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French speakers' use of sound symbolic patterns to assign gender to French and English nonce names

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Abstract. Gender-based sound symbolic patterns have been documented in corpora of given names in several languages. Name-gendering experiments show that native speakers use many, but not all, of these patterns to assign gender to nonce names in their native and non-native languages, suggesting that some patterns may be productive in speakers minds. This study extends this experimental work to a new language, French, by examining how French speakers assign gender to English and French nonce names and comparing their results to those of English speakers. It finds that, like speakers of other languages, French speakers use some, but not all, factors to assign gender to names in both their native and non-native languages. Furthermore, English and French speakers use the patterns in the study in the same way, in contrast to Sullivan (2020)'s study of English and Korean speakers, suggesting that familiarity is an important factor in extending the use of gender-based sound symbolism beyond one's native language.

Keywords. sound symbolism, given names, English, French

1. Introduction. Sound symbolism, the encoding of meaning at phonological and sub-morphemic levels, challenges the notion that the relationship between form and meaning is arbitrary (de Saussure 1916). However, a growing body of research shows that it is more pervasive than previously assumed (e.g. Monaghan et al. 2014; Sidhu & Pexman 2018). In particular, sound symbolic patterns have been found in the phonology of given names, brand names, character names, animal names and more (for a summary, see Sullivan & Kang, to appear).

Of interest here, gender-based sound symbolic patterns have been documented in corpora of given names in several languages (for a summary, see Sullivan & Kang to appear). Name-gendering experiments (e.g. Sullivan & Kang 2019, 2023; Wong & Kang 2020) show that native speakers use many, but not all, of these patterns to assign gender to nonce names in their native and non-native languages, suggesting that some patterns may be productive in speakers' minds. This study extends this experimental work to French by examining how French speakers assign gender to English and French nonce names and comparing their results to those of English speakers.

We begin in the current section with a discussion of sound symbolic patterns in given names across languages, and in French and English specifically, and an outline of our our research questions and hypotheses. In sections 2 and 3 we outline our method and analysis. We present our results in Section 4 and discuss them in 5. We conclude in Section 6 with a summary of the findings and directions for future work.

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1.1. SOUND SYMBOLIC PATTERNS IN GIVEN NAMES ACROSS LANGUAGES. Gender-based phonological patterns which may be sound symbolic in nature have been documented across several languages including English (Cassidy et al. 1999; Cutler et al. 1990; MacAuley et al. 2018; Sidhu & Pexman 2015, 2019; Slater & Feinman 1985; Sullivan 2018; Sullivan & Kang 2019), French (Ackermann & Zimmer 2021; Sidhu et al. 2016; Suire et al. 2019; Sullivan 2018), Armenian (Ananthathurai et al. 2019), Bulgarian (Ackermann & Zimmer 2021), Cantonese (Starr et al. 2018; Wong & Kang 2019, 2020), Danish (Ackermann & Zimmer 2021), German (Ackermann & Zimmer 2021), Hebrew (Ackermann & Zimmer 2021), Hungarian (Ackermann & Zimmer 2021), Japanese (Ackermann & Zimmer 2021; Mutsukawa 2016; Shinohara & Kawahara 2013), Korean (Cho 2021; Sullivan & Kang 2023, to appear), Kutchi (Ananthathurai et al. 2019), Mandarin (Chen & Kenstowicz 2022; Starr et al. 2018; van de Weijer et al. 2020), Polish (Ackermann & Zimmer 2021), Romanian (Ackermann & Zimmer 2021), Russian (Munteanu & Kang In prep), Spanish (Ackermann & Zimmer 2021), Tamil (Ananthathurai & Kang 2020), Turkish (Ackermann & Zimmer 2021), and Urdu (Khan & Kang 2024; Mohsin & Kang 2018; Mohsin et al. 2019). It is possible that these patterns encode gender information directly (i.e. specific sounds have specific gender-based meanings), or that this information is encoded indirectly such that the sounds encode another meaning (e.g. size) which has an association with gender (e.g. female being smaller) and that the link between gender and sound is mediated by this other meaning.

The patterns studied in these studies can broadly be classified into three categories: segmental patterns, suprasegmental patterns and positional patterns. Segmental patterns include female names including more high and/or front vowels, less round and nasal vowels, more sonorant consonants and more acute (coronal, palatal) consonants than male names. Suprasegmental patterns include female names having more light and/or open syllables, being longer (at least in terms of syllable count), and being more likely to have non-initial stress than male names. Positional patterns include female names being more likely than male names to start or end with an open syllable and to begin with a vowel. Not all factors have been tested in all languages, either because they are not relevant (e.g. stress placement is not a factor in French or Korean) or because they were not examined in the study on that language, however these patterns do tend to occur across languages, and where they don't, this is often because there is no discernible pattern and not because there is a pattern in the opposite direction. There are, however, instances where the opposite pattern is found. For example, male names tend to be longer than female names in Japanese (Mutsukawa 2016) and Kutchi (Ananthathurai et al. 2019), and vowel height patterns in the opposite direction in Kutchi (Ananthathurai et al. 2019) and interacts with Korean sound symbolic patterns in Korean (Sullivan & Kang 2023, to appear).

