French
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1. Langage description

French is a Romance language as Spanish, Italian, Catalan, Portuguese, Romanian,… Romance languages are part of the wider family of Indo-European languages (Canault, 2017).

Around the world, 300 millions people speak French, and 235 millions daily. It is also the official language of 32 states and governments (Beck, Marcoux, Richard, & Wolff, 2018; « Organisation internationale de la Francophonie », s. d.).

Phonemic inventory of French :

French is composed of 15 vowels, plus the schwa (/ə/)[1]. 4 articulatory features are relevant : nasality (oral or nasal vowel) ; mode of articulation (degree of openness from open to closed) ; place of articulation (anterior or posterior) ; and labiality (degree of rouding of lips, from rouded to stretched) (Canault, 2017).
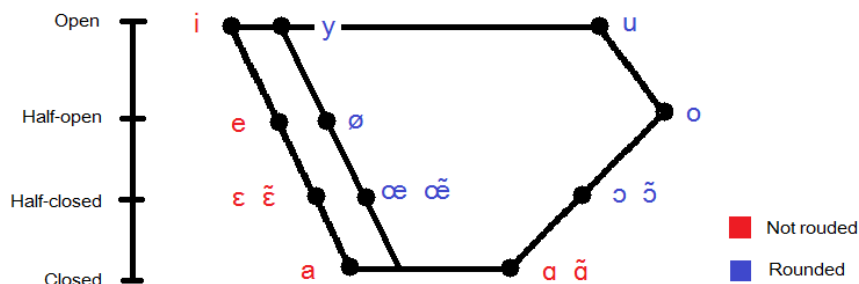

Figure 1. Charter of vowels of French (Adapted from Canault, 2017, p. 58)

French is also composed of 18 consonants and 3 glides. They show 4 relevant articulatory features : voicing (voiced of voiceless consonant) ; nasality (oral or nasal consonant) ; mode of articulation (constrictive [fricative, approximate, vibrating, lateral] or plosive consonant) ; place of articulation (bilabial, labiodental, alveolar, prepalatal=postalveolar, palatal, velar or uvular consonant) (Canault, 2017).

			Place of articulation								Double place of articulation	
			Bilabial	Labiodental	Alveolar		Prepalatal / Postalveolar	Palatal	Velar	Uvular	Labio-palatal	Labiovelar
					Avleodental	Alveolar						
Plosive	Oral	Voiceless	p		t				k			
		Voiced	b		d				g			
	Nasal	Voiced	m		n			ɲ	ŋ			
Fricative	Oral	Voiceless		f		s	ʃ					
	Oral	Voiced		v		z	ʒ			ʁ		
Vibrating	Oral	Voiced				r				R		
Approximate	Oral	Voiced						j			ɥ	w
Lateral (approximate)	Oral	Voiced				l						

Figure 2-Table of consonants of French (Adapted from Canault, 2017, p. 68)

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[1] The schwa correspond to the transcription of a [ø] ou [œ] depending on the articulation of the locutor. Its production in words is optional, some varieties delete it more frequently (Canault, 2017; Rose & Wauquier-Gravelines, 2007).

/ɲ/ is sustituted by many speakers by /nj/. Glides are never in final position, except for the yod (/j/). /ŋ/ was borrowed from English and is always in final position (Canault, 2017; P. Léon, 2011).

The rhotic has a very variable pronunciation. It can be pronounced /ʁ/, /R/ or /r/, the last is only found in some regional variations. The most used transcription is ʁ (Canault, 2017; Rose & Wauquier-Gravelines, 2007).

Regional variations :

French shows a lot of regional variations. However, these divergences mainly concern vowels. About consonants, we can mention the affrication of /t/ and /d/ in Québec and Northern Louisiana French and their palatalization in the rest of Louisiana and Acadia (Detey, Durand, Laks, & Lyche, 2010). Or the pronounciation of nasal vowels like velar consonants without any assimilation in southern French (i.e. « bon » (*good*) pronounced /bɔ̃ŋ/) (Rose & Wauquier-Gravelines, 2007).

