

Article

Acquiring French Intonation against the Backdrop of Heritage Bilingualism: The Case of German–Turkish Learners

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Abstract: This paper investigates the intonation of L3 French, produced by six bilingual learners (ages: 15–17) who speak Turkish as a heritage language (HL) along with German and six same-aged monolingual German learners. We examined a corpus of read speech in two respects: first, we determined the number of accentual phrases (APs) and, second, we extracted F0 values for each segment, normalized them, and calculated the deviations from the average values produced by three native controls (age: 21–23). Although the bilinguals were expected to outperform the monolinguals due to certain similarities between the intonational systems of French and Turkish, their mean deviation from the native contours was only slightly smaller than that of the monolinguals (difference not significant). To determine how strongly the bilinguals' Turkish intonation was influenced by German and whether it could serve as a basis for positive transfer whatsoever, we compared their production in Turkish with data recorded from three monolingual Turkish L1 speakers (ages: 21–32) and five German learners of L2 Turkish (ages: 22–43). Results show that the bilinguals' Turkish intonation does not deviate substantially from the monolinguals' one, in contrast to the contours produced by the L2 learners. This suggests that metalinguistic and prosodic awareness should be fostered in heritage bilinguals to make them benefit from their full linguistic repertoire.

Keywords: French; German; Turkish; intonation; foreign language learning; third language acquisition; heritage bilingualism; language dominance



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1. Introduction

It can be regarded as common knowledge that the default mode of communication observed in most communities around the world is characterized rather by using more than one language on a regular basis than by monolingualism. Nonetheless, the learning and teaching of foreign languages (FLs) in educational settings is largely determined by what has been aptly described as the “monolingual habitus” of schooling in Western societies (Gogolin 1994). Bearing this in mind, it is hardly surprising that research on FL learning against the backdrop of migration-induced multilingualism still leads a shadowy existence. This insufficient attention to the issue is reflected in the fact that many FL teachers to this day hardly make use of their students' multilingual potentials (Hu 2003, 2011; Gabriel and Thiele 2017), although they do show a positive attitude towards multilingualism (Haukås 2016; Kropp 2020). However, since the turn of the millennium there has been a growing interest in both linguistics and language pedagogy to disentangle the multiple instances of cross-linguistic influence (CLI) that can be observed when a FL is learned against the background of more than one previously acquired language. This also holds true for the investigation of phonological learning: The “newly emerging dynamic area” (Cabrelli Amaro and Wrembel 2016, p. 395) of research into bilingualism is commonly subsumed under the umbrella term of third-language (L3) phonology, which addresses, first, “traditional” FL learning, i.e., the consecutive learning of several FLs by monolingually raised students (e.g., French as a second FL after Spanish as a first FL in an English-speaking educational context), and, second, the learning of a FL by pupils who speak a

so-called heritage language (HL) (Valdés 2000; Montrul 2016; Polinsky 2018) along with the surrounding language. To date, the first line of investigation is clearly the dominating one, whereas the second one was pursued in only a minority of the studies available (for an overview see Cabrelli Amaro et al. 2015; Cabrelli Amaro and Wrembel 2016; Domene Moreno 2021, pp. 17–42). Furthermore, the FL addressed in most studies is English, whilst L3 acquisition of Romance phonology still qualifies as an under-researched field. Moreover, most of the extant studies on the bilingual effects in L3 phonological learning have focused on phonological competence as exhibited in initial discrimination ability (see Kopečková 2016, pp. 211–12 for an overview) or regarding perceived foreign accent (e.g., Lloyd-Smith et al. 2017; Lloyd-Smith 2020, 2021). However, to fully understand the nature of the acquisition of an L3 phonological system, it is essential that further studies increasingly expand into the domain of speech production. This applies even more to prosody, which, according to Matras (2009, pp. 231–33), is particularly susceptible to CLI.

Our study aims to fill a research gap in three respects: firstly, we address a FL other than English by investigating the L3 production of French intonation in German–Turkish adolescents. We thus address not only an understudied language combination but also a phonological domain that, to our best knowledge, has not been considered before in research on FL learning against the backdrop of heritage bilingualism. Secondly, we do not limit ourselves to analyzing the learners’ performance in the target language. Following the “Focus on Multilingualism” approach (Cenoz 2013; Cenoz and Gorter 2014), we also include their production in Turkish, which is Germany’s most widespread HL (BaMF (Bundesamt für Migration und Flüchtlinge) 2020, p. 200). Furthermore, we compare the bilinguals’ Turkish with control data recorded from monolingually raised Turkish speakers and German learners of Turkish as a FL. The rationale behind this approach is the lively debate on the question of whether heritage speakers and L2 learners are similar in that both deviate from the monolingual target norm, the former because of language attrition or incomplete acquisition, the latter given their lower proficiency at several linguistic levels (Montrul 2016, pp. 249–97). Thirdly, we include measures of language dominance, i.e., of use and proficiency regarding the two languages that make up the learners’ linguistic background, German and Turkish, to gain as complete a picture as possible of the linguistic conditions under which the FL is acquired.

2. Background

2.1. *Phonological Learning against the Backdrop of Heritage Bilingualism*

Until recently, acquisitional settings other than the subsequent learning of several FLs was not in the center of interest of research in L3 phonology. The acquisition of FLs by heritage bilinguals or bilingual speakers of minority languages, by contrast, has only recently received more attention. This is astonishing given that teaching and learning of FLs in multilingual classrooms is today rather the norm than the exception. Although the few relevant studies available cover both segmental and prosodic aspects, ranging from consonant production to speech rhythm, thus far, there has been a strong focus on the realization of plosives. For instance, Tessmann Bandeira and Zimmer (2012) addressed the production of voiceless stops in L3 English by bilingual learners speaking Pomeranian, a Low German diaspora variety, along with Brazilian Portuguese (BP). Their results showed that the bilinguals’ voice onset time (VOT) productions were more target-like as compared to the values produced by a control group of learners who had been raised monolingually in BP. Furthermore, the authors identified signs of convergence between the (Germanic) system of Pomeranian and the (Romance) system of BP among the bilinguals, who had developed compromise values for both of their languages. Regarding the realization of voiced obstruents (i.e., plosives and fricatives) in L3 French produced by learners speaking the Zurich variety of Swiss German as their dominant language, Schmid (2012, pp. 648–49) provides evidence of transfer from the HLs Italian and Finnish onto the target language: while the Swiss German–Italian subjects seemed to be advantaged over Swiss German monolinguals due to the similarities of Italian and French regarding the production of

voiced obstruents (e.g., fully voiced initial stop consonants), the Swiss German–Finnish speaker showed negative transfer of Finnish VOT patterns in his L3 French. [Gabriel et al.’s \(2016\)](#) VOT measurements suggest that in addition to the learners’ awareness and attitudes, pronunciation training plays an important role: neither the bilingual Chinese–German learners nor the monolingually raised German control group analyzed in their study produced target-like values for L3 French stops. By contrast, the monolingual Chinese learners, who had been explicitly told not to produce aspirated voiceless stops by their language instructor in Beijing, attained rather target-like VOT values. The production of voiceless plosives in terms of VOT patterns was also investigated by [Llama and López-Morelos \(2016\)](#), who analyzed data gathered from Spanish HL speakers taking part in a French immersion program in an English-speaking context in Canada. The authors showed that the learners’ L3 French VOTs were influenced by English—although their HL (Spanish) did not show a comparable influence. This finding indicates that the environmental language, which is also the main language of instruction in FL teaching, outranks the HL as a basis of positive transfer. The results of the studies by [Dittmers et al. \(2018\)](#) and [Gabriel et al. \(2018, 2021\)](#), who analyzed stop production in English, French, and Russian learned as FLs by young Turkish–German and Russian–German bilingual learners in the German educational system, point in the same direction. Regarding the realization of the voiceless stops /p t k/ in L3 French, the multilinguals got closer to the target than their monolingually raised German classmates. However, they failed to pre-voice the voiced counterparts (/b d g/) in a target-like way, even though full voicing could have been positively transferred from their HLs to L3 French, since their production in the HLs at least partly displayed this feature. [Amengual et al. \(2019\)](#) tested the production of the voiceless velar stop /k/ in Japanese as a FL by five US-born Spanish–English heritage bilinguals and found an effect of language mode: although the participants showed language-specific VOT patterns for all their languages when recorded in a setting in which only one language was used, they exhibited CLI when recorded in a “multilingual setting”, where the degree of activation of the learners’ background languages was higher. Based on a larger data set, [Geiss et al. \(2021\)](#) analyzed the VOT patterns in English as a FL produced by 20 German–Italian heritage bilinguals living in Germany and showed that they outperformed a control group of monolingually raised Italian learners (who failed to aspirate the voiceless stops and partly pre-voiced their voiced counterparts) but achieved VOT values comparable to those produced by their monolingually raised German peers. The authors interpret their finding as evidence for the assumption that CLI is favored by language dominance.