1.2. SOME PATTERNS IN FRENCH AND ENGLISH. Turning to English and French names, Sullivan (2018) analyzed a corpus of 238 of the most common baby names in Ontario in 2013 (ServiceOntario 2016a,b) and 199 of the most common baby names in Quebec in 2013 (Québec 2017) for several phonological patterns, finding that while there were several factors that were the same across both languages, there were also differences in how they manifested, suggesting that both cross-linguistic and language-specific patterns may be present. The results from her analysis for the patterns examined in the current study are presented in Table 1 with examples of French names, where applicable, and English otherwise. Phonetic transcriptions of the names can be found in the table caption. The first two columns indicate whether or not each pattern tested was significant in the univariate analysis in Sullivan (2018): sig. indicates significance, n.s. indicates

a non-significant effect and a blank cell indicates the factor was not examined in that language.

EN	FR	Factor	Pattern	Female Example	Male Example
sig.	n.s.	Number of Syllables (length)	F >M	É.mi.lie (3)	Jo.seph (2)
sig.	n.s.	Open Final Syllable	F >M	Émi**lie** (Open)	Jo**seph** (Closed)
sig.	**sig.**	Back Vowels	F <M	Émilie (0)	**Jo**seph (1)
n.s.	**sig.**	/b, l, m, n/ Consonants	F >M	Émilie (2)	Joseph (0)
sig.		Non-initial Stress	F >M	Sa**man**tha (Y)	**Jo**seph (N)
	sig.	Nasal Vowels	F <M	Jeanne /ʒɑn/ (N)	Jean /ʒɑ̃/ (Y)

Table 1. Name gendering patterns tested in the corpus. IPA transcription for the names used in the table: É.mi.lie /emili/; Joseph /ʒosɛf/ (Fr) or /ʤosəf/ (En); Samantha /səmænθə/; Jeanne /ʒɑn/; Jean /ʒɑ̃/

Of the patterns under examination only the presence of back vowels was significant in both languages where they were found to occur more frequently in male names than female names. This effect was also found in Suire et al. (2019)'s examination of French names from France. Number of syllables and the presence of a final open syllable were only found to be significant in English, whereas the presence of the consonants /b/, /l/, /m/ and /n/ (also called round consonants for their association with round shapes in the Maluma/Takete effect; Köhler 1929) was only found to be significant in French. This pattern has previously been examined in experimental work which found that both English and French speakers associated female names in both French and English with roundness (Sidhu & Pexman 2015; Sidhu et al. 2016).

The two remaining patterns were language-specific as French does not have lexical stress and English does not have nasal vowels. In English, female names were more likely to have non-initial stress while in French, male names were more likely to have nasal vowels. This later finding was also found in Suire et al. (2019)'s corpus study. A name-gendering experiment with nonce names spoken by French and English speakers was previously conducted by Sullivan & Kang (2019) for these patterns. It found that English speakers, were, in general, more likely to rate female-biased names as more female than male-biased names, regardless of the language the name was spoken in.

1.3. CURRENT STUDY. The current study extends Sullivan & Kang (2019) to French speakers by conducting the same experiment with French participants, and compares their results to those of the English participants from the previous study. The target factors in this study, and their corresponding patterns in Table 1, are number of syllables, final syllable type (open final syllable), vowel backness (back vowels), consonant sonority (/l/ vs obstruents)[1], stress placement (non-initial stress) and vowel nasality (nasal vowels). It also builds on the analysis in Sullivan & Kang (2019) by examining each pattern individually.

This study has three research questions. First, are French speakers able to use gender-based sound symbolic patterns to assign gender to nonce names, and if so, how? We expect that they will do so, and that, for the nonce names spoken by the French speaker, their results by phonological factor will mirror what was found in the corpus. In other words, we expect to see effects for

[1] While Sullivan (2018) tested for sound-symbolically round consonants, including /b/, in the corpus, the current study examines sonorancy and considers /b/ to be an obstruent.

vowel backness, consonant sonority and vowel nasality, which were found to be significant in the corpus, but not for the other factors examined. Second, are French speakers able to extend their knowledge to another language (English)? If so, we expect that French participants will have similar results for the names spoken by both the French and the English speaker. Finally, does the listener's (participant's) language impact how they use these factors to assign gender to nonce names? If so, we expect to see differences between the English and French speakers for number of syllables, final syllable type and consonant sonority. Participants should display effects for the factors that are significant in their language, but not the other. In the case of the language-specific factors, we would expect to only see an effect when the participant and speaker languages match (i.e. French participants and speakers for vowel nasality and English participants and speakers for stress placement). However, given the similarity between the two languages, the large amount of language contact between them and the fact that speakers of the language likely have some familiarity with the other language, we expect language-based effects to be minimal, especially compared to languages that are more different (e.g. English and Korean, see Sullivan & Kang 2023).