French prosody :

Standard French is a fixed stress language which means that stress does not allow lexical distinction. The stress is on the last syllable (of the isolated word or of the sentence in spoken context – the sentence then becomes a rhythmic group). Although the accent is on the whole syllable, only the vowel is accentuated. The accent involves the variation of 3 parameters : pitch (higher or lower), loudness (generallly stronger) and duration (longer) (Detey et al., 2010; M. Léon & Léon, 2007).

2. Phonological development

Few studies have been conducted about the phonological development of French-speaking children in France and, to our knowledge, no cross-sectional study. However, today the EULALIES project, conducted by Meloni et al. (s. d.) is in progress and concerns a relatively large sample of France French-speaking children.

So data about consonant acquisition is provided from MacLeod, Sutton, Trudeau, & Thordardottir (2011). It comes from a cross-sectionnal study of a population of monolingual children speaking Québec French. Despite the differences in phonetic realizations, the dialects of France French and Québec French share many similarities. There is no a priori reason to think that the vast majority of findings in one of these dialects could not occur in others (Rose & Wauquier-Gravelines, 2007).

Age of consonants acquisition in the three word positions (initial, medial and final):

	By 75% of children	By 90% of children
20-23 months	m	
24-29 months	t ; p ; b	
30-35 months	n ; z ; f ; ɲ	m ; t ; z
36-41 months	d ; k ; g ; l ; w ; ɥ ; v ; ʁ	p ; f
42-47 months	ʃ ; ʒ	n ; l ; w
48-53 months	j	b ; d ; k ; g ; ɲ ; ɥ ; v ; ʁ
Later	s	s ; ʃ ; j ; ʒ

Figure 3 - Table created from MacLeod et al. (2011) results

Age of clusters acquisition :

	By 75% of children	By 90% of children
20-23 months		
24-29 months		

30-35 months	bl-	
36-41 months	fl- ; pw- ; tʁ-	
42-47 months	fʁ- ; kʁ- ; vj- ; -bw- ; -skɥ-	pw-
48-53 months		bl- ; fl- ; kʁ- ; -bw-
Later	-bʁ	fʁ- ; tʁ- ; vj- ; -bʁ

Figure 4 - Table created from MacLeod et al. (2011) results

Percentage consonants correct :

20-23 months	57.4 (SD 16.3)
24-29 months	68.8 (SD 16.6)
30-35 months	81.5 (SD 12.7)
36-41 months	87.8 (SD 7.7)
42-47 months	89.9 (SD 10.4)
48-53 months	95.3 (SD 4.9)

Figure 5 - Table created from MacLeod et al. (2011) results

3. Common phonological processes

Common phonological processes according to Chevrie-Muller & Narbona (2007).
Examples come from the data collected frome the children tested.

Duplications		Helicopter: elikɔptɛʁ → le**koko**tɛʁ
Omissions : of syllable, of consonant, of cluster ; in initial or final positions. Demuth & McCullough (2009) say that most of final consonants are produced at age 2, even in dissylabic words. But difficulties with /ʁ/ still persist.		<u>Consonant:</u> Initial position: jam: kɔ̃**f**ityʁ → kɔ̃ityʁ Final position: flower: flœ**ʁ** → flœ In a cluster: watch: mɔ̃**t**ʁ --> mɔ̃ʁ; triangle: tʁijɑ̃**gl** → tijɑ̃ <u>Syllable:</u> Helicopter: e**li**kɔptɛʁ → ekɔptɛʁ <u>Cluster:</u> Triangle: tʁijɑ̃**gl** → tijɑ̃
Metathesis		Guitar: **gi**taʁ → **di**gaʁ; moutain: mɔ̃ta**ɲ** → mɔ̃t**jan**
Substitutions	**Stopping**	Cheese: f**ʁ**omaʒ → t**ʁ**omaz
	Fronting	Mushroom: **ʃ**ɑ̃piɲɔ̃ → **s**ɑ̃piɲɔ̃
	Labialization	Frog: **g**ʁønuj → **b**ønuj
	Backing	Pizza: pid**z**a → pid**ʒ**a
	Vocalization	Mushroom: ʃɑ̃pi**ɲ**ɔ̃ → ʃɑ̃pi**j**ɔ̃
	Nasalization	Leg: ʒɑ̃**b** → ʒɑ̃**m**
	Voicing	Guitar: gi**t**aʁ → gi**d**aʁ
	Devoicing	Ring: ba**g** → ba**k**
	Assimilation	<u>Progressive:</u> cap: kaskɛt → kaskɛ**st** <u>Regressive:</u> monkey: **s**ɛ̃ʒ → **ʃ**ɛ̃ʒ <u>In a cluster:</u> triangle: t**ʁ**ijɑ̃gl → **kʁ**ijɑ̃gl