A positive effect of the HL Turkish on the learning of English and French as FLs was found by [Özaslan and Gabriel \(2019\)](#), who showed that bilingual Turkish–German learners were successful in avoiding negative transfer of the so-called final devoicing rule, which neutralizes the [±voiced] contrast of German obstruents in syllable-final position (e.g., /b/ surfacing as [b] in *ga[b]en* ‘(they) gave’ but as [p] in *ga[p]* ‘(s/he) gave’). By contrast, the English and French produced by monolingually raised German learners displayed more misproductions such as English *bad* (erroneously pronounced with an unvoiced final /d/, i.e., *[bæt], which is likely to be misinterpreted as ‘bat’), or French *gaz* ‘gas’ (with a devoiced realization of the final fricative /z/, i.e., [gas]). At a more general level, the result of [Kopečková’s \(2016\)](#) study on the acquisition of the Spanish rhotic phonemes /r/ and /ɾ/ in monolingually raised German learners and bilingual learners speaking different HLs along with German suggest that active bilinguals enjoy a long-term advantage in the production of new sounds but that this advantage is modulated by the degree of similarity between the phonologies existent in the multilinguals’ repertoire.

Vowel production in FLs against the backdrop of heritage bilingualism has been addressed in the study by [Kopečková et al. \(2016\)](#), who showed that children of a Polish heritage background differed from monolingually raised German children in the vowel productions in all their languages, including the FL English (see also [Sypiańska 2016](#) for the L3 English vowels produced by Danish–Polish heritage bilinguals). Recently, [Domene Moreno \(2021\)](#) in a comprehensive study addressed the acquisition of L3 English phonol-

ogy by child and adult German–Turkish heritage bilinguals and German monolinguals. Testing the production and perception of a range of segmental features (among them initial consonant clusters, phonemic vowel length, voiced codas, and the quality of laterals), the author found that positive as well as negative transfer occurred from both languages independently of age group. However, the occurrence of CLI was highly divergent from feature to feature, which confirms the disparate findings of previous studies and bars the way to generalizations. To account for her results, the author puts forth a bit-by-bit approach (following [Westergaard et al. 2017](#) Linguistic Proximity Model) in which CLI applies not to full phonological grammars but rather to the bits it is composed of (e.g., features, properties, or processes).

Turning to prosody, [Gabriel et al. \(2015\)](#) and [Gabriel and Rusca-Ruths \(2015\)](#), in their studies on the durational properties of English, French, and Spanish as FLs produced by learners who speak either Mandarin Chinese or Turkish as a HL along with German, found certain indications of a bilingual advantage (cf. [Antoniou 2019](#) for an overview). Their measurements of speech rhythm suggested that multilingual learners with a high degree of phonological and cross-linguistic awareness and a positive attitude towards both the HL and the FL in question performed more target-like than their monolingually raised peers. This, in turn, indicates that extralinguistic factors, such as awareness and attitudes, may facilitate positive transfer from the learners' plurilingual background to the FL learned. Another study by [Domene Moreno and ı̇ Kabak \(Forthcoming\)](#) analyzed a set of duration- and pitch-based rhythm metrics in the English and German produced by adult German–Turkish bilinguals as compared to German monolinguals. Since significant differences between the groups were found only in the duration-based metrics (as a consequence of more Turkish-like rhythmic values in the bilingual group), the authors conclude that CLI affects rhythm metrics individually (cf. [Domene Moreno 2021](#), pp. 40–41).

2.2. Language Dominance

Dubbed by [Grosjean \(2016\)](#) as the complementary principle, it is assumed that bilinguals acquire and use their languages for different purposes and in different domains of life. In consequence, they not only differ widely among each other but also their mastery of the two languages is typically not equivalent. As a matter of fact, it is far more common for bilinguals to be dominant in either of their languages ([Grosjean 1998, 2016](#); [Treffers-Daller 2016](#), p. 235). Definitions of the construct of (individual) language dominance given in the literature usually refer to two key dimensions of the bilingual experience: language competence or proficiency and language use.

In recent years, language dominance has been employed to account for differences in the linguistic behavior of bilinguals with increasing frequency, but at the same time there are not yet any commonly agreed standardized methods to assess it. [Treffers-Daller \(2016\)](#) largely distinguishes two groups of approaches: subjective and generic evaluations vs. specific and objective forms of assessment. While the former typically aim to obtain a measure of “global dominance” relying on self-ratings and questionnaires (and thus present the disadvantage of not being fully objective), the latter are based on tests of specific components of language ability or of specific language skills. However, this procedure entails the caveat that dominance can merely be depicted in relation to the specific criterion selected by the researcher, which can be problematic. For instance, measures of frequency of CLI or code-switching have been severely criticized in consideration of the fact that the occurrence of such phenomena may strongly depend on the norms of a given bilingual community: e.g., in many contact situations on the African continent, language mixing is an unmarked choice, and among Hispanic communities in the US it may be considered the norm (cf. [Treffers-Daller 2016](#), pp. 252, 259–60).

Moreover, it is plainly clear that how bilinguals distribute their languages over different domains and functions generally depends on sociolinguistic, rather than personal factors, such as on language predominance within their direct environment and the wider society (cf. [Kupisch and Van de Weijer 2016](#); [La Morgia 2016](#)). In consequence, when it

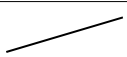
comes to the acquisition of FLs by bilingual learners, it must be considered that such learner groups may include “L3 learners who are active bilinguals and who use their other two languages in everyday life, and others who may live in a monolingual context and use their L2 only occasionally” (Cenoz 2013, p. 73). Therefore, a further objective of the present study is to assess the performance of German–Turkish learners in the L3 French also in the light of their language-dominance patterns and, in doing so, to evaluate whether their behavior in the L3 may serve as a further cue to language dominance.

2.3. The Languages of Our Sample: Intonation in French, Turkish, and German

The three languages of our sample, i.e., French, Turkish, and German, differ considerably from one another in their prosodic systems. While French and Turkish at least partly pattern alike with respect to the distribution of intonational prominences across the speech signal, German considerably diverges from both languages. As a typical word language, German follows the word-based model of intonation (Jun 2014). This means that F0 contours are determined, first, by local pitch movements (i.e., pitch accents that are realized on metrically strong syllables) and, second, by so-called boundary tones, which associate with the edges of prosodic phrases and can express pragmatic meanings (such as, e.g., obviousness or amazement) or signal sentence modality. As to the latter aspect, boundary tones allow to distinguish between declaratives, which exhibit a descending contour marked through a final low tone L%, and (syntactically and lexically identical) yes/no questions, which present a rising contour ending in a final high tone H% (Féry 1993; Grice et al. 2005; Michalsky 2014, 2017).

