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LITERACY AND WORD BOUNDARIES

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1 *Introduction*

Unless they listen to an unknown language, adults are supposed to be able to mark word boundaries in spoken language. Fromkin & Rodman (1983), for example, contrast the difficulty in counting words in an unknown language with the ease of the same task in the mother tongue. Edwards & Kirkpatrick (1999, p. 318), investigating the word concept of young children, used the performance of adults as a point of reference and concluded that the latter "as would be expected, performed nearly 100% accuracy on the task." Davis (1997, p. 33) also mentions the general opinion that marking word boundaries is relatively easy for all adults, even if they are unschooled: "There is also a certain amount of evidence [...] that non-literate speakers of unwritten languages know where words begin and end in their languages." Two main sources of evidence are present in the literature for the competence of adult speakers to mark word boundaries, irrespective of their schooling or the language they speak (Scribner & Cole, 1981; Bowey & Tunmer, 1984; Davis, 1997). The first source comes from linguistic-anthropological research on unknown languages. Sapir wrote in 1921 that the illiterate Nootka-Indians, who assisted him in coding their language, were explicitly aware of words as linguistic units: "No more convincing test could be desired than this, that the naive Indian, quite unaccustomed to the concept of the written word, has nevertheless no serious difficulty in dictating a text to a linguistic student word by word." (Sapir, 1970, p. 33). The second source of evidence comes from research on the origins of writing systems. Gelb (1963) concluded that already in the oldest writing systems words were used as linguistic units, which entails that the "designers" were aware of wound boundaries.

In the last decade, different researchers have suggested nevertheless that literacy might play a prominent role in the ability to mark word boundaries (Roberts, 1992; Olson, 1994; Homer & Olson, 1999), although the direction of causality in this relationship is debated. Some suggested that literacy comes first (Gombert, 1992; Olson, 1994, 1996), while others claimed that the ability of marking word boundaries develops before children learn to read and write (Chaney, 1989; Karmiloff-Smith et al., 1996; Sharpe & Zelazo, 2002).

In this contribution, we discuss the results of two different studies, which investigated the role of literacy in bringing word boundaries into consciousness. The first study was a cross-linguistic comparison in the Netherlands and Norway in which the ability to mark word boundaries of pre-reading children was investigated (see Kurvers & Uri, 2006, for more details). In the second study, the word awareness of adult illiterates is compared both to achievements of young pre-reading children and low-educated adult readers. Before we discuss our research findings, we summarize the relevant research done on this topic.

1.1.1 Research on Children

Awareness of words as linguistic units (or metalexical awareness) can be defined as the ability to isolate words in spoken discourse and to judge words as linguistic units separate from their referential value. Several procedures were popular to measure metalexical awareness: children were asked to count words in an utterance, to segment sentences and clap for each word, to distinguish between words and referents, to change word order, to define words, or to give examples of long or difficult words. Research on this topic started with Karpova (1966), who observed that young children until the age of seven do not segment sentences along word boundaries but preferably into a subject and a predicate part. Around the age of seven, children start marking word boundaries. Many studies from the last thirty years came to the same conclusion, also after correcting for some seriously criticized methodological shortcomings of previous research, such as memory load or expecting the children to know the linguistic term “word” (Valtin, 1984; Bowey & Tunmer, 1984; Yaden, 1986; Adams, 1990; Gombert, 1992; Roberts, 1992; Tunmer, 1997; Edwards & Kirkpatrick, 1999). Adams (1990, p. 298) concluded that the outcomes of research on metalexical development are consistent: “Surprising as it may seem, the evidence concurs that children are not naturally prepared either to conceive of spoken language as a string of individual words or to treat words as individual units of meaning.” Nevertheless, the studies of Chaney (1989) and Karmiloff-Smith et al. (1996), who used different kinds of tasks, produced important counter-evidence. Chaney asked children to retell well-known stories word by word, “so that I can write them down”, and concluded that four and five-year-olds performed very well. Karmiloff-Smith et al. (1996) criticized the off-line methodology used in most studies and introduced an on-line methodology. They read a short story to young children, paused 32 times, both after content words and function words with different linguistic properties, and asked children between four and six years old to repeat the last word mentioned. As they expected, even the four- and five-year-olds had no problem coming up with the last single word. The percentages correct for the four-year-olds were 78%, for the five-year-olds 95%.