The phonological processes observed with the children testing French version of Speakaboo were distributed this way:
- 48% were substitutions, of which 45% were devoicing and 27% fronting. Devoicing were predominant in syllable final position;
- 26% were omissions, predominantly into clusters or in syllable final position;
- 16% were assimilations;

- Additions, metathesis and duplications were less represented.

4. Lexical variation

No lexical variation was find in the data we collected.

5. Results of typically developing French toddlers

29 French children were tested by a French SLP student as part of her master thesis. They were aged from 36 months (3;0 years) to 55 months (4;7 years) ; 10 were girls and 19, boys . They were recruited in two pre-elementary schools near Lyon, France. Their mother tongue was French according to their parents and they had no language disorder according to their teacher.
Bilingual children and children with language disorder or suspected disorder were excluded from the study. One child was excluded after the test because of his low phonological and lexical results.

	Mean (standard deviation)
Age	47,28 months (SD = 5,12) – 3; 11 years
Named picture (spontaneously or with help of a description)	34,34 (SD = 4,59)
Number of phonological errors	11,2 (SD = 8,9)
PCC	89,62 (SD = 8,24)
Number of required repeted words	4,1 (SD = 4,36)
Number of given helps (description, phonological priming, repetition)	8,79 (SD = 3,77)

Some pictures were harder to name and needed a help. In particular : 5.Wave (10 repetitions needed); 6.Lamp (5 repetitions); 9.Skirt (14 repetitions); 11.Ring (11 repetitions); 15.Smoke (10 repetitions); 18.0live (12 repetitions); 21.Meat (9 repetitions); 36.Jam (7 repetitions).
Wave, skirt, ring, smoke and meat were quite never named at first speaking (only 6, 8, 8, 5, 11 times respectively). Children truly needed to be guided to find these target words.

Consonants that were misproduced the most were :

Phoneme	Words where it happened most	Phonological processes that happened the most
-p	Hélicoptère (*helicopter*)	Omission
-b	Robe (skirt); jambe (*leg*)	Substitution by /m/ or /p/
-z	Chaise (*chair*)	Substitution by s
ɲ- and - ɲ	Champignon (*mushroom*); montagne (*mountain*)	Substitution by /j/ or /n/
-d	Pizza (*pizza*)	Omission
-g	Vague (*wave*); bague (*ring*)	Substitution by /k/
l-	Lampe (*lamp*) ; hélicoptère (*helicopter*)	Substitution by /n/ in lamp; omission in helicopter
-ʁ	Guitare (*guitar*)	Omission
ʃ- and -ʃ	Chaise (*chair*); chaussette (*sock*); champignon (*mushroom*)	Substitution by /s/

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	Vache (*cow*)	
ʒ- and -ʒ	Jupe (*skirt*); jambe (*leg*); girafe (*giraffe*) Singe (*monkey*); fromage (*cheese*)	Substitution by /z/ or /ʃ/ (Mostly by /z/ in initial position and /ʃ/ in final position).
s-	Singe (*monkey*)	Substitution by /ʃ/
-gl	Triangle (*triangle*)	Simplification : substitution by /d/, /kl/ or /g/
tʁ- and -tʁ	Triangle (*triangle*); montre (*watch*)	Assimilation (substitution by /kʁ/), omission of the /ʁ/ in final position or omission of the /ʁ/ + substitution by /k/ in initial position.
gʁ-	Grenouille (*frog*)	Omission of the /g/
fʁ-	Fromage (*cheese*)	Omission of the /f/
-bʁ	Zèbre (*zebra*)	Substitution by /pʁ/, omission of the /ʁ/, complexification by addition of an /ʁ/ (giving /ʁbʁ/)
-ʁbʁ	Arbre (*tree*)	Simplification by omission of an /ʁ/ +/- substitution, giving /bʁ/, /ʁb/ or /ʁp/.

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