As opposed to German, French lacks word stress and exhibits a phrase-based—or in Jun’s (2014) terminology: edge-based—intonational system. French tunes are thus determined by pitch movements which occur obligatorily at the end and facultatively also at the beginning of so-called rhythmic groups (French: *groupes rythmiques*), called “accentual phrases” (APs) in recent work on French intonational phonology (Jun and Fougeron 2000, 2002; Delais-Roussarie et al. 2015). The underlying pattern of the well-formed AP in French is exemplified with the phrasal units given in Table 1: the mandatory final prosodic prominence (/LH*/) associates with the right edge of the AP and surfaces phonetically on its last syllable as an F0 rise ((LH)) or high tone (H). The more syllables the phrase contains, the more likely an additional rise (/LHi/) is to occur at the AP’s left edge ((LH)).

Table 1. Realizations of the French AP (Delais-Roussarie et al. 2015, p. 70). Surfacing high tones corresponding to prominent syllables are highlighted in bold.

	IPA Transcription		Surface Realization of /LHi	LH*/	Schematized F0
<i>centre</i> 'center'		['sɑ̃tʁ]	[L	H]	
<i>central</i> 'central'	[sɑ̃	'tʁal]	[L	H]	
<i>centralisent</i> '(they) centralize'	[sɑ̃tʁa	'liz]	[L	H]	
<i>décentralisent</i> '(they) decentralize'	[de sɑ̃tʁa	'liz]	[LH	LH]	
<i>décentralisent le pouvoir</i> '(they) decentralize power'	[de sɑ̃tʁalɪzləpu	'vwɑ̃]	[LH	LH]	

Note that a final boundary tone, associated with a higher level of the prosodic hierarchy may be added so that a larger prosodic unit can also end in a final low tone (L%), as, e.g., in the declarative *Ils décentralisent le pouvoir* ('They decentralize power'), which contrasts with the morphosyntactically identical interrogative *Ils décentralisent le pouvoir?* ('Do they

decentralize power?'), ending in a final high tone (H%). In that case, the AP-final pitch accent (L)H* contrasts with L*, especially when preceding an L% boundary tone, which may yield L* L% nuclear configurations (e.g., in broad- or narrow-focus statements; cf. Delais-Roussarie et al. 2015). Note furthermore that the number and distribution of APs varies essentially as a factor of speech rate or reading speed.

The intonational system of Turkish has an intermediate position between those of French and German. In the unmarked case, stress in Turkish is assigned to the last syllable of the prosodic word, which is obligatorily marked by an initial L tone and a final rise (Kamali 2011; Güneş 2013; İpek and Jun 2013, 2014; Kühn 2016, pp. 35–49). An example is given in the following: *şeker* 'sugar', *şekerlik* 'sugar sprinkler', *şekerliğimiz* 'our sugar sprinkler', *şekerliğimizde* 'in our sugar sprinkler', *şekerliğimizdeki* 'located in our sugar sprinkler' (final stress is marked in bold). The tonal shape of such prosodic words represents an obvious parallel with the initial low and the final high tone of the French AP, as outlined above. In the literature on Turkish intonation, these prosodic words are analyzed as forming either phonological (Φ) phrases (Güneş 2013; Féry 2017, pp. 250–57) or, on a par with French, as APs (Levi 2002, 2005). In our analysis of the Turkish data, we will also refer to the smallest intonational units as APs. Note that in pre-final position the final H tone of the Turkish AP is commonly replaced by an L tone, which entails a globally flat contour at the end of the intonational phrase (IP) as in (IP (L *Babamız* H) (L *ekmek* L) (L *aldı* L)) L%, 'Our father bought bread' (cf. Güneş 2013, p. 199; Féry 2017, p. 251). For this pattern, Féry (2017, p. 250) assumes a recursive AP (in her words: Φ) structure as in, e.g., ((L *Babamız* H)((L *ekmek* L) *aldı* L) L%, which we adopt in our analysis. However, Turkish exhibits a well-defined set of exceptions to this global pattern (so-called irregular roots or stems, cf. Kabak and Vogel 2001; Göksel and Kerslake 2005, pp. 27–28), which rather follow the German-like model of word-based intonation. Relevant examples include place names such as *Adana* with initial and *Bursa* with penultimate stress, a couple of loans and borrowings such as *futbol* 'football' (< English *football*) or *lokanta* 'restaurant' (< Italian *locanda*) and negated verb forms such as *getir*_[Neg me]*dim* 'I didn't bring' or *bil*_[Neg m]*iyor* 's/he doesn't know', containing the affix -*m(e)*-, which blocks stress assignment to the right. Exceptions such as these even allow for expressing lexical and grammatical contrasts via stress-assignment as in, e.g., *bebek* 'baby' vs. *Bebek* (a neighborhood of Istanbul) or *benim* 'my' (*ben* 'I' + possessive suffix) vs. *benim* 'It's me' (*ben* 'I' + copular suffix). Note that this is entirely impossible in French. While Turkish APs are produced with a global rising pattern (LH) in the unmarked case, regardless of the number of syllables (see the above examples), APs containing irregular roots show a more complex tonal pattern, with an H*+L pitch accent located on the accented syllable (Levi 2002, 2005; Kamali 2011; Féry 2017, p. 253). This may yield APs with a rising-falling-rising pattern as in, e.g., (L *lokan*_{H*+L}*tamuzdan* H) 'from our restaurant'.

3. Empirical Study

3.1. Research Questions

Based on, first, the previous research on L3 acquisition summarized in Section 2.1 and, second, the suprasegmental properties of French, German, and Turkish, outlined in Section 2.3, Turkish–German bilingual learners who speak Turkish as an HL along with German should outperform their monolingually raised same-aged peers concerning the mastering of the phrase-based intonation of French. We aim thus to answer the following first research question:

RQ1. Do bilingual Turkish–German learners of L3 French perform more target-like regarding the production of the phrase-based intonation of French as compared to monolingually raised German learners, i.e., do the former deviate less from native sample contours than the latter?

However, positive transfer from the HL Turkish into L3 French is only possible if the Turkish intonation produced by the respective Turkish–German bilinguals presents the phrase-based characteristics of monolingual Turkish as spoken in Turkey, i.e., if it is

largely devoid of CLI from the environmental language German and not attrited at the intonational level (as in the case of the English–Spanish heritage bilinguals tested by Llama and López-Morelos 2016, whose HL Spanish was not influenced by the environmental language, English, regarding VOT production). We therefore aim to answer the following second research question:

RQ2. Does the intonation produced by Turkish–German bilinguals in the HL Turkish pattern with the (at least partly) phrase-based intonation produced by monolingually raised speakers of L1 Turkish, i.e., does it show less deviation from monolingual L1 Turkish than the Turkish intonation produced by monolingually raised German learners of Turkish as a FL?

Finally, as already laid out in Section 1, we strive to determine whether a meaningful link can be established between the learners’ patterns of language use and proficiency, i.e., their language dominance, and their actual performance in both the HL Turkish and the FL French. We shall therefore try to answer the following third research question:

RQ3. To what extent can the Turkish–German bilinguals’ production of intonational contours in their HL Turkish and in L3 French be related to their individual language-dominance patterns?

3.2. Participants, Data, and Analysis

To answer RQ1 regarding the learners’ production in their L3 French at the intonational level, we scrutinized a corpus of read speech produced by two groups of learners of French as a FL, i.e., six German monolinguals (each three males and females; group M) and six Turkish–German bilinguals (each three males and females; group B). Both learner groups were thus balanced for gender. For both groups, the data collection was carried out in different places of Westphalia (northwestern Germany) in 2016 within the project “Multilingual development. A longitudinal perspective” / “*Mehrsprachigkeitsentwicklung im Zeitverlauf*” (MEZ), 2014–2019; (cf. Brandt et al. 2017). The background data (background questionnaire) were collected by an external survey institute (cf. IEA Hamburg 2017), while proficiency measures and speech data were gathered by the project members themselves, including the second author of the present study. All bilinguals were born in Germany; four of them also had at least one parent born in Germany, making them second or third generation HL speakers of Turkish, respectively. They typically used both German and Turkish when talking to family members and close friends, whereas in the public domain, the use of German was almost exclusive (cf. for more details see the results on language dominance presented in Section 4.1, below). At the time of data collection, all learners were aged 15–17 years, attended senior high school (German *Gymnasium*), and had received formal instruction in French for three years. Accordingly, they qualify as advanced beginner or lower intermediate learners (levels A2–B1 according to the Common European Framework of Reference for Languages; cf. (Niedersächsisches Kultusministerium 2017, p. 8)). Furthermore, a C-test (Grotjahn 2010) revealed that both learner groups were equally proficient in the target language, the bilinguals achieving 43.6 and the monolinguals 47.6 out of a maximum of 80 points.