In addition, there are different views on where metalinguistic abilities come from. Some researchers, like Karmiloff-Smith et al. (1996), assign a crucial role to the general language development, some others claim a major role for the cognitive development (for an overview see Yaden, 1986; Gombert, 1992; Tunmer, 1997), while again some others claim that learning reading and written language (becoming literate) makes speakers aware of the existence of word boundaries (Ehri 1979; 1984; Olson, 1994; 1996). In research with young children, it is difficult to differentiate between these three different views because learning to read and write coincides with linguistic and cognitive development. That is different for adult illiterates.

1.1.2 Research on Low-educated Adults

Not much research has been carried out on adults' awareness of words and word boundaries. Scribner & Cole (1981) compared adult illiterates in Liberia with three different groups of readers (in Vai, in Arabic, and in English) on some metalexical tasks. They found effects of schooling but hardly any effect of literacy as such: Vai readers, who learned to read and write informally, did not differ much from illiterates in, for example, mentioning long words or defining words. Hamilton & Barton (1983) and Barton (1985) examined the word concept of 60 English-speaking adults of different reading levels. In one of their tasks they asked the subjects to repeat different sentences word by word. Most of their subjects were capable of isolating the different words and made hardly any mistakes. No significant differences were found between the three groups of readers, but the adults' responses were clearly different from what was known about young children. As a matter of fact, the adults only made mistakes when confronted with phrasal units like *more or less.* Barton (1985, p. 192) concluded: "Adults, literate and not literate, can utilize the distributional criteria and the grammatical information of the language correctly to isolate words and thereby demonstrate sophisticated awareness of the segmental structure of language."

Gombert (1994) carried out a training experiment with three different metalinguistic tasks, one being a sentence segmentation task. Subjects were 21 adult Moroccans in France, seven of whom never went to school before (the illiterates), seven who had been in a literacy course for about one year (the partial literates), and seven who had completed primary education and could read and write French (the literates). A training experiment turned out to have been effective for the literates, but not for the other two groups, that could at best repeat one of the simple sentences word by word. In most cases the sentences were divided into phrases (about 80% of the mistakes), in some cases into syllables (about 15% of the mistakes). Gombert assumed the bad results to be caused by the fact that the subjects had to segment sentences in French, their second language, instead of their mother tongue.

Davis (1997) did not ask illiterates, but "ordinary" people from different professional backgrounds to count words in sentences or to judge if an item was a word. He concluded "ordinary" language users still have problems in marking word boundaries. Not every participant came up with the expected answer. The word *I,* for example, did not count for some of the participants in the sentence *No I don't* because that was a letter, and some counted three words in the sentence *Let's play hide and seek.*

Mithun (1998), who did research on the polysynthetic language Mohawk, asked her informants if utterances like *wathiaterane* ("those two meet each other") had to be counted as one word. The fact that the informants "knew" it was one word, irrespective of having received grammar training, was in her opinion the ultimate prove that it really was one word. It means, implicitly, that Mithun came, about seventy years later, to the same conclusion as Sapir did in 1921: every speaker of every language knows where one word ends and the next begins in his own language.

Because Karmiloff-Smith et al. (1996) stressed that the often-mentioned late emergence of word awareness in children was mainly the consequence of the off-line methodology used in most of the studies and because they did find quite different outcomes using an on-line methodology, we carried out a replication of that study in two more languages, Norwegian and Dutch. A summary of that study is presented in section 2.

As said before, with young children it is difficult to disentangle literacy acquisition from language and cognitive development and therefore to determine the decisive factor in the emergence of word awareness. Adult illiterates form a stricter test. For, unlike young children, they are experienced language users, while, just like young children, they are not introduced into systematic writing. If language development is the main factor in the breakthrough of word awareness, one would expect major differences between children and adults, irrespective of their reading ability. If, on the other hand, literacy is the decisive factor, one would expect substantial differences between readers and non-readers, irrespective of their age. In section 3 we present results of a study in which we compared adult illiterates with young pre-reading children and low-educated adult readers.

2 *Study 1*

In order to test the assumption that children much younger than six will display a clear knowledge of word boundaries, Karmiloff-Smith et al.

