

A Sentence Repetition Task for Early Language Assessment in Spanish

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Abstract

Sentence repetition tasks have been widely used in the last years as a diagnostic tool in developmental language disorders. However in Spanish there are few (if any) of these instruments, especially for younger children. In this context, the aim of this study is to develop a new Sentence Repetition Task for assessing language (morphosyntactic) abilities of very young Spanish children. A list of 33 sentences of different length and complexity was created and included in the task. A total of 130 typical developing children from 2 to 4 years of age were engaged in a play situation and asked to repeat the sentences. Children's answers were scored for accuracy at sentence and word level and error analysis at the word level was undertaken. Besides a subsample of 92 children completed a non-word repetition task. First results show its adequacy to children from 2 to 4 years of age, its capacity to discriminate between different developmental levels, and its concurrent validity with the nonword repetition task.

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Sentence repetition tasks have been widely used in the last years as a diagnostic tool in developmental language disorders. In fact, some authors consider that sentence repetition scores are better clinical markers of Specific Language Impairment (SLI) than other used assessments, such as non-word repetition and past tense elicitation tasks (Archibald & Joanisse 2009; Conti-Ramsden, Botting & Faragher, 2001; Seef-Gabriel, Chiat & Roy, 2010). Bilingual and multilingual children with language impairment also

perform poorly on this task (Chiat et al., 2013; Nag, Snowling & Mirkovic, 2018; Simón-Cereijido, 2017).

Sentence repetition only implies listening to the target sentences and reproducing them immediately as accurately as possible. In spite of this apparent simplicity and its utility as a clinical marker, there is not yet a theoretical agreement on the cognitive processes underlying the task. Different researchers discuss which is its nature and relationship with other language skills. Based on the multi-component working memory model (Baddeley, 2000), several studies interpret sentence repetition scores as a measure of the episodic buffer and the phonological loop (Adams & Gathercole, 2000; Alloway, Gathercole, Willis & Adam, 2004; Alloway & Gathercole, 2005; Pierce, Genesee, Delcenserie & Morgan, 2017). This view emphasizes the memory processes underlying sentence repetition and it also has practical consequences (i.e. working memory training programs as treatment). In contrast to this approach, other researchers have proposed that sentence repetition also provides a measure of language (lexical and grammatical) processing skills (Klem et al., 2015; Nag et al., 2018; Polišenská, Chiat & Roy, 2015; Risches, 2012) and not necessarily of a separate memory component.

Sentence repetition tasks have been developed for different languages and age groups. English is the one that counts with a higher number of studies (Baddeley, Hitch & Allen, 2009; Chiat et al., 2013; Seef-Gabriel, Chiat & Roy, 2008; Riches, 2012; Stokes, Wong, Fletcher & Leonard, 2006 – comparing English and Cantonese), but there are studies in other languages (Catalan: Gavarró, 2017; Czech: Polišenská et al., 2015; French: Leclercq, Quémart, Magis & Maillart, 2014; Italian: Devescovi & Caselli, 2007; Kannada: Nag et al., 2018; Norwegian: Klem et al., 2015; Hungarian: Gábor & Lukács, 2012; Icelandic: Thordardottir, 2008).

In Spanish, to our knowledge, there is only one pilot study (Moreno, Madrid & Moruno, 2013), published in a Spanish journal, with 18 typically developing children and 10 deaf children with cochlear implant (ages: 2 to 4 years). A total of 24 sentences (18 simple and 6 complex) were presented to the children to repeat them. This research was focused in specific phonological aspects comparing both groups of children and the limitations of the study, due to its pilot character, are obvious.

Regarding standardized tests, there are some instruments adapted to Spanish, not specifically designed as a sentence repetition tasks, but that include a few number of items to be repeated as part of a broad language assessment. Among them, there is a Spanish version of the CELF test (Wiig, Semel & Secord, 2009) for preschool children aged 3 through 6;11 years. However, the standardization sample was comprised of 464 individuals from across the United States and Puerto Rico and 122 out of them were reported to be bilingual (p. 153). Therefore we understand that the scores are not adapted to the participants in Spain. The NEPSY-II (Korkman, Kirk & Kemp, 2007) adapted into Spanish also includes a sentence repetition task for children 3 to 6 years of age and there are norms for Spanish monolingual population. There are some problems derived from the direct translation of the items in both tests, specifically the representative value of the sentences for assessing Spanish grammar knowledge. For bilingual English-Spanish (Mexican) children (4 to 6 years) there is an instrument for language assessment that includes a sentence repetition task (BESA; Peña, Gutiérrez-Clellen, Iglesias, Goldstein & Bedore, 2014), standardized for this particular bilingual population.