2. Method. An online name gendering experiment was conducted to explore if and how French and English speakers make use of cross-linguistic and language-specific gender-based sound symbolic patterns to assign gender to given names. More details of the methodology can be found in Sullivan (2018).

2.1. PARTICIPANTS. Eighteen monolingual North American English speakers and sixteen monolingual native French speakers completed the experiment. The participants were eighteen years of age or older, had normal speech, hearing and vision, and had limited exposure to languages other than their native language. They were required to have access to headphones and a computer with internet access and a functional audio system. An additional nine English-speaking participants were excluded from the analysis for technical reasons (n=5) or being unable to discriminate nasal and non-nasal vowels (n=4).

2.2. LANGUAGE BACKGROUND QUESTIONNAIRE. A language background questionnaire asked participants about their level of proficiency in and exposure to French and English, as well as their proficiency in other language(s) that they speak.

2.3. STIMULI. The target stimuli consisted of minimal pairs of nonce names whose members differed from each other in terms of one of six target factors (Table 1). For each pair, a CVCV sequence containing sounds found in both languages was constructed and then modified to create a pair of nonce names in which one was more male and the other more female. For each factor, two minimal pairs were created for each language it occurred in (i.e. four pairs were created for each cross-linguistic pattern and two pairs for each language-specific pattern), for a total of ten pairs and twenty nonce names. The full list of stimuli is listed in Table 2. Four additional sequences were used as training items for each language (English: [kəmu], [vofe], [zɛgo], [nəku]; French: [temo], [vode], [dəfu], [fego]). The stimuli were recorded by a native speaker of Canadian English and a native speaker of Canadian French.

2.4. PROCEDURE. Participants completed the experiment online in jsPsych (de Leeuw 2015) in their native language (i.e. study materials, including instructions and the language background questionnaire, were presented to the speaker in their native language). They were randomly assigned to complete either the English or French portion of the experiment first. The purpose of

Factor	**Language**	**Female**		**Male**	
Number of Syllables	EN	CV.[və].CV	[lɛ.və.to]	CV.CV	[lɛ.to]
			[dɑ.və.fi]		[dɑ.fi]
	FR		[ge.və.fo]		[ge.fo]
			[ti.və.lɑ]		[tilɑ]
Final Syllable Type	EN	CVCV	[vɑdi]	CVCV[v]	[vɑdiv]
			[nope]		[nopev]
	FR		[fobɛ]		[fobɛv]
			[likɑ]		[likɑv]
Vowel Backness	EN	$CV_{[-back]}CV$	[sifɑ]	$CV_{[+back]}CV$	[sufɑ]
			[nɛpo]		[nɑpo]
	FR		[nikɑ]		[nukɑ]
			[kɛlo]		[kɑlo]
Consonant Sonority	EN	CV[l]V	[bole]	$CVC_{[-son]}V$	[boze]
			[bilɑ]		[bisɑ]
	FR		[golɛ]		[gofɛ]
			[gilɑ]		[gibɑ]
Stress Placement	EN	[CVˈCV]	[nɑˈpi]	[ˈCVCV]	[ˈnɑpi]
			[beˈvo]		[ˈbevo]
Vowel Nasality	FR	CVCV	[dɛzo]	$CV_{[+nasal]}CV$	[dɛ̃zo]
			[gɑsi]		[gɑ̃si]

Table 2. Target stimuli for name gendering experiment

this was to counterbalance the order of the two blocks of the experiment. Before beginning the experiment, participants completed informed consent, language background questionnaire, headphone check and sound check.

For each language, participants completed a name gendering task followed by an AX discrimination task. We do not discuss the AX discrimination task here, but details can be found in Sullivan (2018). The name gendering task began with instructions, which were followed by the four training trials, and then the target trials. The training stimuli and target stimuli were separately randomized by participant.

The instructions gave the participants the prompt "A new family from Ottawa has moved in next door. They have two kids: a boy and a girl. The kids have unusual names and you are trying to figure out what each kids name is." and then told them that they would hear a name and be asked to rate how male or female they think it is. For each name, participants heard it aurally and then had to rate it on a 6 point scale ranging from definitely female to definitely male. Figure 1 illustrates the name gendering task procedure.