(1996) argue for a methodology in which children's metalinguistic awareness is tested within the bounds of normal syntactic/semantic processing (on-line processing). After a pre-experimental training session with open class words, Karmiloff-Smith et al. read a short story to the children, stopping 32 times midway a sentence and asking the children to repeat the last word. They used a motivating on-line task (an interesting story) in which the children only momentarily had to go off-line when answering the question (i.e. "What was the last word I said?"). The four-year-olds (mean age 58 months) in Karmiloff-Smith et al.'s study succeeded in about 75% of the cases when asked to repeat the last word and the five-year-olds in 96% of the cases. Nearly 60% of the younger children and nearly 80% of the older children had a success rate of more than 80%. In a follow-up experiment, half of the children were asked to repeat not the last word, but the last *thing*, whereas the rest of the children were asked to repeat the last *word* (as in the first experiment). In the *thing* condition, 96% of the responses were not single words. The fact that children reacted very differently in the *thing* condition than in the *word* condition is, according to the authors, an extra indication that the children really handled the notion *word* in a metalinguistic way. Because we wondered why the outcomes of Karmiloff-Smith et al. differed so much from what many other studies found, we (see Kurvers & Uri, 2006) carried out a cross-linguistic replication of this experiment in Norway and the Netherlands.

2.1 Participants

The subjects in the Dutch study were 32 children (18 boys and 14 girls), tested in the first term of their second pre-school year, around November. The children were divided into two age groups on the basis of the same breaking point that Karmiloff-Smith et al. used in their study (i.e., 64 months). About half of the children were 64 months or younger (mean age 58.7 months, range 51-64); about half were 65 months or older (mean age 69.6 months, range 65-76). The mean age in both groups was comparable to that in the original study. As in Karmiloff-Smith et al.'s study, the children were recruited from two monolingual schools and from (lower) middle-class homes.

In the Norwegian study, 24 subjects participated: 12 girls, 12 boys. 11 Subjects were 64 months old or younger (mean age 54.3 months, range 47-64) and 13 were older than 64 months (mean age 69.6 months, range 65-76). They all attended the same middle-class pre-school. They were tested during the second term of the school year.

2.2 Material

As in the original study, a story was designed in which pauses were inserted following selected words from open and closed class categories. All pauses were mid-sentence. There were no target words in the first two sentences of the story, and the first word of a sentence was never a target.

The story was selected from a Dutch storybook for youngsters (Wille, 1992). The selected story had about 500 words, the same length as the story used in the Karmiloff-Smith et al. study. The story is about a little girl, Hanne, who is looking forward to the next day's trip with her parents to the seaside. Unfortunately, when she wakes up the next morning, it is raining cats and dogs and her dad has to find a creative alternative to please the very disappointed child. The story was, with some minor adaptations, due to language-specific selection of target words, translated into Norwegian.

The selection of target words followed exactly the criteria Karmiloff-Smith et al. used. There were 32 target words, 16 from the open class category (nouns, verbs and adjectives, such as *ice*, *want* or *honest*) and 16 from the closed class category (determiners, conjunctions, pronouns, and prepositions such as *the*, *and*, *they* or *behind*). Half of the words in each class were monosyllabic, and half were bisyllabic. Within each subset there were equal numbers of consonant initial and vowel initial words. When the words were vowel-initial, the pre-target word always ended with a consonant to create the possibility of elision.

All responses of the children were classified using the following categories defined by Karmiloff-Smith et al. (examples are in Dutch):

Correct answer:	e.g., *emmer* (bucket)
Multiword answer:	e.g., *een emmer* (a bucket) instead of *emmer,* *that is not honest,* instead of *honest*
Anticipation:	adding a possible next-to-come word, e.g., *zoen* or *dikke zoen* (big kiss) instead of *dikke* (big)
Non-target single word:	e.g., *rugzak* (rucksack) instead of *met* (with) in the context "a rucksack with..."
No response:	*I don't know*
Elision (resyllabification):	adding the last consonant of the word before to the target word, e.g., *nemmer* instead of *emmer*
Monosyllable:	e.g., *mer* instead of *emmer*

2.3 Results

The internal consistency of the instrument was high (Cronbach's alpha 0.93 in the Dutch experiment, 0.81 in the Norwegian). Table 1 presents the outcomes of the studies in Norway and The Netherlands, compared to those of the original study.

Table 1: Median, ranges and percentages of correct answers, divided by word class and age group, separately for the Dutch and the Norwegian experiment plus the Karmiloff-Smith et al. (1996) outcomes.