It is difficult to compare previous results derived from studies that specifically use sentence repetition tasks. However, in spite of the diversity of languages, ages of the participants and tasks' designs, researchers coincide in highlighting the potential of this

task to provide valid information on children's linguistic knowledge and to discriminate between typically developing children and children with language delays or disorders (Seef-Gabriel et al., 2010). It seems to draw upon a wide range of language processing skills (Klem et al., 2015; Nag et al., 2018) and it reflects well-known characteristics of language developmental stages as the difference between acquisition of content versus function word or typical error patterns. In this vein, both quantitative (Mean Length of Utterances) and qualitative measures of children's spontaneous productions correlate with measures obtained from repetition tasks (Devescovi et al., 2007). There are numerous studies including Non-Word Repetition Tasks (NWR) compared to Sentence Repetition. Non-word repetitions tasks, both in monolingual and bilingual children, are usually considered as a measure of verbal short-term memory and/or working memory (Alloway & Gathercole, 2005; Archibald & Joanisse, 2009; Baddeley et al., 2009). Children with Developmental Language Disorders performed below typically developing children in NWR and SR tasks, and both measures are moderately to highly correlated in different studies (*see* Zebib, Tuller, Hamann & Prévost, 2019 - for French monolingual and bilingual children with TD and DLD profiles; Rujas, Mariscal, Casla, Lázaro & Murillo, 2017 – for monolingual Spanish Late Talkers).

Methodologically, repetition tasks allow the examiners to control a range of selected targets in a more systematic way and to obtain evidence on children's linguistic performance more efficiently. In practical terms, this method constitutes an alternative to more time-consuming procedures as spontaneous language sampling analysis.

Excepting Moreno et al.'s pilot study, no previous study has, to our knowledge, examined Spanish typically developing children under 4 years of age, using a specific sentence repetition task. Given the reliability, validity and predictive value of this kind of instruments to detect language delays and disorders, this study was designed aiming

at building a sentence repetition task in this language, appropriate and engaging for young children. Our aim was to include a set of sentences with different length and morphosyntactic complexity adequate to assess grammar development of monolingual Spanish children under 4 years of age.

Sentence Repetition Tasks can vary in the way they are constructed and, consequently, may differ in the linguistic and cognitive abilities they tap and measure. In this study we take into account sentence length (number of words), the familiarity of content words that form the sentences and the complexity of the items in morphosyntactic terms. Given that Spanish is a Romance language, the sentences built up contain verb (tense, number, person) and noun (gender and number) morphology. The majority of sentences were simple but we also included some complex items at the end of the list of sentences (see details in Procedure).

We expect a good internal consistency for the whole set of sentences developed, and, consequently, that the task is appropriate to assess morphosyntactic development of the participants in our study. We also expect to get age effects showing the capacity of this tool to discriminate between different developmental levels; that is, that older children obtain significantly better scores than younger ones. Moreover, differences between errors affecting open and close words are expected. Errors affecting function words are hypothesized to be more frequent than errors affecting content words, but differences between both kinds of errors are expected to decrease as children grow older. Finally, positive and significant correlations with non-word repetition task are hypothesized.

Method

Participants

The participants were 130 children (56 boys and 74 girls) between 24 to 48 months of age. They were divided into 4 groups of age (see Table 1). All participants were recruited from kindergartens and municipal nursery schools from Madrid and Toledo (Spain). All participants were monolingual Spanish-speaking children, with no history of hearing loss and no referral to speech or language therapy services. All of them were typically developing children with no language delay, as shown by the two standardized tools used (see Procedure). The sample is typical of a middle socio-economic class.

Families signed consent forms to participate in this study, which was approved by the Research Ethical Boards of Universidad (BLIND FOR REVIEWERS) and Universidad, (BLIND FOR REVIEWERS) where this project was carried out.

Procedure

Materials and tasks

Children under 2;06 years of age were assessed with the MacArthur Communicative Development Inventories (Spanish-European version; López Ornat et al., 2005), as this instrument can be administered up to 30 months of age. Only children with vocabulary and grammatical percentiles within normal ranges were included in the sample (group 1). For older children (2;06-4;00; groups 2 to 4) Merrill-Palmer (Roid, Sampers, Anderson, Erickson & Post, 2004) was used to assess language level. As for the case of group 1, only participants scoring within normal ranges were included.