The native French control group (F-L1) consisted of three monolingually raised female speakers from Dijon, France (aged 21–23)¹. At the time of data collection in 2018, they were exchange students at the University of Mainz (Rhine-Main metropolitan area) and had received formal instruction in English as a FL for eight years. They had no advanced knowledge of additional FLs. As their command of German was low, the instructions during the recording session were given in French.

All participants were asked to read out the story *Amandine fait du sport* ‘Amandine does sports’ (147 words), taken from a much-used textbook (Jouvet 2006; cf. Appendix A). They were given time to read through the story and to practice reading it before being recorded.

To answer RQ2, the bilingual learners were additionally asked to read out the Turkish short story *Nasreddin Hoca karın ne olduğunu bilmiyormuş* ‘Nasreddin Hoca doesn’t know

what snow is' (48 words; cf. Appendix B), which was taken from a collection of traditional Turkish tales (Karagöz and İşler 2005). Besides, the same text was also recorded from two control groups consisting of three monolingually raised speakers of Turkish from Ankara (L1-TR; ages: 21–32) and five monolingual German learners of L2 Turkish stemming from central Germany (L2-TR; ages: 22–43). The recording sessions took place at the University of Mainz (Rhine-Main metropolitan area) in 2019; the instructions were given in German or English as a function of the participants' command of German.

An overview of all participant groups is provided in Table 2.

Table 2. Overview of the participant groups.

	Test Group	Ages	n	Data Collection
M	Monolingual German learners of French	15–17	6	Westphalia, 2016
B	Bilinguals German–Turkish learners of French	15–17	6	Westphalia, 2016
L1-F	Native speakers of French	21–23	3	Rhine-Main area, 2018
L1-TR	Native speakers of Turkish	21–32	3	Rhine-Main area, 2019
L2-TR	Monolingual German learners of Turkish	22–43	5	Rhine-Main area, 2019

Aside the reading data serving the intonational analyses, some further data available in the MEZ data set were used to assess the bilinguals' language-dominance patterns (and hence to answer RQ3). This was done in two different ways, relying on both subjective-generic measures and objective-specific tests to mitigate the shortcomings of either method and to provide as complete a picture as possible (cf. Section 2.2).

The generic assessment was based first and foremost on the extralinguistic information collected within the MEZ project by means of a sociolinguistic background questionnaire. Strongly inspired by the methodology proposed for the bilingual language profile (BLP) by Birdsong et al. (2012), we used these data to calculate a composite dominance score for each bilingual participant. For this purpose, the answers given by the participants to a total of 29 questions from the MEZ questionnaire were transformed into credits points and then summed up to language totals for both Turkish and German. In a following step, the subtraction of the Turkish language total from the German one yielded a composite dominance score (on a scale ranging from −91 to +91). The resulting values were then multiplied with the factor 1.099 so that the scale of the final dominance score ranges from −100 to +100, values around 0 indicating balanced bilingualism, whereas negative values indicate the dominance of Turkish, and positive values German dominance. Values of ±100 would theoretically indicate the absence of bilingualism, i.e., monolingualism in either language. As in the BLP, the included questions belonged to four different modules, viz., language history, language use, self-assessed proficiency, and language attitudes. Table 3 provides an overview of the questions included in each module.

To gauge language dominance more objectively, i.e., based on language testing instead of self-assessment by the participants, we furthermore considered four proficiency measures provided in the MEZ data set. The first three were part of a so-called LGVT test (*Lesegeschwindigkeits- und Verständnistest* 'reading-speed and comprehension test'; Schneider et al. 2017; Schlagmüller et al. 2022) and comprised tests of reading comprehension (in form of a multiple-choice test containing 47 items, 2 points per correct answer, i.e., max. 94 points, presented here as percentage of maximum possible), of reading speed (number of read words in 6 minutes), and of reading accuracy (percentage of correct answers in relation to the number of answers given). The fourth measure assessed writing skills based on short texts written by the participants (retellings of picture stories). Following Klinger

[et al. \(2019\)](#), a score including factors such as task completion, text length, types of used nouns, adjectives, verbs, and compounds, and number of formal elements was calculated. It indicates the percentage of the maximum possible. All four proficiency measures were taken over four successive measurement times in the MEZ project within a time span of three years (2015–2018). We therefore used mean values here. Tapping into the bilinguals' writing and reading skills in their native languages, the selected measures present the advantage of being independent from the main object of inquiry in this study, i.e., the bilinguals' prosody in the FL French.

Table 3. Modules and questions included in the calculation of the dominance scores.

Module	Included Questions
Language history	Three questions: parents' languages, years of formal instruction in FL and HL
Language use	Eleven questions: habitual and most frequent language in the home, language parents use with each other, language of address used by father/mother, language used to address/communicate with father/mother/siblings/best friend/friends/in the schoolyard
Self-assessed proficiency	Six questions: pronunciation, writing skills, orthography, grammar in speaking and writing, lexicon
Language attitudes	Six questions: importance of speaking German/Turkish well, usefulness of knowing speaking/writing German/Turkish for future jobs, "I like watching TV in ...", "I don't like speaking ..."

For the intonational analyses, the recordings were transcribed orthographically and segmentally with EasyAlign ([Goldman 2011](#)) using Praat ([Boersma and Weenink 2020](#)); errors in the automatic segmentation were corrected manually. Since prosodic analyses require fluently produced speech data, all passages characterized by strong disfluencies needed to be discarded. More particularly, as the learners usually failed to produce longer sentences without notable interruptions, we decided to run the intonational analysis of French as a FL only on the five shortest sentences of the text (cf. the underlining in [Appendix A](#); 4–16 syllables, mean: 9.2). A second motivation for this decision was that longer sentences allow for more variability regarding phrasing decisions because the number and distribution of APs may vary depending on factors such as reading speed (cf. [Section 2.3](#)). This is highly relevant in the present context given that the learner contours were to be compared to native ones to calculate a deviation score. The choice of the five shortest sentences thus guaranteed that all natives would produce them with the same number and distribution of APs (cf. [Section 4.2.1](#)) and contributed to minimize hesitation phenomena in the learner data.

In a first step, we determined the number and distribution of APs in the relevant sentences. To this end, all local F0 maxima occurring within the realization of each sentence were examined with regard to their position in the respective prosodic words: Whenever an F0 maximum coincided with the last syllable of a lexical word (including clitics), it was taken to correspond to a realization of the mandatory final prosodic prominence (LH*) associated with the right edge of an AP (LH or H). When it was associated with non-final syllables of a content word or a functional element, by contrast, it was considered to represent an (optional) initial rise (LHi) occurring at the left edge of an AP. A further criterion for distinguishing between initial and final rises was the falling slope after the maximum, which tends to be steep at AP edges and shallow after initial rises ([Jun and Fougeron 2002](#), p. 153).

In a next step, we extracted three F0 values for each voiced segment using a Praat script (namely, at the 0.25, 0.5 and 0.75 time points). Octave jumps and similar measuring errors were excluded manually. Then, the F0 raw values were averaged for each segment and the resulting average values were normalized over each sentence (i.e., converted into

z-scores; cf. [Rose 1987](#); [Seoudy 2015](#)) to make the F0 movements comparable over speakers and sentences. Eventually, we calculated the deviation for each segment from the average value attained by the three French native controls for the same segment via subtraction. These difference values were then averaged to obtain mean deviation scores per sentence and speaker. The lower a deviation score attained by an individual learner score was, the more target-like his or her intonation was considered.