Netherlands (n=32)				
Word-class	Age-group	Median (range)	Mean (sd)*	% correct
Open class words	Younger	3.0 (0-10)	3.93 (3.09)	24.6
	Older	2.0 (0-16)	3.87 (4.61)	24.2
Closed class words	Younger	2.0 (0-13)	3.94 (4.21)	24.6
	Older	3.0 (0-12)	4.20 (4.06)	26.3
Norway (n=24)				
Open class words	Younger	5.0 (2-7)	4.73 (1.56)	29.5
	Older	5.0 (1-8)	4.70 (1.89)	29.3
Closed class words	Younger	3.0 (1-13)	4.45 (3.42)	27.8
	Older	3.0 (0-11)	4.23 (3.14)	26.4
England (Karmiloff et al., 1996) (n=48)				
Open class words	Younger	14.5 (1-16)		76.8
	Older	16.0 (9-16)		97.1
Closed class words	Younger	13.0 (3-16)		73.7
	Older	16.0 (7-16)		95.3

* Means and standard deviations only available for the Dutch and Norwegian data

Table 2 presents the relative frequencies of the response types in the Dutch and Norwegian groups, again compared with the outcomes in the original English study.

Table 2: Response types in percentages of the total of answers in the Dutch, Norwegian and English experiment

	Age-group	Correct	Multi-word	Anti-cipa-tion	Non target word	No response	Elision	Single syllable
Dutch	Younger	24.6	52.0	15.4	2.0	5.9	0.0	0.0
	Older	25.2	54.8	12.1	1.5	6.5	0.0	0.0
Norw.	Younger	29.0	46.3	15.1	3.7	6.0	0.0	0.0
	Older	28.8	50.9	12.5	3.1	4.6	0.0	0.0
Engl.	Younger	75.3	17.5	2.9	2.3	0.3	0.0	0.5*
	Older	96.2	0.8	0.0	1.0	0.0	0.0	2.1*

* single syllables as percentage of responses to bisyllabic words

As Table 2 shows, the percentages of the multiword reactions (repeating more than one word) and the anticipations (coming up with a guess of the next word in the story) are much higher than in the English experiment. Both in the Dutch and the Norwegian studies, about half of the responses are multiword reactions (ranging from two to six words). More than 10% of the reactions are anticipations, while in the original experiment only a few of the younger children responded with some kind of anticipation.

Syllabic errors and elisions (re-syllabification) were non-existent, despite the fact that the experiment was designed in such a way that they could have occurred.

While some outcomes are comparable to the original study, two outcomes were quite different from what Karmiloff-Smith et al. found. The young children in Karmiloff et al.'s study were very good at isolating words, both the four-year-olds and the five-year-olds (success rates of 75% and 96%, respectively). The children in our studies were not; in fact, for all groups multiword responses were far more frequent than correct responses. Karmiloff-Smith et al. also found a significant difference between the older and the younger children. We did not: the percentages correct are nearly the same for the two age groups in both countries.

As a matter of fact, our results are much closer to the outcomes of many older studies that used an off-line approach, criticized by Karmiloff-Smith et al. for being too far away from normal syntactic/semantic processing. In many older studies, the general conclusion was that most children before the age of six are not very good at isolating words, no matter whether they were based on qualitative interviews with young children, on segmentation tasks with or without additional tapping, or on word judgment tasks. We too found that the children of this age do not seem to be naturally prepared to conceive of spoken language as a string of individual words (Adams, 1990).

Because the differences with the original study were rather striking, we carefully looked at possible factors that might explain the differences in the outcomes such as typological differences among the languages or unforeseen differences in the test items such as word stress. The only reasonable explanation we could find was the difference in pre-school curriculum in England on the one hand, and the Netherlands and Norway on the other. The English national curriculum offers indications that formal reading instruction in England starts at an earlier age than in the Netherlands and Norway, i.e., before grade 1. It could be that, as in Homer & Olson (1999), the children in the English study outperformed the Dutch and Norwegian children because they had more experience with written forms. For an extra check on this explanation, we informally repeated the experiment with three Dutch children in grade 1, after about seven months of formal reading instruction. The percentages correct were much higher now (85%, 91%, and 94%, respectively) than those of the preschoolers. This suggests that literacy may play a crucial role in the major changes in children's metalinguistic development.

3 Study 2

In the second study, we looked at the awareness of words as a linguistic unit of adult illiterates, compared to two reference groups. The segmentation task that is presented here was one of the tasks in a larger research project that was carried out to compare the metalinguistic abilities of adult illiterates, young pre-reading children and low-educated adult readers.

