



**HAL**  
open science

# Mundurucu Number Words as a Window on Short-Term Memory

Johan Rooryck, Alberto Tonda, Jairo Saw, Pierre Pica

► **To cite this version:**

Johan Rooryck, Alberto Tonda, Jairo Saw, Pierre Pica. Mundurucu Number Words as a Window on Short-Term Memory. The origins of numerical abilities: the future, Feb 2017, Chicheley Hall, United Kingdom. , 2017. halshs-01497577

**HAL Id: halshs-01497577**

**<https://shs.hal.science/halshs-01497577>**

Submitted on 28 Dec 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Mundurucu Number Words as a Window on Short-Term Memory

Johan Rooryck<sup>1</sup>, Alberto Tonda<sup>2</sup>, Jairo Saw<sup>3</sup>, Pierre Pica<sup>4</sup>

<sup>1</sup>Leiden University, <sup>2</sup>Université Paris-Saclay, <sup>3</sup>Sawre Aboy, <sup>4</sup>CNRS & Instituto do Cérebro, Natal

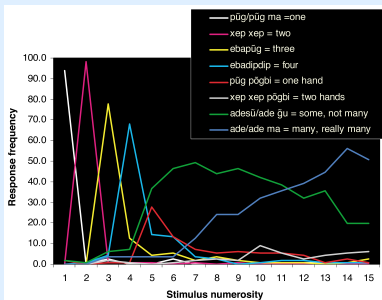
## 1. Properties of Mundurucu number words

In Mundurucu, each number word is one syllable longer than the previous one. Moreover, they seem articulated in two distinct parts, expressing a **set** and the *successor function*, respectively (Pica, 2016).

Table 1

Word	Gloss	Reference	Syllables
Pûg	"One"	One	One
Xepxep	"Fat-redup"	Two	Two
Ebapûg	"Your arm(s) and one"	About three	Three
Ebadipdip	"Your parent(s)-redup"	About four	Four

Figure 1 from Pica et al., 2004



Could characteristics of Mundurucu number words be related to properties of working memory?

## 3. Evidence

We observe that Mundurucu classifiers express iconic properties of working memory, such as grouping and serial ordering.

Classifiers can also combine to increase the size of the magnitude they express (e.g. **badip** = **ba** + **dip**).

In general, it seems that **xep < ba < dip < badip**

Even though Mundurucu number words do not possess an exact cardinality, they still feature a number of syllables that corresponds to the number of STM slots used to store that many objects.

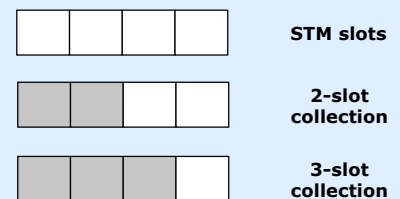
The Mundurucu linguistic system seems to indicate that objects are perceived mainly with respect to their spatiotemporal characteristics, somewhat ignoring the full identity of the object. This is coherent with observations on STM and its relation to object file, from which it emerges that object file representation can only make reference to spatiotemporal features.

## 2. Classifier words and STM collections

Interestingly, Mundurucu number words are made out of **classifiers**, which are traditionally viewed in linguistics as elements making reference to specific geometrical features of an object.

ako-**ba** = "Banana fruit"  
ako-**dip** = "Field of banana trees"  
waje-**ba** = "Cocoa fruit"  
waje-**dip** = "Field of cocoa trees"

Short-term memory (STM) is organized in collections of concepts that have strong association with one another and much weaker associations to chunks already in use. There is strong evidence that STM has a limit of 4 slots that can store information (Cowan, 2001).



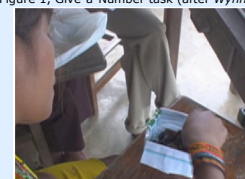
## 4. Conclusions

Mundurucu speakers are limited in the expression of numbers because they somehow only use working memory.

If Mundurucu number words reflect the organization of working memory, and they show a specific ordering, this perceived ordering can also be a property of working memory, as some works on subitizing seem to suggest (see for example von Szeliski, 1924 and Garner, 1948).

The remaining question is: how does the representation of working memory properties relate to the properties of the Approximate Number System?

Figure 1. Give-a-Number task (after Wynn, 1990)



« Give me three seeds! »  
**Stimuli:** pûg, xep xep, ebapûg, ebadipdip, pûg pûgbi, etc (from Izard et al., 2008)