The same methodology was applied to the Turkish intonational data. In this case, two sentences from the reading text were considered (cf. Appendix B). To determine whether the German–Turkish bilinguals’ intonation patterned with monolingual Turkish or whether it was influenced by the environmental language German, we first identified the number of APs produced per sentence by each participant. As done in the analysis performed on the French data, we examined all local F0 maxima within the realization of each sentence regarding their position: unless the maximum coincided with a lexically or grammatically stressed syllable of an irregular root and hence represented the high target of an H*+L pitch accent (cf. Section 2.3), it was taken to mark the end of an AP. In a second step, we calculated the deviation of the bilinguals’ contours from the average contour of the monolingual Turkish controls (group L1-TR) according to the methodology described above for the French data sets and then compared it to the deviation found between the native average contour and the contours produced by German learners of Turkish as a FL (L2-TR). Furthermore, we also calculated the mean deviation of the monolingual Turkish speakers (group L1-TR) from their own group average, i.e., the within-group variance. The same was done for groups B and L2-TR.

4. Results

In this section, we present the results of our empirical study. As these results on language dominance (Section 4.1) will be relevant for the analysis of the intonational data, this part of the results will be presented before the results on intonation in French and Turkish (Section 4.2).

4.1. Language Dominance

Table 4 shows the results of the dominance assessment performed for the German–Turkish bilinguals (group B; cf. the methodology in Section 3.2). First, it includes the global dominance scores calculated based on the extralinguistic data available in the background questionnaire, i.e., mainly relying on the interplay of language use and self-assessed proficiency. As the scores are relatively close to 0, the bilinguals largely qualify as balanced bilinguals (mean: 10.7). One exception is participant B6, who seems to be moderately dominant in German (dominance score: 39).

In addition to the global dominance scores, Table 4 also includes a series of proficiency measures for both German and Turkish. A comparison of the results across languages shows that all bilinguals but one regularly score higher in German than in Turkish with regard to reading comprehension, speed, and accuracy as well as regarding general writing skills. An exception is learner B3, who generally performs better in Turkish than in German. However, also B3 reads faster in German than in Turkish. Furthermore, bilingual B6 displays higher writing skills in Turkish, even though he is clearly German-dominant according to all other measures.

In sum, the performed dominance assessments suggest that the bilingual speakers qualify overall as fairly balanced bilinguals. Yet, their reading and writing skills are noticeably better in German in most cases. In the discussion in Section 5, we will argue that the main reason for this is that the bilinguals primarily use German in public and educational contexts, while Turkish is largely restricted to the familial domain.

A closer look into the MEZ background questionnaires additionally confirms these observations: in general, the bilinguals display the same positive attitudes towards both of their languages. However, they rate their proficiency in German slightly higher. Their language use is across-the-board largely balanced, but it differs according to the specific

domain or situation looked at. At home, both languages occur, but parents more often use Turkish than German both between each other as well as to address their children. Nevertheless, when replying to their parents, the participants use German and Turkish roughly to the same extent and, when talking to their siblings or best friends, German is more prevalent. In the schoolyard, finally, German is clearly the dominant language, and the participants have hardly received any Turkish-medium education.

Table 4. Overview of different dominance measures (group B, averages over four measurements).

		B1	B2	B3	B4	B5	B6	Mean
Dominance score		19.5	−1.4	−8.0	17.9	−2.7	39	10.7
Comprehension	German	44	50	30	45	45	35	42
(% of max)	Turkish	19	28	40	42	15	11	26
Speed	German	1007	1141	948	1214	1137	917	1061
(<i>n</i> of words)	Turkish	565	616	761	941	634	475	665
Accuracy	German	99	96	79	90	93	89	91
(% correct)	Turkish	70	84	90	82	61	57	74
Writing	German	42	30	40	51	42	44	42
(% of max)	Turkish	26	25	52	42	27	56	38

4.2. Intonational Data

4.2.1. French Intonation

Table 5, below, displays the numbers of APs produced by the two learner groups and the French natives as determined following the methodology described in Section 3.2. It also gives the number of APs containing initial rises, i.e., (LHi), in brackets. For the complete labeling of the data set see Appendix C.

Table 5. Number of APs realized in the five target sentences. Uppermost panel: French natives (group L1-F); middle panel: monolingual learners (group M); lower panel: bilingual learners (group B). The numbers in brackets indicate the number of APs produced with an optional initial rise (LHi).

Sentence	1	2	3	4	5	Total
L1-F1	2 (1)	2 (2)	4 (1)	2 (1)	1 (1)	11 (6)
L1-F2	2 (1)	2 (2)	4	2 (2)	1 (1)	11 (6)
L1-F3	2 (1)	2 (2)	4	2 (2)	1	11 (5)
Mean	2	2	4	2	1	11 (5.7)
M1	3	5	7	4	2	21
M2	2 (1)	4 (1)	4 (3)	3 (1)	2	15 (6)
M3	3	4 (1)	5 (2)	4 (1)	1 (1)	17 (5)
M4	3	5	7	5	1 (1)	21 (1)
M5	3	5	7	4	2	21
M6	3	5	6	3 (1)	2	19 (1)
Mean	2.8	4.7	6.0	3.8	1.7	19.0 (2.2)
B1	3	5	7	4	2	21
B2	3	5	6	4 (1)	2	20 (1)
B3	3	4 (1)	5 (1)	4 (1)	1 (1)	17 (4)
B4	3	5	6 (1)	4 (1)	2	20 (2)
B5	3	5	6 (1)	3 (1)	2	19 (2)
B6	2 (1)	4	5 (2)	3 (1)	1 (1)	15 (5)
Mean	2.8	4.7	5.8	3.7	1.7	18.7 (2.3)

First and foremost, Table 5 shows that all native controls realized the target sentences with the same number and distribution of APs. Furthermore, the comparison of the

different participant groups evinces that, first, both learner groups produced significantly more APs than the native controls and, second, that bilingual learners do not differ from monolinguals in this regard. Similarly, the number of APs containing optional initial rises was substantially lower in the two learner groups (means: 2.2 and 2.3) than in the natives (mean: 5.7). As opposed to our expectations, the deviation of the bilingual learner group from the natives did thus not prove to be lower than that of the monolingual group.

The examples in Figure 1 illustrate this: while the native speaker L1-F1 (left panel) realizes the sentence *Mais elle fait du sport le dimanche soir* ‘But she does sports on Sunday nights’ in two APs—both with an initial rise—, the learner M5 (right panel) produces five APs, none of which contains an initial rise.

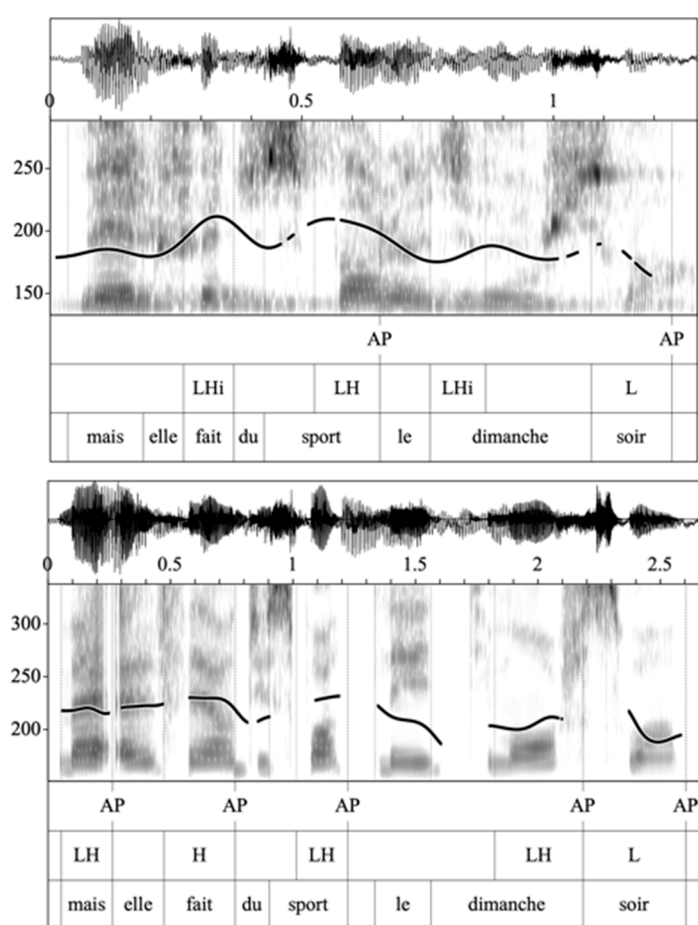


Figure 1. Target sentence 4 realized by a native speaker (upper panel) and by a monolingual German learner (lower panel).²

Table 6 shows the deviation scores calculated for each of the five sentences analyzed for each learner. As laid out in the methodology (cf. Section 3.2), this score represents the learners' average deviation from the monolingual target norm (i.e., from the natives' average contour) for every sentence.