3. Analysis. Participant responses were converted to a six-point scale ranging from 1 (definitely female) to 6 (definitely male) for analysis. Separate full interaction mixed effects linear regression models were constructed for each target factor in R (R Core Team 2020) using the *lmer()* function from the lme4 package (Bates et al. 2015). The lmertest package (Kuznetsova et al. 2017) was used to generate significance values. Each model was constructed with the target factor as the predictor variable, gender bias (male or female), name language (French or English)

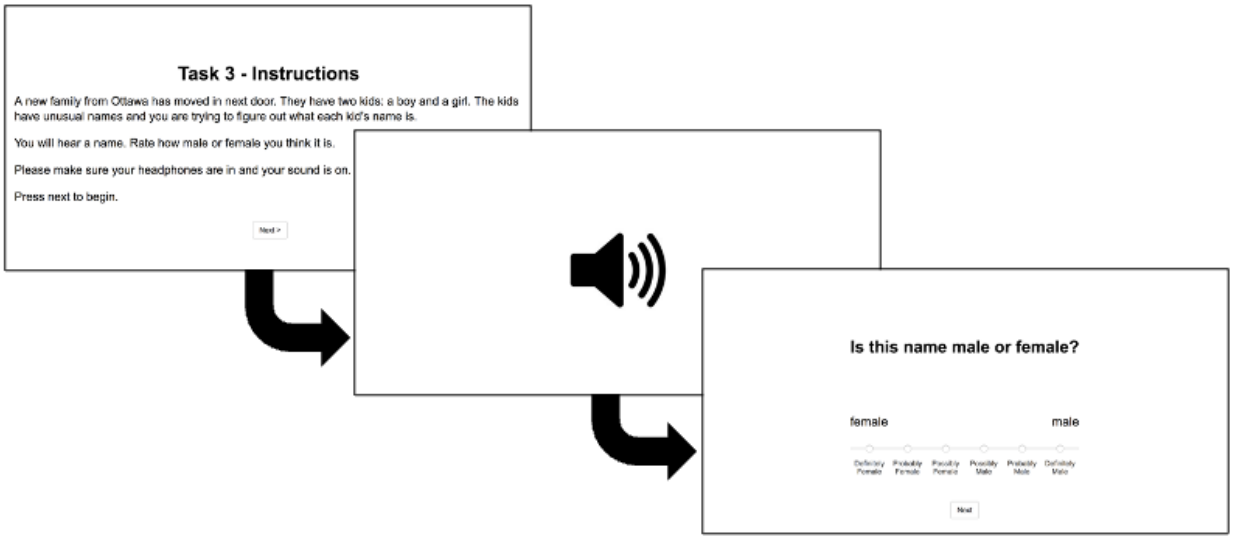

Figure 1. Name gendering task illustration

and participant language (French or English) as predictor variables, and random intercepts were included for participant and minimal pair. Gender bias, name language and participant language were simple coded (female/English = -0.5; male/French = 0.5) with female or English as the reference variable. For stress placement and vowel nasality, the effect of name language and its interactions were excluded because these factors were only tested in one language.

4. Results. The results of the name gendering task are displayed in Figure 2. Each pane in the figure shows the results for one name language and target factor, with the results for French names in the top row and those for English names in the bottom row. Within each pane, the first set of bars represents the responses for the French participants, and the second, those of English participants. The blue bars represent mean responses for male-biased nonce names and the purple bars, those for female-biased ones. The error bars represent standard error. The panes for stress placement for French names and vowel nasality for English names are blank as these were language-specific factors that occur and were tested only in the other language.

Comparing the pairs of male and female names within each target factor, participant language and name language shows that, for the most part, participants tended to give more male ratings (higher scores) to the male-biased names and more female ratings (lower scores) to female-biased names. There are, however, some exceptions. Most notably, there is little to no difference in the ratings of names for the stress placement factor, and only English speakers' ratings of French names were higher for the male-biased names for the consonant sonority factor. For this factor, English speakers show no difference responding to English names while French speakers rated the female-biased names as more male. Furthermore, no differences in ratings are observed for French speakers' responses to French names for vowel backness and English speakers' responses to English names for number of syllables. The results for each target factor will be discussed in more detail in the subsequent sections.