A subsample of 92 children was also evaluated using a non-word repetition task used in previous studies (Mariscal & Gallego, 2013; Rujas et al., 2017).

For sentence repetition a list of 33 sentences was built up, controlling length and phonological complexity of content words. The set of words included are frequent items

used by Spanish children in their acquisition process and were taken from López-Ornat et al. (2005) MCDI database. When possible, simple syllabic structure (CV) was chosen to avoid the impact of articulatory difficulties to produce the words.

The majority of the sentences included in the task were simple sentences, first generated using SV sentences and then introducing different direct and indirect objects (SVO sentences); besides, a total of 8 complex sentences were included in the task (see Appendix for the list of Spanish sentences and its translation into English). All the sentences include typical morphological units for verbs (tense, number, person) and nouns (gender and number) and were presented in the same order (always from simplest to more complex) to children.

After getting to know with the researcher, each child was administered the task in the school she/he attended (in some cases at home, with the presence of one parent). All the participants completed the task in less than 20 minutes and their performance showed their comprehension of the instructions. Similarly to Seef-Gabriel et al. (2008), for the repetition task a puppet was used to help children to get involved. Specifically, children were seated in front of the researcher, the puppet was introduced and children were asked to teach him to talk. The sentences were read out by the experimenter in the same order to all the children, at a normal utterance pace and clearly articulated. Stamps and stickers were used to reinforce them every 5 items. It could be that children did not respond after the first attempt. In these cases, a second opportunity was provided. If there was no answer, next item was presented. All children's answers were audio or video recorded for transcription and coding.

Transcription, Coding and Scoring

Children's sentence repetitions were recorded and transcribed off-line. Given the transparency of Spanish orthographic system, children's responses were transcribed orthographically.

After transcription, all children's repetitions were first coded at sentence level (i.e. correct or incorrect sentence repetition) and then at word (content vs. function words) and morpheme level (Noun and Verb bound morphemes). For word level, three different kinds of errors were coded: substitution, omission and addition. For morpheme level, substitution errors were coded considering its grammaticality. We also included the code XXX for unintelligible segments, NR for non-responses and considered word order errors. For this study, we only report analysis at sentence and word level (see Result). According to this coding system, two measures were defined: 1) A sentence level accuracy measure: number and proportion (compared to the number of targets attempted by each child) of correctly repeated sentences, and, 2) Measures of the number and kind of errors of children's repetitions of content words (CWs) and function words (FWs). A sentence is coded as correct if the child correctly repeats all the words that comprise each item, without considering articulation errors.

A second rater (a trained speech and language therapist) coded 11.54 % of the children's repetitions and inter-coder agreement for sentence level coding was calculated ($Kappa = .84$).

Results

Reliability

Cronbach's coefficient alpha was computed for the set of items as a whole. For the sentence level measure of global accuracy $\alpha = .97$. This result shows that the task

achieved a good level of internal consistency.

Responsiveness

Children's responsiveness was high compared to other studies (Seef-Gabriel et al., 2008), especially for children older than 30 months of age. Table 2 shows the mean number of nonresponses and standard deviation by age group for the task. The mean rate of non-responses was age related. Variability is especially high for younger children (group 1) and it decreases through ages. This result has clear consequences for interpreting scores (see Discussion).

Developmental Effects

The analyses are reported separately for sentence and word level measures.

Firstly, for the accuracy measure on sentence repetition, total number of correctly repeated items and proportion scores (calculated out of the total number of items attempted by each child) were obtained. Given the positive and high correlation between both sets of scores, absolutes and proportions, ($r = .963$; $p < .001$, bilateral) the following results and analysis only refer to absolute scores. Table 3 shows descriptive statistics regarding performance for the 4 age-groups. One-way analysis of variance shows a clear age effect ($F(3, 126) = 63.1$, $p < .001$, $\eta^2 = .600$, $1-\beta = .999$). As expected, sentence repetition accuracy increases developmentally. Post-hoc comparisons (Bonferroni) show significant differences ($p < .01$) between all age groups, except between groups 3 ($M = 22.33$) and 4 ($M = 26.45$) ($p = .18$).

Secondly, number of errors regarding children's repetition of Content and Function words (CW & FW) were computed separately. Given the different number of both kinds

of words in the set of sentences (106 content words and 86 function words), proportion scores were obtained and used for analysis.