As can be seen in Table 5, the bilinguals' mean deviation was only slightly smaller than the monolinguals' one (0.70 vs. 0.77). As this difference does not reach statistical significance ($t_{(51,804)} = -1.159, p = 0.26$), it cannot be concluded that the bilingual learners perform overall more target-like than the monolingual learners in the FL (cf. RQ 1). However, it is worth pointing out that a certain amount of variability was of course also present in the monolingual control group's sample. Yet, as can be seen in Table 7, the average deviation of the native speakers (L1-FR) from their own group mean value, i.e., the within-group variation, is much lower than in the two learner groups (0.50 vs. 0.77 and 0.70).

Table 6. Deviation from L1-F based on normalized F0 values (upper panel: group M; lower panel: group B).

	M1	M2	M3	M4	M5	M6	Mean M
Sentence 1	0.57	0.32	1.24	0.39	0.37	1.20	0.68
Sentence 2	0.86	1.13	0.81	0.75	0.68	1.14	0.90
Sentence 3	1.10	0.88	1.16	0.97	0.92	0.92	0.99
Sentence 4	0.53	0.62	0.77	0.40	0.82	1.21	0.73
Sentence 5	0.54	0.58	0.60	0.53	0.60	0.63	0.58
Mean	0.72	0.71	0.92	0.61	0.68	1.02	0.77
	B1	B2	B3	B4	B5	B6	Mean B
Sentence 1	0.58	0.36	0.73	0.73	0.34	0.45	0.53
Sentence 2	0.78	0.64	0.86	0.69	0.76	0.44	0.70
Sentence 3	0.98	0.49	0.96	1.09	0.89	1.08	0.92
Sentence 4	0.53	0.64	0.63	0.83	0.58	0.76	0.66
Sentence 5	0.71	0.89	0.64	0.79	0.66	0.60	0.72
Mean	0.72	0.60	0.76	0.83	0.65	0.67	0.70

Table 7. Average deviations of group L1-F from their own group means.

	L1-F1	L1-F2	L1-F3	Mean
Sentence 1	0.19	0.52	0.21	0.31
Sentence 2	0.65	0.65	0.57	0.62
Sentence 3	0.54	0.44	0.44	0.47
Sentence 4	0.51	0.34	0.35	0.40
Sentence 5	0.62	0.87	0.59	0.69
Mean	0.50	0.56	0.43	0.50

Moreover, the bilinguals' deviation scores show overall somewhat lesser variability than the monolinguals' (SD: 0.19 vs. 0.28), although the difference between the variances of the deviation scores in the bilingual sample and in the monolingual sample narrowly fails to reach statistical significance ($F_{(29, 29)} = 0.486, p = 0.057$). The distribution of the deviation scores (cf. Figure 2) suggests that the main reason for this is that some of the monolinguals' individual productions (e.g., M6, sentences 1, 2, and 4; cf. Table 6) display an especially high deviation from the monolingual target, whereas the bilinguals' productions show a more homogeneous distance from the monolingual target norm.

Further investigation of the individual learners' performances revealed that three of the four lowest average deviation scores come from the bilingual participants (B2, B5, and B6: 0.60, 0.65, and 0.67), whereas the two highest deviation scores stem from monolinguals (M6 and M3). Interestingly, the learners B2 and B5 are among the most balanced bilinguals, i.e., they are less German-dominant than other bilingual participants. These findings thus speak to a slight advantage of some bilinguals at the individual level. Yet, taking into account all bilinguals, there is no significant correlation between average deviation scores and language dominance scores ($r = 0.11$; cf. the discussion in Section 5 for possible explanations for this finding).

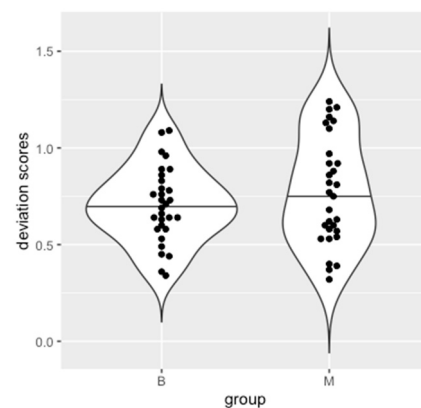


Figure 2. Distribution of deviation scores for the analyzed sentences according to learner group (left: group B; right: group M).

4.2.2. Turkish Intonation

Table 8 shows the numbers of APs produced in the Turkish target sentences by the native monolinguals (group L1-TR), the German–Turkish heritage bilinguals (group B), and the German L2 learners (group L2-TR). All the monolinguals produced the same number of APs, whereas the monolingually raised German learners of Turkish (group L2-TR)—in addition to showing more group-internal variation—clearly used a greater number of phrases. The German–Turkish heritage bilinguals (group B), finally, were again quite homogeneous, but they produced slightly more phrases than the monolingual controls (group L1-TR). However, as expected, their results turned out to be substantially closer to the monolinguals’ than the learner group are. For a complete labeling of the produced contours in each group see Appendix D.

Table 8. Number of APs realized in the two target sentences. From left to right: L1 speakers of Turkish (L1-TR), heritage bilinguals (B), German learners of Turkish (L2-TR).

	Sentence 1	Sentence 2		Sentence 1	Sentence 2		Sentence 1	Sentence 2
L1-TR1	3	4	B1	4	4	L2-TR1	4	6
L1-TR2	3	4	B2	3	4	L2-TR2	5	6
L1-TR3	3	4	B3	4	5	L2-TR3	4	6
			B4	4	4	L2-TR4	4	6
			B5	3	4	L2-TR5	5	6
			B6	3	5			
Mean	3	4		3.5	4.7		4.4	6

Table 9 offers the deviation scores calculated on basis of the Turkish data set. In this case, the scores represent the bilinguals’ (group B) and the German L2 learners’ (L2-TR) deviation from the monolingual L1 Turkish target norm, i.e., from the monolingual average contour (L1-TR).

As can be seen in Table 9, the heritage speakers’ mean distance is clearly lower than the L2 learners’ (0.59 vs. 0.77; $t_{(21.907)} = -3.237$, $p = 0.004$), i.e., the Turkish F0 contours of group B deviate significantly less from those of group L1-TR than those of group L2-TR do. This suggests that the bilinguals’ Turkish intonation does not deviate substantially from that of the monolinguals, in contrast to the contours produced by the L2 learners. This result is also supported by the fact that the mean deviation of the monolingual L1 learners from their own average contour (i.e., the monolinguals’ within-group variation) was quite similar (0.50; cf. Table 10).

Table 9. Deviation from L1 Turkish mean (L1-TR) based on normalized F0 values (upper panel: HL Turkish (group B); lower panel: L2 speakers (group L2-TR)).