4.1. NUMBER OF SYLLABLES. Figure 2 shows that male names, on average, receive more male ratings than female names, with the exception of when English speakers rated English names, in

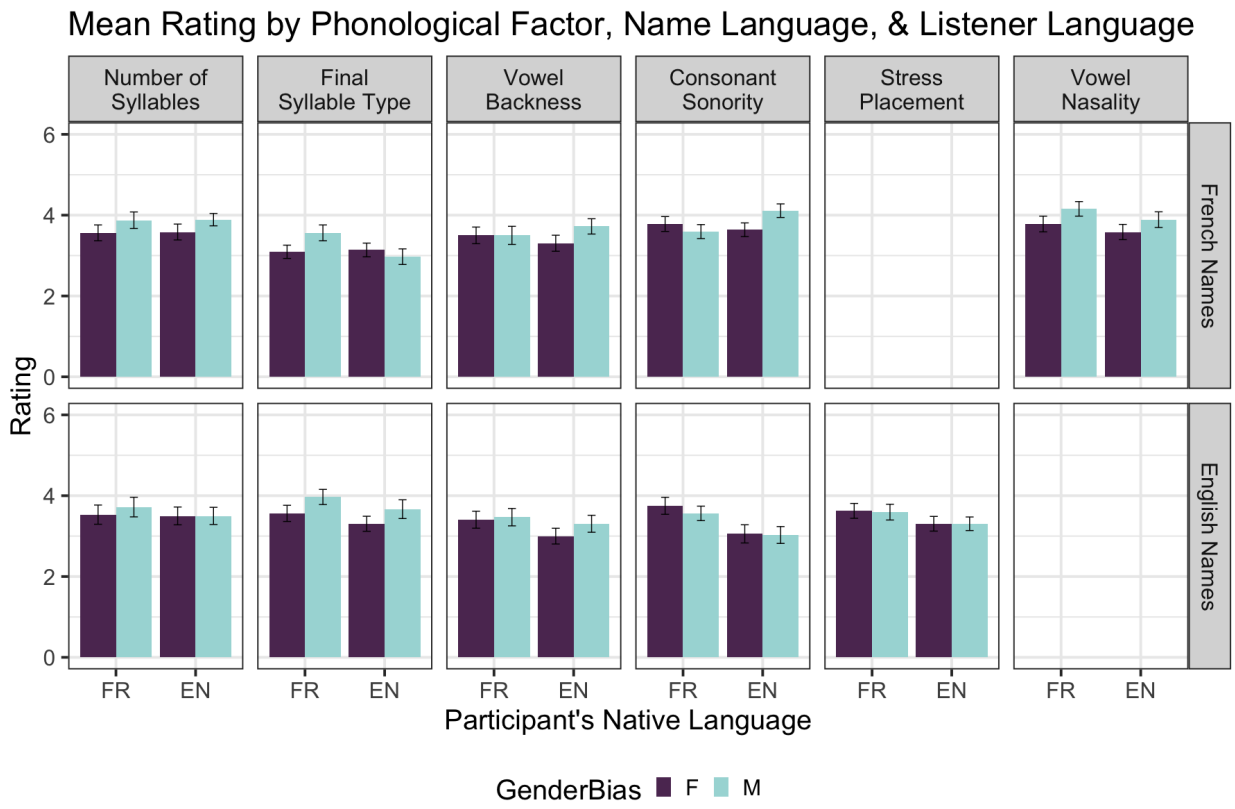

Figure 2. Mean rating by phonological factor, name language and participant language. Ratings range from 1 (most female) to 6 (most male). Error bars represent standard error.

which case there was no difference. The linear regression model (Table 3) does not yield any significant results, suggesting that there is a high likelihood this pattern isn't attributable to gender bias.

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.64	0.386	2.0714	9.454	0.00982	**
Gender Bias (M)	0.201	0.127	230	1.58	0.115	
Name Language (FR)	0.165	0.764	2.00	0.216	0.849	
Participant Language (FR)	0.0538	0.163	32.0	0.330	0.743	
Gender Bias * Name Language	0.215	0.255	230	0.845	0.399	
Gender Bias * Participant Language	0.0972	0.255	230	0.381	0.703	
Name Language * Participant Language	-0.142	0.255	230	-0.559	0.577	
Gender * Name Lang * Participant Lang	-0.181	0.510	230	-0.354	0.723	

Table 3. Results of the mixed effects linear regression model for number of syllables

4.2. FINAL SYLLABLE TYPE. The results for final syllable type in Figure 2 show that, for the most part, participants rated male-biased names as more male than female-biased names. The only exception is that English speakers rated male-biased names as less male, on average, for the

French names only. However, this effect is not significant in the regression model (Table 4) which only shows significant main effects for gender bias (at $p<0.05$) and name language (at $p<0.10$). The gender bias effect confirms that male-biased names are rated as more male for this factor while the name language effect indicates that the French names received less male ratings overall than their English counterparts.