3.1 Participants

Participants were 25 adult illiterates, 24 pre-school children and 23 adult readers in the Netherlands. The adult illiterates were not able to read simple words, neither in their mother tongue nor in their L2 Dutch. Most of them had never been to school as a child in their home country; a few had attended primary school for about one or two years (mean years of schooling 0.40, sd. 0.76). The years of schooling of the adult readers ranged from two to six years (mean 4.61, sd. 1.74). The children attended the last term of preschool and were up to attending first grade, in which formal reading instructions starts. Of all the groups, the majority of subjects consisted of Moroccans (14 children, 14 illiterates, and 11 readers) most of them having Tarifit, one of the Berber languages, as their first and dominant language. Smaller numbers in all groups were Turkish (5, 4, and 6 respectively) and Somali (4, 6, and 4 respectively). A few participants came from former Dutch colonies, speaking Dutch besides their home language. Two adult readers and two children were Dutch from origin. Depending on the most preferred and dominant language of the subjects, the experiment was carried out either in the first language of the subjects, or in Dutch as a second language. For the majority of the adults, that turned out to be the mother tongue (31), while for the children the opposite was found (7).

3.2 The Segmentation Task

The task to be analyzed can be characterized as progressive segmentation. A sentence was presented orally and the subjects were asked to segment in pieces what was said, for example, *I come from the south of Morocco*. No example of how the segmentation could be done was presented, unless participants refused without getting an example (four illiterates did). In that case, one example was given with segmentation along word boundaries. The instruction was repeated with three sentences. Next, a word group out of those sentences was presented, for example, *the south of Morocco,* and the subjects were asked to segment it in even smaller pieces. Finally, one or two single words out of that word group, for example, *Morocco* or *south*, were again presented with the same question. The task consisted of three sentences, three word groups, four multisyllabic words and two monosyllabic words. All items were translated (by experienced bilinguals) into Somali, Turkish and Tarifit, taking care that structural features of the sentences were comparable.

To decide what counts as a single word, the orthographic rules of the different languages were applied. All four languages use an alphabetic writing system (in Latin script) in which word boundaries are marked by spaces. Compounds that would lead to differences in the marking of word boundaries, like, for example, *wasmachine* (washing machine), one word in Dutch, and *machina noeseban*, two words in Tarifit, were left out from the task. An example of one of the sentences in the different languages, together with a literal translation in English, is given below. The example makes clear that the languages involved differ substantially in their morphology.

Ik kom uit het zuiden van Somalië
I come out-of the south of Somalia
Waxaan ka imid dhanka koonfureed ee Soomaalyia.
What from I-came direction-of south of Somalia.
Necc usird zi ljanub n lmagrib
I I-come out-of south of Morocco
Ben güney Türkiye'den geliyorum.
I south Turkey-out-of I-come.

In the following sections, the analyses will be concentrated on the segmentation of the sentences and the word groups only. First of all, some examples are presented of the way two adult illiterates carried out the segmentations. Then, analysis will focus on the differences among the three groups (children, illiterates, and low educated readers). Finally, within the group of adult readers, the speakers of a non-written language (Tarifit) are compared with those who also have a command of their mother tongue in a written form.

3.3 Results

To put the results in context, two examples are given of how the illiterate participants carried out the segmentation task. The first is Satma, an illiterate Moroccan woman, who carried out the task in Tarifit. The second case is Arkem, an illiterate Turkish woman, who carried out the task in Turkish. Satma is 43 years old, has never been to school in Morocco, has lived in the Netherlands for about 20 years, speaks Tarifit, and has receptive and some productive knowledge of oral Dutch and Moroccan-Arabic. She has attended an adult literacy class for about four months for five hours a week and has learned to read and write her first six words in Dutch. Arkem is a 50-year-old Turkish woman who has lived in the Netherlands for 16 years. She has never been to school as a child, speaks and prefers to speak Turkish, and has attended the adult literacy class irregularly for about nine months for three hours a week. Both Satma and Arkem have a good knowledge of what writing is and can be used for, and know at least half of the letters of the Latin alphabet. Neither of them can interpret or read "environmental words" like *uitgang* (way out), *postkantoor* (post office), or *centrum* (centre) or the logos of the shops they visit, like *C&A*, *Hema,* or *Blokker*. The interview with Satma is carried out in Tarifit; the interview with Arkem in Turkish. The sentences to be segmented are given in the original language and are in italics; the literal translation is given between square brackets. The rest of the interaction is translated into English. The fragment in example 1 starts after some misunderstanding of what Satma was expected to do. Since she did not understand, an example was given with a segmentation along word boundaries.