	B1	B2	B3	B4	B5	B6	Mean B
Sentence 1	0.67	0.83	0.60	0.71	0.68	0.65	0.69
Sentence 2	0.55	0.48	0.67	0.33	0.45	0.50	0.50
	0.61	0.65	0.63	0.52	0.56	0.58	0.59
	L2-1	L2-2	L2-3	L2-4	L2-5	Mean	
Sentence 1	0.89	0.81	0.75	0.70	0.99	0.83	
Sentence 2	0.52	0.78	0.61	0.74	0.89	0.71	
	0.71	0.80	0.68	0.72	0.94	0.77	

Table 10. Average deviations of group L1-TR from their own group means.

	L1-1	L1-2	L1-3	L1-4	L1-5	L1-6	Mean
Sentence 1	0.41	0.65	0.55	0.48	0.48	0.57	0.52
Sentence 2	0.44	0.72	0.40	0.68	0.29	0.34	0.48
	0.43	0.69	0.48	0.58	0.39	0.46	0.50

Furthermore, the within-group variation (cf. Table 11) was quite low in the bilingual group (0.42), indicating that all bilinguals used similar F0 contours, whereas it was highest in the L2 learners (0.61; possibly due to the differing degrees of proficiency).

Table 11. F0 variation within Turkish speaker groups (i.e., deviation from the own group means).

	Within-Group Variation
L1-TR	0.50
B	0.42
L2-TR	0.61

Besides the fact that the German L2 learners (group L2-TR) produced a greater number of APs, another main reason for the deviation of their F0 contours from the monolinguals' is certainly the fact that they in roughly half of the cases failed to recognize lexically or grammatically stressed syllables (i.e., so-called irregular roots; cf. Section 2.3), which require tonal marking by an H*+L pitch accent, e.g., *bir gün* 'one day', *her taraf* 'all sides' or *bilmiyor* '(s/he) doesn't know' (Göksel and Kerslake 2005; Hony 1957). Instead, they typically produced the respective APs with the unmarked rising pattern, and, for instance, stressed the verb form *bilmiyor* on its last syllable, yielding (_L *bilmiyor* _H) rather than (*bil*_{H+L} **miyor*). In contrast, the German–Turkish heritage bilinguals (group B) stressed these syllables according to the monolingual norm and thus patterned with the Turkish monolinguals regarding the tonal shape of the respective APs (see Appendix D for the complete labeling of the produced contours).

5. Discussion

On balance, the Turkish–German bilinguals in this study were not found to perform overall more target-like with regard to the mastery of the phrase-based intonation of the target language French when compared to their monolingually raised German peers, although less variability was found in the bilinguals' productions (cf. RQ 1). Against the backdrop of the intonational similarities between the learners' HL Turkish and the target language French and given that previous studies on segmental aspects of French phonology in Turkish–German bilingual learners such as Dittmers et al. (2018) and Gabriel et al. (2018, 2021) did report positive transfer from Turkish onto French (cf. Section 2.1), this finding

comes somewhat unexpected at first sight. Note also that [Marchand and Le Gac \(2020\)](#) found that monolingually raised Turkish learners of French as a FL usually realize initial and final pitch movements in a target-like manner. One possible reason for the absence of positive transfer at the intonational level in our bilingual learners could surge from the lack of a basis for positive transfer in the learners' linguistic background. In other words: if the bilinguals' Turkish intonation had—at least partially—lost its predominantly phrase-based characteristics due to attrition under the pressure of the environmental language, German, it could no longer be used as a basis for positive transfer to a third language. Yet, this does not seem to be the case given that the intonational analysis of the Turkish data has shown that the bilinguals do not produce markedly more APs in Turkish and that their intonation curves do not deviate substantially from the ones produced by monolingually raised speakers from Turkey (cf. RQ 2).³ In turn, the Turkish intonation produced by the German learners of Turkish as a FL clearly differed from the productions of the two former groups with regard to both the number of phrases and the contours used and, besides that, presented a considerably greater degree of variability. Note in this context that our findings largely pattern with the results of the VOT study by [Llama and López-Morelos \(2016\)](#), whose Spanish–English bilingual learners of French did not present any positive effect of their HL Spanish either, even though their HL still showed the relevant characteristics to serve as a basis for positive transfer.

From a merely linguistic point of view, it thus remains unclear why positive transfer is not observed at the intonational level in the same way as it was found in at least some studies on segmental aspects (cf. Section 2.1). Nevertheless, our findings suggest that there is no wholesale transfer of phonology. Instead, phonological features rather seem to be transferred independently, as proposed by [Domene Moreno \(2021\)](#) in her bit-by-bit approach, which basically adapts [Westergaard et al.'s \(2017\)](#) Linguistic Proximity Model to the phonological domain (see also [Westergaard 2021](#); [Archibald 2022](#)). The present study thus provides first evidence that intonation, besides being known to be particularly permeable in language contact ([Matras 2009](#), pp. 232–33), represents a challenging subdomain in L3 phonological acquisition.

Furthermore, it is likely that the bilinguals' patterns of language use and proficiency as well as the context of learning French play a crucial role regarding the absence of positive intonational transfer. The analysis of the learners' language dominance has revealed that the participants characterize overall as balanced bilinguals. Yet, they generally use German in public contexts, while the use of Turkish is restricted to the familial domain. Furthermore, proficiency tests disclosed that their reading and writing skills are higher in German except for one participant (B3). It thus seems reasonable to assume, first, that the degree of activation of the HL Turkish is low in the German-medium education system, where the FL French is acquired mainly through the medium of the majority language (German) and, second, that suprasegmentals are less accessible than segmental features in FL learning. To make heritage bilinguals benefit from their knowledge in the HL, cross-linguistic and in particular prosodic awareness would thus need to be fostered in this bilingual learner group.

Besides, the present study has shown that the participants' language-dominance patterns can only partially be linked to their performances (cf. RQ3): i.e., on the one hand, the language use according to domains of life seems to play a meaningful role (cf. above), but, on the other, no correlation could be observed between global dominance and deviation scores. At least for the sample of bilinguals analyzed in this paper, performance in the L3 thus cannot be used as a telling cue to language dominance. This is probably the case because the dominance scores and patterns were quite homogeneous across the bilingual learner group.

6. Conclusions

Our study examined the intonational patterns of L3 French declaratives in read data produced by German–Turkish learners in comparison with control data gathered from

monolingually raised German learners. Expectations of positive transfer from the bilinguals' HL onto their FL French were not met, although their Turkish reading pronunciation did not exhibit any signs of attrition under the influence of the environmental language, German. The results of this pioneer study on L3 intonation thus add to our understanding of L3 phonology in that they suggest that the suprasegmental level of speech production is less accessible in FL learning. Interestingly, the lack of accessibility is also one of the factors commonly adduced to account for the vulnerability of intonation in language contact (cf. [Matras 2009](#), pp. 232–33). Despite the likelihood of intonational transfer in general, positive transfer thus seems to need support by fostering prosodic awareness in multilingual learners if we want it to facilitate their acquisition of L3 intonation. FLs should thus be taught “through a multilingual lens” ([Cummins 2021](#), p. 314) to activate the learners' multilingual knowledge. To achieve this goal, appropriate knowledge ought to be included to a greater extent in the training of FL teachers, who should be encouraged to make use of their pupils' multifaceted linguistic skills.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki. The approval procedure for the data collection in German secondary schools using the procedures described above included ethical considerations and was the responsibility of an external survey institute (IEA Hamburg). The procedure is documented in the method report (cf. [IEA Hamburg 2017](#)).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Due to confidentiality restrictions, the data analyzed in this study are not publicly available. They are available on request from J.G.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Text of the French reading task ([Jouvet 2006](#)). Sentences 1–5 considered for the intonational analysis are highlighted by underlining.

Les chats n'aiment pas faire du sport, mais le chat des Carbonne aime ça. (1) Le chat s'appelle Amandine. (2) Elle fait souvent du sport le dimanche soir. (3) Elle ne fait pas de la natation parce que les chats n'aiment pas l'eau. Elle ne fait pas du foot avec Alain, et elle ne fait pas du jogging avec Olivier. (4) Mais elle fait du sport le dimanche soir. La famille Carbonne est devant la télé le dimanche soir, et ils ne jouent pas avec Amandine. (5) Elle n'aime pas ça ! Alors elle grimpe sur la télé. Alors maman va à la cuisine et Amandine va aussi à la cuisine. Après, Amandine grimpe sur les genoux de papa et de maman, puis elle grimpe encore sur la télé, puis sur les étagères et sur la table. Et comme ça, Amandine fait du sport le dimanche soir.