Table 4 shows descriptive statistics regarding errors in CWs and FWs for the 4 age-groups. A mixed analysis of variance shows a clear effect of the word type ($F(1, 126) = 124.55, p < .001, \eta^2 = .505, 1-\beta = .999$). As expected children of all ages produce more errors when repeating function words than content words. Besides, there is an interaction between age-group and word type ($F(3, 126) = 7.23, p < .001, \eta^2 = .151, 1-\beta = .981$). As age increases differences between content and function words decreases, but the difference between CW and FW scores is only significant ($p < .001$) for groups 1, 2 and 3, but it does not have significance for group 4, as it is indicated by Bonferroni test ($p = .007$).

Different subtypes of errors in sentence repetition were also computed. Tables 5 and 6 display the distribution of omissions, substitutions and additions for the whole sample and for group-age, respectively. Omissions are the most frequent errors, followed by substitutions and additions, whose proportions are quite low for all the children. This pattern is common to CW and FW and to all age-groups. Scores for groups 1 and 2 are considerably higher than for groups 3 and 4, and there is also a clear decrease from group 3 to 4. The oldest children (group 4: 3;07-4;00) only produce 3% of omission in CW and FW (see Table 6 and Figure 1).

Concurrent Validity

In order to obtain an index of concurrent validity of the sentence repetition task the correlation between sentence level scores (i.e. total number of items correctly repeated) and a measure of accuracy of non-word repetition was obtained. Results indicate a high correlation between both scores ($r = .710; p < .001$, bilateral).

Discussion

The aim of this study was to present a sentence repetition task developed for early language assessment of Spanish children and to evaluate: 1) its adequacy for children from 2 to 4 years of age; 2) its capacity to discriminate between different developmental levels, both at sentence and word level; and, 3) its concurrent validity with another measure based on repetition (non-word repetition task).

Regarding its adequacy to evaluate young children, the task has proved to be engaging even for very young children, as nonresponse rates shows. Children's responsiveness in this sample is high compared to other studies (Seef-Gabriel et al., 2008) and it increases through ages. However, inter-subject variability, especially in the youngest age group is remarkable, although expected. Rate of nonresponse to individual items needs to be taken into account when assessing children's linguistic performance, as a low score where every item has been attempted cannot have the same meaning as this same score where a high proportion of items have been refused. For future research a more in-depth analysis of nonresponse pattern, especially for the youngest children, could be accounted. Task length may be one reason for youngest children's (group 1) nonresponses. Given that the number of items in our task is relatively high (i.e. 33 sentences), it might be reduced for future studies.

Analysis at sentence level show that the task discriminates well in the age range considered here. Children are able to produce more accurate repetition of the sentences that comprise the task as they grow older. But, as post-hoc comparison shows, developmental differences are not significant when comparing groups 3 ($M = 22.33$) and 4 ($M = 26.45$) ($p = .18$). This result could be explained by the nature of this accuracy measure. Given it is a very superficial or broad index of sentence repetition

abilities (0 point for incorrect repetition vs. 1 point for correct repetition), it does not capture differences in performance between children in group 3 (3;00- 3;06) and group 4 (3;07-4;00). Regarding analysis of repetition of content and function words, our results are consistent with our hypotheses and provide evidence that individual differences in performance are influenced by word category. As expected, content words are better repeated than function words through all ages, but this difference is only significant for younger children (group 1, 2 and 3). For the oldest children in our sample (group 4), difference between correct repetitions of CW vs. FC is not significant. Descriptive analysis of error subtypes (omission, substitution and addition) do show a common pattern for all age-groups, being omissions the most frequent kind of error both for CW and FW. Proportion of errors decrease considerably from groups 1 and 2 to groups 3 and 4, and the percentage of omissions for the oldest children (group 4) in the study is quite low. These differences in favor of content words are completely in line with the task nature, as it aims at assessing development of morphosyntactic knowledge or/and use in young children. As function words create syntactic structure and the hierarchical relation between words within sentences, whereas content words give lexical content to the sentences, results obtained are in agreement with the expected developmental trajectory. As age and linguistic competence of the participants increase, error scores for function words decrease, together with the difference between content and function words scores.