Example 1: Interaction between S = Satma and I = Interviewer on the segmentation task.

I *Okay, yes, listen again.*
Aryaz awessar ad irah tiwecca rar seppitar.
[Man he-is-old Fut. he-goes tomorrow to hospital.]
Can you segment into pieces what I said?

S He goes to the hospital, but if he will not be hospitalised, he has to come back the next day.
I Okay, something else.
Di thanut dinni attas n deffah d tumatic.
[In shop there many of apples and tomatoes.]
Can you segment what I said into pieces?
S Yes, that can be segmented.
Tomatoes separately and apples separately.
I *Okay, the next one.*
Necc usird zi ljanub n lmahrib.
[I I-come out-of south of Morocco].
Can you segment my "awar"?
S People come from different cities, from different regions.
Some come from cities and some from villages.
I Okay, the next one. You only have to take care about what I say, about my words.
Aryaz awessar.
[man he-is-old.]
Can you divide that into pieces furthermore?
S What do you mean?
The awar of an older man is different from the awar of a younger man.
How you call an older man is different from how you call a younger one.
Is that what you meant?
I *Di thanut.*
[In shop.]
How about that?
S No, you cannot divide that. That is just "in the shop."

Satma is constantly looking for divisible entities in the content of the sentences: tomatoes and apples can be separated, and the country of origin in different sites. When there is just one place (in the shop) or one person (the old man), the question about segmenting what is said seems to be weird to her.

The second interview proceeded in the same, way; here only some examples of the segmentations of Arkem are presented:

I *Şu yaşlı adam yarın/postaneye/gidecek? How many parts?*
A Şu yaşlı adam / yarın / postaneye / gidecek. Four parts.
This old man / tomorrow / postoffice-to / go-he-will.
I *Şu dükkânda çok elma ve domates bulunuyor?*
A Şu adam dükkânda / elma / ve domates / bulunuyor. Four parts.
In the shop of that man / apples / and tomatoes / are to be found

located. (*çok* is left out)
[…]
I *elma ve domates?*
A Elma / domates (leaves *ve* out)
I *Şu yaşlı adam?*
A: Şu yaşlı / adam. Two parts

Arkem responds quite differently from Satma, who divided the world and not the language into pieces. Arkem segments the sentences into meaningful clauses, which (in Turkish) often coincide with separate words. But she does not disconnect the words *ve* ('and') and *şu* (this) from the next content words ("ve domates" or "şu yaslı") or she leaves them out (like in "elma / domates"). In both cases, she seems not to interpret those words as separate structural elements of the sentence.

Together, Satma and Arkem are quite representative for most of the illiterate adults, as we will see.

For a first comparison of the groups, the reactions were dichotomized according to a segmentation of sentences and word groups into either conventional words or not. Further analysis is concentrated on the different ways in which subjects segment the sentences into units. Table 3 presents an overview of the means and standard deviations of segmentation into words, split out for mother tongue and Dutch as a second language.

Table 3: Means and standard deviations of segmentation of sentences into words, by group and language

Task	Language	Children			Illiterates			Literates		
Sentence		Mean	Sd	N	Mean	Sd	n	Mean	Sd	N
segment-	L1	0.14	0.38	7	0.11	0.32	19	1.67	1.23	12
ation	L2	0.21	0.43	15	0.00	0.00	5	2.70	0.67	10
	total	0.19	0.40	22	0.09	0.28	24	2.14	1.13	22

The mean correct score of literate adults is 2.14 (sd 1.13), while the two groups of non-readers hardly segment any sentence into isolated words. There is a strong and significant main effect of group ($F_{2,61}=67.46^{**}$) and no main effect of language ($F_{1,61}=3.64$). The interaction between group and language is also significant ($F_{2,61}=4.38^{*}$) and mainly caused by the fact that the mean score of the literates is higher in Dutch as a second language than in the mother tongue (we will come back to that). That difference does not exist with the two other groups, because they do not segment sentences into isolated words at all, neither in their first language, nor in the second. Posthoc analysis shows that the differences between both groups of non-readers and the adult readers are significant ($p<0.01$), while there is no difference between the young children and the adult illiterates.