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.41	0.100	8.38	34.01	<0.001	***
Gender Bias (M)	0.267	0.126	230	2.12	0.0349	*
Name Language (FR)	-0.434	0.130	2.01	-3.33	0.0788	.
Participant Language (FR)	0.0.276	0.197	32.0	1.40	0.172	
Gender Bias * Name Language	-0.233	0.252	230	-0.923	0.357	
Gender Bias * Participant Language	0.340	0.252	230	1.35	0.178	
Name Language * Participant Language	-0.00694	0.252	230	-0.028	0.978	
Gender * Name Lang * Participant Lang	0.591	0.504	230	1.17	0.243	

Table 4. Results of the mixed effects linear regression model for final syllable type

4.3. VOWEL BACKNESS. Looking at the results for vowel backness in Figure 2, we observe that French participants display relatively little difference in their ratings between male- and female-biased names though the pattern is slightly towards male-biased names receiving more male ratings than female-biased ones. This pattern is more evident for English speakers, who have a larger gap in their ratings between male- and female-biased names in this direction. The linear regression model (Table 5) shows an overall effect of gender bias at the $p<0.10$ significance level whereby male names have more male ratings than female-biased ones. However, no interaction is observed between gender bias and participant language.

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.40	0.485	2.06	7.01	0.0182	*
Gender Bias (M)	0.196	0.112	230	1.75	0.0818	.
Name Language (FR)	0.212	0.964	2.00	0.220	0.846	
Participant Language (FR)	0.135	0.163	32.0	0.831	0.413	
Gender Bias * Name Language	0.0243	0.224	230	0.108	0.914	
Gender Bias * Participant Language	-0.330	0.224	230	-1.47	0.143	
Name Language * Participant Language	-0.299	0.224	230	-1.33	0.185	
Gender * Name Lang * Participant Lang	-0.174	0.449	230	-0.387	0.699	

Table 5. Results of the mixed effects linear regression model for vowel backness

4.4. CONSONANT SONORITY. Figure 2 shows that French speakers rate female-biased names as more male than male-biased names, regardless of name language, while English speakers show the opposite pattern for French names (i.e. male-biased names are rated more male than female-biased names), but have no discernible pattern for English names. The logistic regression model (Table 6) shows an interaction between participant language and name language, suggesting that the two language groups behave differently. However, no significant interactions were present

between gender bias and either name language or participant language, though the interaction between gender bias and participant language does approach significance at the p = 0.1 level.

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.57	0.286	2.0645	12.5	0.00565	**
Gender Bias (M)	0.0174	0.124	230	0.140	0.889	
Name Language (FR)	0.432	0.567	2.00066	0.762	0.526	
Participant Language (FR)	0.214	0.144	32.0	1.49	0.147	
Gender Bias * Name Language	0.250	0.249	230	1.01	0.316	
Gender Bias * Participant Language	-0.410	0.249	230	-1.65	0.101	
Name Language * Participant Language	-0.802	0.249	230	-3.22	0.00145	**
Gender * Name Lang * Participant Lang	-0.500	0.498	230	-1.01	0.316	

Table 6. Results of the mixed effects linear regression model for consonant sonority

To interpret the significant interaction between name and participant language, a post-hoc analysis was conducted by constructing separate linear regression models for each participant language. These models had the same structure as the initial model except that participant language and its interactions were removed from the model. The results of this analysis are shown in Table 7. Comparing the two languages shows that name language has a larger effect for English speakers than French speakers (i.e. the difference between their mean ratings between the two languages was larger than for French speakers), and that the speakers of the two languages had gender bias effects in opposite directions: English speakers gave male-biased names more male ratings than female-biased names while French speakers did the opposite. This is consistent with what is observed in Figure 2.

Language	Factor	Est.	*SE*	df	t-value	p-value	
EN	(Intercept)	3.46	0.353	2.20	9.79	0.00743	**
	Gender Bias (M)	0.222	0.169	121	1.32	0.191	
	Name Language (FR)	0.833	0.690	2.00	1.21	0.350	
	Gender Bias * Name Language	0.500	0.338	121	1.48	0.142	
FR	(Intercept)	3.67	0.221	2.00	16.6	0.0036	**
	Gender Bias (M)	-0.188	0.180	122	-1.04	0.300	
	Name Language (FR)	0.0313	0.442	2.00	0.071	0.950	
	Gender Bias * Name Language	0.00	0.360	122	0.00	1.00	

Table 7. Results of the post-hoc mixed effects linear regression models for consonant sonority by participant language

4.5. STRESS PLACEMENT. No difference in ratings between male- and female-biased names is observed in Figure 2 for both French and English participants. This is confirmed by the regression model (Table 8) which shows no significant effects.

4.6. VOWEL NASALITY. Figure 2 shows that both French and English speakers rate male-biased names as more male than female-biased names. The regression model confirms this finding as there is a significant effect at the $p<0.10$ level which indicates male-biased names receive higher (more male) ratings, but no effects of participant language.

