (binomial model), the results indicated no significant difference between the two experimental versions ($EST = -0.098$, $SE = 0.115$, $z = -0.853$, $p = 0.394$), but the observed proportion of correct responses for the target words in subject position was significantly higher than that in the object position ($EST = 0.557$, $SE = 0.158$, $z = 3.534$, $p = 0.000$). The interaction was not significant ($EST = 0.076$, $SE = 0.141$, $z = 0.536$, $p = 0.592$). For the confidence ratings, the difference between the experimental versions was not significant ($EST = -0.180$, $SE = 0.225$, $t = -0.799$, $p = 0.425$), nor was the difference between target words in subject or object position ($EST = -0.001$, $SE = 0.033$, $t = -0.044$, $p = 0.965$). However, the interaction of the two predictors was significant ($EST = 0.110$, $SE = 0.048$, $t = 2.309$, $p = 0.021$). The significant interaction is shown in Table 2, in that the difference in average confidence rating between the sound and the no-sound condition is larger for the target words in object position than for those in subject position.

2.1.3. Experiment 1: Discussion

The results of Experiment 1 showed no clear indication that PNs are acoustically distinct from CNs. We found no difference between the two experimental versions. We did find a difference, at least for the correct responses, between the two

positions, but since this difference existed in both experimental versions it is likely that there was some bias in the stimuli that made the target words in subject position more easily recognizable as PNs than the target words in object position. We would like to stress once more that the participants reported no knowledge of Korean before they participated in the experiment, but, of course, the possibility that they had some knowledge of the language cannot be completely ruled out. For instance, some of the PNs in the experiment might have resembled those of football players, actors, or exchange students.

2.2. Experiment 2

Given the response bias that was not primarily due to one of the experimental factors in Experiment 1, we ran another version of the same experiment, this time with Swedish stimulus materials, which were presented to Chinese participants.

2.2.1. Experiment 2: Design, Material and Participants

The stimulus utterances were similar to those used in Experiment 1 in that they all had the same syntactic structure subject-verb-object, and the PN was either in subject position or in object position. We tried to match the PNs with the CNs even more strictly than in Experiment 1. Most targets were disyllabic, and a few were monosyllabic. In order to avoid potential cues that the participants might use to guess which of the two target words was the PNs, the second syllables of the target words were matched so that the PNs ended in much the same way as the CNs. Furthermore, we avoided very common names (such as *Björn*, *Anna*, *Frida*) so that any possibility of familiarity with the names in the experiment was reduced to a minimum. Given the stricter criteria on the stimulus material, there were fewer items in Experiment 2 than in Experiment 1: 19 utterances had the PN in subject position, 16 in object position, yielding a total of 35 items. Table 3 shows two examples of utterances used in Experiment 2. PNs are indicated by shading.

Table 3: Example sentences from Experiment 2

subject	verb	object
flickan	slår	Hervor
'The girl beats Hervor'		
Östen	väljer	siffror
'Östen chooses numbers'		

The utterances were presented to a group of speakers of Chinese who had no knowledge of Swedish. The experimental procedure and design were the same as in Experiment 1. The sentences were presented in their original orthography to the participants. The instructions were given in Chinese. In the instructions, we emphasized, even more strongly than in Experiment 1, that the participants needed to listen carefully before making their judgement. Our expectations matched those for Experiment 1.

2.2.2. Experiment 2: Results

A total number of 46 participants were tested in Experiment 2, 28 female and 18 male, average age 23.6 years. Half of them did the experiment with sound, the other half did the

experiment without sound. All participants reported no knowledge of Swedish. They were paid for participating in the experiment. Table 4 gives an overview of the results of the second experiment.

Table 4: Results of Experiment 2. Figures represent proportions of correct responses and average confidence ratings, respectively.

	object	subject
sound	0.427 – 3.42	0.533 – 3.53
silent	0.505 – 3.64	0.499 – 3.43

Interestingly, the results showed a tendency towards more correct responses to the stimuli with sound when the PNs were in the subject position, and simultaneously a tendency towards fewer correct responses to the stimuli with sound when the PNs were in the object position. The confidence ratings paralleled this tendency, although, as the results show, to a weaker extent. A further interesting observation is that the average confidence ratings were higher by approximately one point for the Chinese participants compared to the participants from Experiment 1. Finally, the proportions of correct responses for the PNs in subject and object positions were minimally different in the silent version. This final observation suggests that we succeeded in our effort of making the PNs as similar to the CNs as possible.