Considered as a whole, the set of results obtained for this study converge with developmental evidence gathered using spontaneous sample analysis and elicitation tasks in different languages, and they reflect properties of early language production in typically developing children (Devescovi & Caselli, 2007; Gábor & Lukács, 2012; Gavarró, 2017; Moreno Torres et al., 2013; Nag et al., 2018). Additionally, a significant

and high correlation between sentence repetition and non-word repetition was obtained in this study. This last measure has been taken as an index of verbal short-term memory in previous research and/or as a measure of phonological knowledge (Alloway & Gathercoles, 2005; Archibald & Joanisse, 2009; Baddeley et al., 2009). In fact, there is a theoretical discussion about what mechanisms and/or knowledge underlies sentence repetition task. Although correlational results obtained for the present paper do not give an answer to this debate, they add evidence on the concurrent validity of the SRT in Spanish. More data and analysis are needed to tease apart if the SRT can be interpreted as a measure of verbal short-term memory, a measure of Phonological Working Memory or as a general index of linguistic (phonological, lexical and/or morphosyntactic) knowledge. Future analysis taking NWR scores - and not age - as the criteria to form the groups could be informative, together with a comparison between SR and others tasks measuring working memory, as the classical digit task. Our research project includes both types of measures for a subsample of children, together with more general language measures (CDI and Merrill-Palmer's tests), that will be considered for future studies. Another possible analysis that could be relevant to the above mentioned theoretical question is to explore the relation between sentence length and complexity and repetition scores. Even though our design do not intentionally control these variables, our set of sentences include short and long sentences (2 to 9 words) and simple and complex items, that could be recoded for future and interesting analysis.

Out of the results obtained for this study, we can conclude that the new Spanish Sentence Repetition task designed to assess linguistic level of very young monolingual Spanish children seems to be adequate, reliable and valid for these developmental period. This is the first study developed in Spanish with a numerous sample and very

young children (under 4 years of age). Additional studies (in course) will add more (and needed) evidence on its predictive validity and its capacity to differentiate children with typical development from children with any kind of developmental language disorder. Hopefully, our future analysis will also provide evidence on the discussion about which cognitive processes and kind of knowledge are involved in this apparently simple task.

For Review Only

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Table 1. *Distribution of participants by age.*

Group	N	Age (months)	range	Mean (SD)
1	30	24 to 29		25.50 (1.88)
2	36	30 to 35		31.86 (1.72)
3	33	36 to 41		38.06 (1.82)
4	31	42 to 48		45.71 (1.94)

Table 2. *Mean number of nonresponses for the Sentence Repetition Task by age group (maximum score = 33).*

Group	Age (months)	range	Mean (SD)
1	24 to 29		10.93 (11.76)
2	30 to 35		3.78 (6.47)
3	36 to 41		1.88 (4.56)
4	42 to 48		0.23 (0.49)

Table 3. *Total number of correctly repeated sentences.*

Group	Mean (SD)	Range (max-min)
1	4.07 (5.85)	0-21
2	11.03 (8.36)	0-29
3	22.33 (8.18)	2-33
4	26.45 (5.13)	10-33

Table 4. *Proportion of repetition errors in Content and Function Words.*

Group	Content	Function
	Mean (SD)	Mean (SD)
1	.33 (.19)	.43 (.25)
2	.26 (.18)	.36 (.24)
3	.09 (.12)	.14 (.17)
4	.04 (.06)	.08 (.09)

Table 5. *Different subtypes of errors (proportions*) in sentence repetition for the whole sample.*

<i>Word Types</i>	<i>Error subtype</i>	<i>Mean (SD)</i>
Content	Omission	.16 (.18)
	Substitution	.01 (.01)
	Addition	.001 (.006)
Function	Omission	.22 (.25)
	Substitution	.02 (.02)
	Addition	.00 (.02)

*Number of errors in content and functions words divided by total number of content and function words, respectively.

Table 6. *Different subtypes of errors (proportions) in sentence repetition by age group.*

<i>Group</i>	<i>Age (months)</i>	<i>CONTENT WORDS</i>			<i>FUNCTION WORDS</i>		
		<i>Mean (Sd)</i>			<i>Mean (Sd)</i>		
		<i>Omission</i>	<i>Substitution</i>	<i>Addition</i>	<i>Omission</i>	<i>Substitution</i>	<i>Addition</i>
1	24 to 29	.32 (.19)	.006 (.01)	.003 (.008)	.41 (.26)	.01 (.02)	.00 (.02)
2	30 to 35	.24 (.18)	.01 (.01)	.002 (.006)	.34 (.25)	.02 (.02)	.07 (.01)
3	36 to 41	.08 (.12)	.01 (.01)	.002 (.005)	.12 (.17)	.02 (.02)	.00 (.01)
4	42 to 48	.03 (.06)	.01 (.01)	.00 (.003)	.05 (.88)	.02 (.02)	.01 (.01)