In the same way, the segmentation of word groups is analyzed and presented. Table 4 presents the means and standard deviations of the segmentation of word groups into isolated words.

Table 4: Means and standard deviations of segmentation of word groups into words, per group and language

Language	Child		Illiterate		Literate	
	Mean	Sd	Mean	Sd	Mean	Sd
L1	1.0	0.58	1.00	1.00	1.42	0.77
L2	0.29	0.61	0.25	0.50	2.30	0.82
total	0.52	0.68	0.87	0.97	1.82	0.91

All in all, both groups of non-readers do segment word groups into isolated words more often than they do sentences, but even then the majority of children and illiterates prefer another kind of segmentation to segmentation in words (see below). Based on this dichotomisation, there is a significant main effect of group ($F_{2,61}$=15.46, p=0.00), no main effect of language ($F_{1,61}$=1.63, p=0.20) and a significant interaction between group and language ($F_{2, 61}$=6.77, p=0.00). Posthoc analysis shows a significant difference between both groups of non-readers and the adult literates ($p<0.05$), but not between children and adult illiterates.

For further analysis, all other reactions (except segmentation into words) were categorized along type of segmentation: segmentation into word groups; segmentation in which all content words were separated, but function words were not isolated; mixed reactions, for example starting with a segmentation into word groups and then switching to segmentation into syllables; segmentation into syllables; segmenting the content; or, no reaction (I do not know). Table 5 presents the relative frequencies of the types of reactions for the sentences given by the different groups.

As already mentioned, the majority of the literates segment sentences into isolated words, while most non-readers do not. The children prefer segmentation into syllables (about one third of all responses) or they start segmenting into a word group and successively turn over into segmentation into syllables (mixed reactions). The illiterates often separate word groups or they react on the content and try to divide the content into parts. A frequent response of all groups is segmentation in which unstressed functors as articles and prepositions or conjunctions “hitchhike” with the next content words, or are just left out from segmentation. For the non- readers, this holds true for all languages (see the next section for a closer look at the responses of the adult readers).

Table 5: Relative frequencies of reactions on sentence segmentation, by group

	Child	Illiterate	Literate
Words	6.3%	3.0%	66.7%
Word groups	15.9%	30.3%	0%
Functors not isolated	17.5%	25.8%	24.2%
Mixed reactions	25.4%	10.6%	6.1%
Syllables	30.2%	0%	3.0%
No segmentation	0%	4.5%	0%
Reactions on the content	0%	21.2%	0%
Other	4.8%	4.5%	0%
Total	100%	100%	100%

In the same way, the frequencies of the different reactions on the segmentation of word groups were calculated. The majority of the adult readers do segment word groups into separate words. Although the percentage of segmentation into separate words is larger than with segmentation of sentences, nearly 70% of the illiterates and more than 80% of the children do something else. The most preferred responses of the illiterates are reactions on the content, no further segmentation, or not isolating unstressed words like in "apples / and tomatoes," while the children again prefer segmentation into syllables.

To summarize, when subjects are asked to divide sentences or word groups into "parts," it seems to be self-evident for most of the adult readers to segment into isolated words, while most of the non-readers prefer something else. The illiterates segment sentences into word groups or try to divide the content of the sentence. Young children prefer syllables. Unstressed functors are, in many cases, not interpreted as parts of a sentence to be isolated. This also holds for some of the literates.

3.4 Differences Between Written and Unwritten Languages

Tables 3 and 4 showed a substantial difference within the group of adult readers: unlike the two groups of non-readers, the adult readers much more frequently segmented sentences into separate words in DL2 than in the mother tongues (Somali, Turkish and Tarifit). Further analysis shows that this difference has nothing to do with either first or second language but with the fact that some of the mother tongue tasks were carried out in Tarifit, a language that for the literate Moroccan speakers of Tarifit is not available in written form. The mean score (number of segmentation into isolated words) for the literate speakers of Tarifit is 1.17 (sd. 1.16), while the mean score in both Turkish and Somali are comparable with Dutch as a second language (Turkish: mean= 3.00, sd= 0.00; Somali: mean=2.50, sd= 0.71; Dutch L2: mean= 2.30). In Table 6, the mean scores of the literate adults are split into oral language (Tarifit) and written languages (Dutch, Somali and Turkish).