As in Experiment 1, the results were analyzed using multilevel regression models. For the correct responses we found no significant first-order effect of experimental version ($EST = -0.114$, $SE = 0.150$, $z = -0.762$, $p = 0.446$) nor of position ($EST = 0.259$, $SE = 0.324$, $z = 0.799$, $p = 0.424$). However the observed interaction was significant ($EST = 0.551$, $SE = 0.217$, $z = 2.541$, $p = 0.011$). For the confidence ratings, none of the effects was significant (experimental version: $EST = -0.159$, $SE = 0.167$, $t = -0.95$, $p = 0.341$; position: $EST = -0.052$, $SE = 0.069$, $t = -0.76$, $p = 0.448$; interaction: $EST = 0.122$, $SE = 0.081$, $t = 1.50$, $p = 0.133$).

2.2.3. Experiment 2: Discussion

The results of Experiment 2 were more promising than those of Experiment 1, even though they were not quite as we predicted. We found higher proportions of correct responses for the stimuli with sound, but only for the PNs in subject position. For the PNs in object position we actually found lower proportions of correct responses when presented with sound. These results suggest that acoustic information typical for PNs may exist, but that this information is dependent on or overridden by position in the sentence.

2.3. Experiment 3

The results of Experiment 2 indicated that acoustic information whether a noun is a CN or a PN may exist. Experiment 3 was carried out to locate potential acoustic cues indicating PNs. If PNs figure more prominently in spoken language than CNs, is that because of information in the noun itself, or is it because of information in the context of the noun? A preliminary answer to that question was given by Müller and Kutas [3], who measured electrophysiological responses to CNs and PNs. They observed larger N1 and P2 amplitudes for PNs at 125 ms, well before the offsets of the words. Since the target words in their study were always in the

beginning of the test utterances, this finding suggests that acoustic characteristics typical for PNs are located in the words rather than in their context. We attempted to confirm Müller and Kutas' observation in our third experiment. In this experiment, we used a gating task, that is, we presented short carrier sentences from which the last word had been cut out. We hypothesized that if acoustic information is in the context of the target words, then participants should be able to guess whether the missing word at the end of the sentences was a PN or a CN.

2.3.1. Experiment 3: Design, Material and Participants

Experiment 3 was carried out with Swedish materials and listeners. The missing target words were embedded in one of two carrier sentences, either a statement 'Det här är en bild på ...' (*This is a picture of ...*) or a question 'Vad tycker du om ...?' (*What do you think of ...?*). The target words were all disyllabic, and each PN was matched with a CN so that both started with the same syllable onset. This was done in order to maximally reduce the role of possible coarticulation effects from the last word in the carrier sentence to the beginning of the target word. Two example sentences are shown in Table 5.

Table 5: Example sentences from Experiment 3

statement	Det här är en bild på liljor / Lisa. 'This is a picture of lilies / Lisa'
question	Vad tycker du om rumba / Rudolf? 'What do you think about rumba / Rudolf?'

We constructed a list of 60 pairs of target words (e.g., *lilies* and *Lisa*). Each PN and its matched CN was combined with both a question and a statement carrier sentence, yielding a total of 240 test sentences. These sentences were used to create four versions of the experiment consisting of 60 items each, so that each combination occurred only once for a participant.

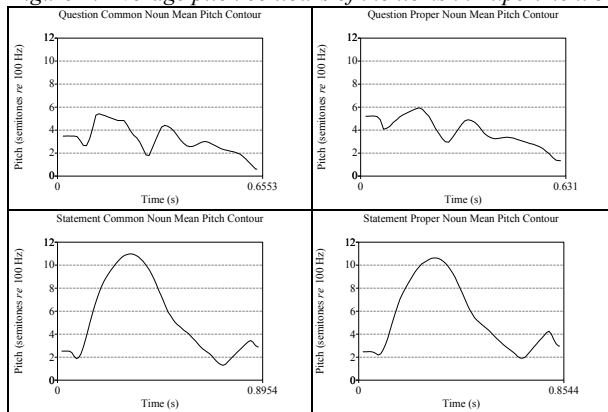
The sentences were read by a native speaker who was not aware of the experimental purpose. She read the sentences while looking at pictures of the target words (faces for the PNs, objects for the CNs), and was asked to read as lively as she could, imagining that there was a listener in the room whom she addressed directly.