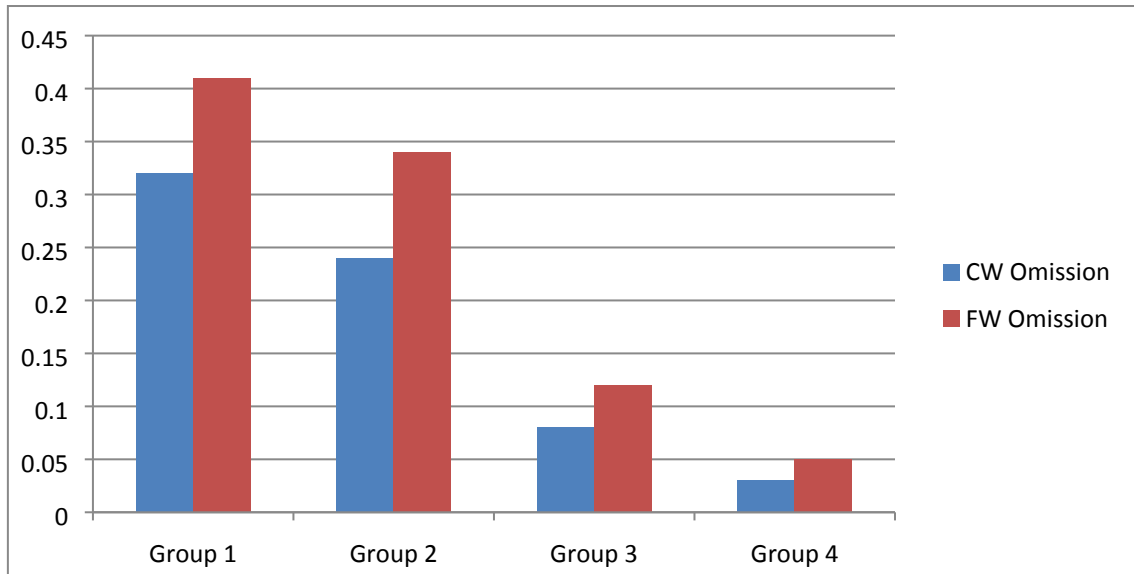


Figure 1. *Proportion of different error subtypes in sentence repetition by age group.*

Appendix: List of sentences and their translation into English

1. Mamá come (Mom eats)
2. Papá dice hola (Daddy says hello)
3. El coche es azul (The car is blue)
4. Es bonito el gato (Is beautiful the cat) (in Spanish the pronoun drop is correct)
5. Tienes que comer ya (You) have to eat just now)
6. Mi silla no es roja (My chair is not red)
7. ¿Qué mira tu papá? (What is your daddy looking at?)
8. La niña va al parque (The girl goes to the park)
9. El oso come mucha miel (The bear eats much? honey)
10. Pon el pan en la mesa (Put the bread on the table)
11. Ahora vamos a coger los peces. (We are going to take the fishes now)
12. Los niños son muy guapos (The children are very Smart)
13. Aquí se sentó Ana (Ann sat here)
14. No quiero que me saques (I don't want you take me out)
15. Esa señora come pan y jamón (That lady eats bread and ham)
16. Luis quiere leche y galletas para merendar (Luis wants milk and cookies for snack)
17. Hoy estará el abuelo (The granddaddy will be today)
18. Dice mamá que cojas el babi (Mommy says to you to take the dress)
19. Aquí hay más zumo que en tu casa (Here there is more juice than in your house)
20. Vamos al cole en el coche de papá (We go to school in daddy's car)
21. Cuando quieras nos vamos a casa. (When you want we go home)
22. La niña llora porque quiere agua (The girl cries because she wants wáter)
23. Todos querían una galleta(Everybody want a cookie)
24. No deberías ir al patio (You shouldn't go to the park)
25. El niño tiene que comer una pera (The boy has to eat a pear)
26. Esa niña lleva los zapatos que me gustan (That girl is wearing the shoes I like)
27. Ven a verme cuando salgas del cole (Come to see me when you leave school)
28. Se cayó al suelo y se hizo mucho daño (He fell down and feel a lot of pain)
29. Los niños son más altos que las niñas (The boys are taller than the girls)
30. El chocolate no te gusta pero a mí sí. (You don't like chocolate but I do)
31. Si hace calor irás a la playa (If it is warm you will go to the beach)
32. ¿Cuándo se ha caído el niño? (When have the boy fallen down?)
33. Las niñas que llevan el vestido son amigas mías (The girls who are wearing the dress are my Friends)