Table 6: Means and standard deviations of literates' segmentation of sentences into words, by type of language

Language	Mean	Sd	N
Oral	1.17	1.16	6
Written	2.50	0.89	16
total	2.14	1.13	22

It turns out that speakers of Tarifit significantly less frequently segment sentences into isolated words than speakers of Turkish, Somali, or Dutch as a second language (t=-2.87, p<0.01).

What do literate speakers of Tarifit do when asked to segment a sentence, compared to the other literates? Table 7 presents the distribution of the response-categories of the speakers of Tarifit compared to the others. It might be relevant to notice once more that this analysis refers to adult readers, who, as was pointed out before, prefer in general segmentation into isolated words as a strategy.

Table 7: Relative frequencies of responses on sentence-segmentation, by group

	Oral		Written	
Words	6	33.3%	38	79.2%
Functors not isolated	12	66.7%	4	8.3%
Mixed	0	0.0%	4	8.3%
Syllables	0	0.0%	2	4.2%
Total	18	100%	48	100%

The number of reactions is small of course; only six of the readers were Tarifit speakers and only three sentences were segmented. The first remarkable point is that literate subjects who are asked to segment a sentence in a language they also know as a written language, segment into isolated words much more often than speakers of Tarifit, who know their mother tongue only as an oral language (79.2% versus 33.3%). The second point is that the literate speakers of Tarifit differ from the illiterates (compare Table 4) in that only one type of "error" response is used: not isolating unstressed functors (66.7%). All in all, speakers of Tarifit, including the literate ones, seem to have more difficulties in unambiguously marking word boundaries if they have to do that in a language they do not know as a written language, even if that is their first and most dominant language.

4 *Summary and Discussion*

The research results of the two studies presented in this contribution indicate that the ability to mark word boundaries in spoken language depends on knowledge of the written form of the language in question. This conclusion is based on the performance of Dutch and Norwegian pre-schoolers who had not entered formal reading instruction yet. They were not successful in reacting with a single word when asked to repeat the last word that was said in a sequence of words. Their default responses were multi-word units. This conclusion is further based on how different illiterate groups (both children and adults) segment utterances compared to a literate group (adults). The comparison of three groups, young children, illiterate adults and adult readers, showed a convincing and significant difference between, on the one hand, readers who prefered segmentation along word boundaries and, on the other hand, both groups of non-readers who had a clear preference for other ways of segmentation: semantic phrases, word groups, or syllables. A third source of evidence is the results that adult readers significantly more often marked word boundaries when they carried out the segmentation task in a language for which they knew the written form, too. The outcomes found for the children fit the outcomes of many other studies on the word-concept of young children (see section 1). All in all, the results seem to demonstrate that the linguistic entity *word* is not the "default" sentence unit of a sentence for young children (Kurvers & Uri, 2006).

Our conclusion contrasts with earlier findings of Hamilton & Barton (1983) who concluded that both literate and illiterate adults have a "sophisticated awareness" of the word as a linguistic unit. But in their study the "illiterate" group actually contained bad readers. The outcomes of most of the literates fit quite well with what Hamilton & Barton found for each of their three groups of adults: they have no difficulty at all in imagining the linguistic unit of the word. So, it is more interesting to see that in our study the literate speakers of Tarifit (who do not know their language as a written language) reacted like the literate Vai in Scribner & Cole's (1981) classic research project in Liberia. In fact, our results confirm what Gombert (1994) also found: adult illiterates are not very well accustomed to mark word boundaries in spoken language. Our conclusion seems to be contradicted by the often-cited observations of

Sapir that the illiterate Nootka Indians did not have any problem dictating sentences word by word. But, first of all, their output was interpreted by a skilled linguist who knew how to extract linguistic information and what to look for. Another suggestion is that Sapir's observations concerned a polysynthetic language and that means that grammatical functions (function words being the most difficult word category for the illiterates) do not exist as separate words.

Future research on this and related metalinguistic topics should include literacy as a determining factor in the development of metalinguistic abilities. Or, as stated by Bamberg (2002, p. 451): "This is where literacy comes in and is given the credit (as a developmental mechanism) for transforming an early form of 'language knowledge' (one that is more implicit, holistic and content-directed) into a more 'explicit and analytic awareness' that enables the speaker/writer to detach from content and situational context, generalize across them, and use linguistic forms in ways that signify 'rhetorical flexibility'."

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