The target words were cut out of the sentences, and subjected to an acoustic analysis. Figure 1 shows the average pitch contours of the questions and the statements combined with the PNs and the CNs. The contours suggest great similarity between the two utterance types.

The materials were presented to the participants using the speech-editing program Praat. Beneath each sentence the two alternatives were given, and the participants responded by clicking on the word they thought was missing. Just like in Experiments 1 and 2, they also marked how confident they were on a scale from 1 to 5.

We expected that, if there was information about the missing word in its context, that the participants would perform more accurately than chance.

Figure 1: Average pitch contours of the items in Experiment 3.



2.3.2. Experiment 3: Results

44 native speakers of Swedish participated in Experiment 3. There were three experimental items for which all participants selected the PN. It was decided that the CN for these items was an unlikely (though not impossible) completion of these sentences, and, consequently, these items were discarded from the analysis. The proportions of correct answers were 0.500 for the statements, and 0.495 for the questions. The respective average confidence ratings were 3.09 and 2.86.

In other words, the overall proportions of correct responses hardly differed from chance, and there was only a minor difference between the proportions of correct responses for the statements and the questions. The overall confidence ratings, however, were higher for the statements than for the questions. The statistical analysis confirmed these observations. For the proportions of correct responses, the intercept representing guessing was not significantly different from zero ($EST = -0.025$, $SE = 0.072$, $z = -0.347$, $p = 0.729$), nor was the difference between the statements and the questions ($EST = 0.012$, $SE = 0.102$, $z = 0.116$, $p = 0.908$). Nevertheless, the difference in confidence ratings between the questions and the statements was significant ($EST = 0.221$, $SE = 0.034$, $t = 6.394$, $p = 0.000$).

2.3.3. Experiment 3: Discussion

The results of Experiment 3 did not provide evidence that there is acoustic information distinguishing PNs from CNs in the context of the nouns. This result is consistent with the observations reported by Müller and Kutas [3], who found differences in N1 and P2 amplitudes before the offset of the target words.

3. Discussion

Our results provide preliminary evidence that phonetic characteristics typical for PNs may exist, and listeners may be aware of them. This conclusion is mainly based on the results of the second experiment reported in this paper. In Experiment 2, we found that the proportion of correct responses increased when the PNs were presented with sound, but only for the target words that occurred in subject position. For the PNs in object position, we observed, in fact, the opposite. This result needs to be explored further, since the same effect was not found in Experiment 1. A third experiment with Swedish

participants listening to Chinese stimuli will be reported on in future work.

One inherent difficulty with the current experimental set-up was to force the participants to make their choice based on the acoustic information rather than something else (e.g. the meaning of the words). Perhaps we did not succeed optimally in this respect, in spite of stating this clearly in the instructions. First of all, there was a bias for the participants to select the words in subject position. This bias was observed most strongly in Experiment 1, and to a lesser degree also in Experiment 2. In other words, the participants thought the subject words (those that occurred first in the sentences) to be PNs more often than the object words. This bias is in itself interesting and needs to be taken into account in future experiments. Second, it is hard to completely rule out any knowledge of the foreign language, or at least, expectations of the other language. Such expectations may have played a stronger role in the choice of the target word than the acoustic information provided in the experiments with sound. Third, it is difficult to match the orthographic transcriptions with the sound in a foreign language. This may have led to the participants paying less attention to the sound and more to the transcriptions, leading to nonsignificant differences between the loud and the silent versions of the experiments.

Our results do not indicate which features are important for PN identification (e.g. whether they are at the segmental or the suprasegmental level), but they do suggest that these characteristics should be located in the PNs themselves, rather than in their context. The results from Experiment 2, furthermore, indicate that such features may interact with other acoustic features, possibly acoustic correlates to the information structure of the sentences [6]. These are issues that need to be explored in more detail.

4. Acknowledgements

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5. References

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