Appendix B

Text of the Turkish reading task (Karagöz and İşler 2005). Sentences 1 and 2 considered for the intonational analysis are highlighted by underlining.

Nasreddin Hoca karın ne olduğunu bilmiyormuş. (1) Bir gün sabah kalkmış ki her taraf kar. (2) Tabii karın ne olduğunu bilmiyor, pamuk zannetmiş. Hemen karısının başına gitmiş, demiş ki: “Karı, karı, kalk! Her taraf pamuk dolu! Yatağı yorganı getir de dolduralım” demiş. Bunun üzerine, yatak yorgan ne varsa hepsini doldurmuşlar.

Appendix C

Realization of APs in the five French test sentences by participant groups (L1-F: monolingual French speakers; M: monolingual German learners of French as a FL; B: German–Turkish learners of French as a FL). The numbers appended at the end of the lines indicate the frequency with which the contour in question was produced in the respective group, e.g., “5/6” stands for “produced by 5 out of 6 participants”.

Sentence 1	<i>Le chat</i>	<i>s'appelle</i>	<i>Amandine.</i>		
L1-F	(L H*)	(L Hi	L*)L%	3/3	
M	(L H*)	(L H*)	(L*)L%	5/6	
	(L H*)	(L Hi	L*)L%	1/6	
B	(L H*)	(L H*)	(L*)L%	5/6	
	(L H*)	(L Hi	L*)L%	1/6	
Sentence 2	<i>Elle fait</i>	<i>souvent</i>	<i>du sport</i>	<i>le dimanche</i>	<i>soir.</i>
L1-F	(L Hi		L H*)	(L Hi	L*)L%
					3/3
M	(L H*)	(L H*)	(L H*)	(L H*)	(L*)L%
	(L Hi	L H*)	(L H*)	(L H*)	(L*)L%
	(L	H*)	(L H*)	(L H*)	(L*)L%
					4/6
B	(L H*)	(L H*)	(L H*)	(L H*)	(L*)L%
	(L H*)	(L H*)	(L H*)	(L Hi	L*)L%
	(H*)	(L H*)	(L H*)	(L Hi	L*)L%
					4/6
					1/1
					1/1
Sentence 3	<i>Elle ne fait pas</i>	<i>de la natation</i>	<i>parce que</i>	<i>les chats</i>	<i>n'aiment pas l'eau.</i>
L1-F	(L H*)	(L H*)	(L H*)	(L*)L%	2/3
	(L H*)	(L Hi LH*)	(L H*)	(L*)L%	1/3
B	(L Hi L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(H*) (L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(L H*) (L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(L Hi L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(L Hi L H*)	(L Hi LH*)	(L H*)	(L H*)	(L H*) (L*)L%
M	(L H*) (L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(L*) (L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%
	(L Hi L H*)	(L H*)	(L Hi L H*)	(L Hi L*)	(L Hi L*)L%
	(H*) (L H*)	(L H*)	(L Hi L H*)	(L Hi L*)	(L Hi L*)L%
	(L H*)	(L H*)	(L H*)	(L H*)	(L H*) (L*)L%

Sentence 4	<i>Mais elle fait du sport le dimanche soir.</i>	
L1-F	(L Hi L H*) (L Hi L*) _{L%}	3/3
M	(L H*) (L*) _{L%} (L H*) (L*) _{L%} 1/6 (L Hi L H*) (L H*) (L*) _{L%} 1/6 (H*) (L H*)(L H*) (L Hi L*) _{L%} 1/6 (H*) (L H*)(L H*) (L H*) (L*) _{L%} 1/6 (L H*)(L H*)(L H*) (L H*) (L*) _{L%} 1/6 (L H*)(L H*)(L H*) (L Hi L*) _{L%} 1/6	
B	(L H*)(L Hi L H*) (L H*) (L*) _{L%} 2/6 (L Hi L H*) (L H*) (L*) _{L%} 2/6 (L H*)(L H*)(L H*) (L H*) (L*) _{L%} 2/6 (Hi L H*)(L H*)(L H*) (L H*) (L*) _{L%} 2/6	
Sentence 5	<i>Elle n'aime pas ça !</i>	
L1-F	(L Hi L*) _{L%} 2/2 (L*) _{L%} 1/2	
M	(L H*) (L*) _{L%} 4/6 (L Hi L*) _{L%} 2/6	
B	(L Hi L*) _{L%} 2/6 (L H*)(L H*) _{L%} 2/6 (L H*)(L*) _{L%} 2/6	

Appendix D

Realization of APs in the two Turkish test sentences by participant groups (L1-TR: monolingual Turkish speakers; B: German–Turkish bilinguals; L2-TR: L1 German learners of L2 Turkish). Note that the recursive AP structure (_{AP} (_{AP})) we assume following Féry (2017) (cf. Section 2.3) is counted as only one AP and rendered with a single bracket. For instance, the pre-final and final APs of Sentence 2 ((_L *pamuk* _L) *zannet*_{H*+L} *miş* _L) is labeled (L H*+L)_{L%}. Lexically and grammatically accented syllables are highlighted in boldface.

Sentence 1	<i>Bir gün sabah kalkmış ki her taraf kar.</i>	
L1-TR	(H*+L H) (H*+L H) (H*+L L) _{L%}	3/3
B	(H*+L H) (L H) (H*+L L) _{L%} 3/6 (H*+L H) (L H) (L H) (H*+L L) _{L%} 2/6 (L H) (L H) (L H) (H*+L L) _{L%} 1/6	
L2-TR	(H*+L H) (L H) (L H) (H*+L L) _{L%} 2/5 (H*+L H) (L H) (L H) (L H) (L H) _{L%} 1/5 (L H) (L H) (L H) (L H) (L H) _{L%} 1/5 (L H) (L H) (L H) (H*+L L) _{L%} 1/5	

Sentence 2	<i>Tabii karın ne olduğunu bilmiyor, pamuk zannetmiş.</i>							
L1-TR	(L	H)	(H*+L	H)	(H*+L H)	(L	H*+L)	L% 3/3
B	(L	H)	(H*+L	H)	(H*+L H)	(L	H*+L)	L% 4/6
	(L H)	(L H)	(H*+L	H)	(H*+L H)	(L	H*+L)	L% 1/6
	(L H)	(L H)	(H*+L	H)	(H*+L H)	(L H)	(L H*+L)	L% 1/6
L2-TR	(L H)	(L H)	(H*+L	H)	(L H)	(L H)	(L H*+L)	L% 2/5
	(L H)	(L H)	(L	H)	(H*+L H)	(L H)	(L H*+L)	L% 1/5
	(L H)	(L H)	(H*+L	H)	(H*+L H)	(L H)	(L H*+L)	L% 1/5
	(L H)	(L H)	(L	H)	(L H)	(L H)	(L H*+L)	L% 1/5

Notes

- ¹ Note that this control group was not balanced for gender. However, there is no reason to believe that male speakers could behave in general differently from females with regard to the number and distribution of APs they use. Moreover, as shall be explained later in this section, we selected comparatively short target sentences to limit the variability across native speakers as much as possible.
- ² Note that the F0 maximum visible on *fait* in the native example was analyzed as a non-final pitch excursion on the initial syllable of the (compound) lexical word *fait du sport*. The shallow slope following the high tone also indicates the absence of an AP boundary at this point. By contrast, in the learner's production, the steep fall following the peak on *fait* does indicate an AP boundary.
- ³ Note that the claim made here applies only to the sample of read speech analyzed in the present study, which consists exclusively of declarative sentences. A different result was achieved by Kühn (2016), who reports some signs of attrition in the Turkish interrogative contours produced by Turkish heritage speakers living in Germany.

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