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.46	0.402	1.13	8.60	0.057	.
Gender Bias (M)	-0.0156	0.139	99.0	-0.113	0.911	
Participant Language (FR)	0.304	0.242	32.0	1.26	0.218	
Gender Bias * Participant Language	-0.0313	0.278	99.0	-0.113	0.911	

Table 8. Results of the mixed effects linear regression model for stress placement

	Est.	*SE*	df	t-value	p-value	
(Intercept)	3.85	0.393	1.03	9.81	0.0608	.
Gender Bias (M)	0.340	0.172	99.0	1.97	0.0512	.
Participant Language (FR)	0.233	0.196	32.0	1.19	0.244	
Gender Bias * Participant Language	0.0694	0.345	99.0	0.201	0.841	

Table 9. Results of the mixed effects linear regression model for vowel nasality

4.7. SUMMARY. The results show that participants rate male-biased name as more male than female-biased names for final syllable type, vowel backness, and vowel nasality. No difference is observed for number of syllables and stress placement. These effects do not vary by participant or name language. For consonant sonority, there does appear to be an effect of participant language with French speakers giving female-biased names more male ratings than male-biased names while English speakers do the opposite.

5. Discussion. The current study examines if and how French speakers use gender-based sound symbolic patterns to assign gender to nonce names, if this varies according to the language of the nonce name and if their use of these patterns is similar or different to that of English speakers. Our statistical models show that for five of the six target factors, there was no significant differences in how English and French participants used the factor assigned gender to nonce names. For these factors, there was also no significant differences in how the patterns were used to assign gender to the nonce names across name languages.[2] Given the lack of significant language-based differences in these cases, we take the results of the overall model to be indicative of French participants and French nonce names for the purposes of our discussion.

Consonant sonority was the only factor for which there were effects of name and participant language. For this factor, both name language and participant language had effects on gender-bias ratings. French speakers did not show an effect for this factor whereas English speakers did, but only when listening to French names. In other words, this factor appears to only have been used by English speakers, and only in the case where they were listening to the French nonce names. This difference is somewhat surprising as it contrasts with Sidhu et al. (2016)'s experimental work with real French and English names that found French and English speakers were more likely to assign female names to round figures than male names, regardless of the name's language, and suggests that there is an interplay between shape sound symbolism and name gender.

Our first research question was to examine if and how French speakers use gender-based

[2] There was an overall significant effect of name language for final syllable type, however this was independent of the effect of gender bias and thus likely attributable to other factors.

sound symbolism to assign gender to nonce names. We hypothesized that they would, and that we would see this effect for factors that were significant in the corpus, namely vowel backness, consonant sonority and vowel nasality. Our by-factor results partially support this hypothesis, showing effects for vowel backness ($p<0.10$) and vowel nasality ($p<0.10$), which were significant effects in Suire et al. (2019) and Sullivan (2018)'s corpus analyses.

However, consonant sonority, which was significant in Sullivan (2018)'s analysis was not found to be significant for French speakers in our experiment whereas final syllable type, which was not significant in Sullivan (2018) was found to be significant here ($p<0.05$). The lack of effect of consonant sonority could possibly be because the difference in sonority between the male- and female-biased nonce names in our study was not as wide as it could have been. Notably, we used fricatives and voiced stops as a contrast with /l/, but the presence of a voiceless stop seems to be a stronger indicator of gender for French names in the corpus analysis than the presence of /b/, /l/, /m/ or /n/. It's possible that contrasting sonorants with voiceless stops could yield an effect that did not materialize here.

The effect of final syllable type could be due to influence from English since this factor is a strong predictor of name gender in that language (Sullivan 2018). As participants would likely have significant exposure to English names, it is possible that they were familiar with this factor and applied it to names spoken by both English and French speakers. Another possibility is that participants are tuning into another factor, in this case the proportion of open syllables in the name, which was a significant predictor for French in Sullivan (2018)'s corpus analysis. In the corpus, female names had higher proportions of open syllables than male names. Since closing the final syllable reduces the proportion of open syllables, it could be that French speakers were using this, rather than the positional syllable effect, to assign gender to these names.

Our second research question examines whether French speakers are able to extend their use of patterns from their native language to another language. We hypothesized that French speakers would do so and that their results for French and English names would be the same. Our results support this hypothesis as French speakers display the same patterns in English and French across the four cross-linguistic factors studied. While this could be due to the extension of patterns beyond the speaker's native languages, it could also be due, at least in part, to the familiarity speakers of French and English would have with both languages due to factors related to language contact and exposure.

Support for this second hypothesis comes from Sullivan (2020)'s study of English speakers' use of gender-based sound symbolic patterns to assign gender to Korean names, which found that English speakers did not appear to be extending English patterns to Korean names, at least not in the ways that were expected if they were simply extending English patterns (as reported in Sullivan & Kang 2019). This contrasts with what is observed in the current study, where English speakers behave the same across languages for all but one factor. However, since Korean is more distantly related to English than French, and English speakers have less exposure to Korean than French, if familiarity with a non-native language is a factor, we would expect less extension to Korean than French, which is what we observe by comparing these two studies. A future study involving English, French and Korean participants responding to stimuli from all three languages could shed light on whether or not familiarity contributes to peoples' ability to extend gender-based patterns beyond their native language.

Our third and final research question addresses whether or not the speaker's language affects how they assign gender to nonce names. Given the overall similarity between English and

French, we hypothesized that we would see similar results for the participants across the four cross-linguistic factors, but that results may differ for the language-specific factors since they are not found in both languages. Our results support the first part of this hypothesis, but not the second, since for five of the six factors, including both language-specific factors, English and French speakers had similar results. This contrasts with Sullivan (2020) which compared English and Korean speakers' use of sound symbolic patterns to assign gender to Korean names and found that while Korean speakers used most factors, including those present in both languages to assign gender to names in the expected direction, English speakers did not. The contrast between Sullivan (2020) and the current study suggests that familiarity may be an important factor in using gender-based sound symbolic patterns to assign gender to names.

The only factor that did not display this pattern was consonant sonority where English speakers displayed the expected pattern (but only for French names) while French speakers did not and, if anything, were patterning in the opposite direction. It isn't entirely clear what's going on in this case as the pattern for the sound-symbolic round consonants (/b l m n/) in the corpus appears to be stronger in the French names. One possibility is that English speakers used their knowledge of differences between French and English to use this feature for gender assignment in English, but not in French. Another possibility, discussed above, is that for French speakers, the presence of a voiceless stop (/p t k/; known as sharp consonants in sound symbolism (Köhler 1929)) are more important for French speakers, and that is why they did not show a pattern. A final possibility is that the corpus results are swayed by the use of the inclusion of /b/ in addition to sonorant consonants, and that a different pattern may have emerged there if it had been excluded. Future work on the corpus should test for sonorous consonants rather than sound-symbolic round consonants to investigate this.

It is also difficult to interpret what the similarities between the language-specific factors mean. For stress placement, both English and French participants show no difference while, for vowel nasality, they both rate names with nasal vowels as more male than those without nasal vowels. The first finding is inconsistent with Sullivan (2018)'s English corpus analysis, suggesting that English speakers were also not able to make use of this factor. One possible reason for this is that stress was shifted in the nonce words without the reduction to schwa that occurs in English, making this, perhaps less salient for English listeners and causing them to disregard it, whereas for French speakers they may simply have not used it at all. Testing this factor with reduction to schwa may reveal additional information regarding how this factor is used.

For the nasal vowel factor, it is unsurprising that French speakers are using it. It is less clear why the English speakers are making use of it. Sullivan & Kang (2019) present three possible explanations for why English speakers are using the pattern: first, that it is a cross-linguistic tendency that is hidden in English but emerges in the experimental task, second, that participants have familiarity with French and therefore this pattern and third, that participants are interpreting it as a vowel plus nasal sequence and therefore viewing it as a closed syllable. This last explanation seems less likely in light of Sullivan (2020)'s study that found that English speakers were not more likely to rate a name as male if it had syllables that were closed with nasal consonants than if it was not. However, the first two possibilities are still viable, and testing this factor on speakers who are unfamiliar with French would shed some light on whether this factor may be cross-linguistic or if English speakers are able to apply it based on their familiarity with French.

One major challenge with this study is the low number of participants and stimuli. This makes assessing potentially complex interactions and evaluating subtle effects difficult. Further-

more, the low number of stimuli per target factor makes it difficult to know what effects might be the results of the stimuli used and which are actually related to the predictors being investigated. Future research in this area can alleviate this by including more stimuli per target factor and using more participants than the current study.

6. Conclusion. The results of this study suggest that French speakers are able to use some, but not all, factors to assign gender to names in both French and English, and that their results do not vary based on the language of the names they are assigning gender to. However, these results do not neatly align with what is found in the corpus, suggesting that the factors available for them to use are not all the same as those present in the names in the language. While not conclusive, these findings are consistent with previous work which finds that speakers use some but not all factors to assign gender to names in their native languages (Sullivan & Kang 2019; Sullivan 2020; Sullivan & Kang 2023; Wong & Kang 2020). Comparing English and French speakers' use of the patterns shows a striking similarity in how they are used, even for language-specific patterns, in contrast to how English and Korean speakers differed in their use of patterns in Korean names (Sullivan 2020), suggesting that familiarity with a language may be an important factor for determining how people apply gender-based sound symbolic patterns in non-native languages.

This study adds to a growing body of literature suggesting that gender-based sound symbolic patterns are present in given names, and that these patterns are active in speakers minds and available for use, at least in their native language. Future research in this area should incorporate more languages, participants and stimuli and examine how speakers do or do not use gender-based sound symbolic patterns to assign gender to names in languages that they are familiar with, including their native languages, and languages with which they are less familiar.

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