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EMPIRICAL STUDY

The Roles of Age, Attitude, and Use in First Language Development and Attrition of Turkish–English Bilinguals

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Recent decades have seen an increase in research informing our understanding of the complex ways in which bilingual development is shaped by biological, cognitive, and behavioral factors. We investigate the predictors that shape, drive, and constrain the development of the first language (L1) of bilinguals, focusing on 92 Turkish–English bilingual adults with a wide range (0–42) of age at onset (AaO). We tested their productive command of L1 lexical, morphological, and syntactic features, investigating to what extent background variables relating to AaO, experience, and attitudes toward the Turkish language and culture predict the relative level of proficiency across these features. To obtain a comprehensive picture of the interaction of these linguistic and extralinguistic factors, we employed structural equation modeling. We show that for speakers with younger AaOs, exposure-related factors are associated with the level of L1 proficiency they retain as adults; for later bilinguals, exposure-related factors matter less.

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Introduction

There is a substantial amount of research demonstrating that language production differs between monolinguals and bilinguals: language use among the latter population has often been shown to be less complex (e.g., Onar Valk & Backus, 2013; Yağmur, 1997; Yılmaz, 2011), accurate (e.g., Schmid, 2013; Schmid & Dusseldorp, 2010), and lexically diverse/fluent (e.g., Schmid & Jarvis, 2014) than that of monolinguals. Contrary to popular opinion, such effects can be seen in all of the languages a bilingual commands, including the one that was learned early in life through exposure in the home (we refer to this language as the first language, or L1, irrespective of whether or not it eventually becomes the speaker's dominant language). The L1 of bilinguals is different from that of monolinguals, regardless of the age at which a second language (L2) is acquired, proficiency levels in both languages, or amount of exposure. This difference manifests itself in a broader range of variability among bilingual populations compared with monolinguals, with some individuals scoring squarely within the monolingual range, while others clearly fall outside it. This variability is likely due to a number of processes, among them L1 attrition, as well as incomplete L1 acquisition and/or convergence toward a variety of the L1 that has changed due to language contact within the bilingual community among Heritage Speakers (HSs) (see also Bousquette & Putnam, 2019).

Much research has gone into establishing which factors determine how close to the monolingual baseline an individual bilinguals' ultimate proficiency in their L1 will be, but our understanding of these processes remains limited (e.g., Polinsky & Scontras, in press; Schmid & Cherciov, 2019). It seems that the sequence and timing of language acquisition has an important role to play, with populations comprising simultaneous and early bilinguals (including HSs) likely to differ more strongly from monolinguals than populations who were first exposed to the L2 at later ages for some, though not necessarily all, grammatical features. It has often been suggested that the age range around puberty represents an important turning point in this context: individuals who become bilingual before this age show a broad range of variance in ultimate attainment of the L1, while later bilinguals tend to exhibit a much narrower range that is closer to what is observed in monolinguals (e.g., Bylund, 2009; Montrul, 2008). Furthermore, language learning aptitude is correlated with L1 skill for younger populations, but no such correlation has been found among

postpuberty bilinguals (Bylund, Abrahamsson, & Hyltenstam, 2010; Bylund & Ramírez-Galan, 2014). Such observations have led to speculations that, once grammatical structures have been acquired in early childhood, an extended period of rich exposure and use (characterized by input from a range of sources and ideally in various modalities and styles) may be necessary in order to ensure their entrenchment and render them impervious to attrition (Flores, 2019; Polinsky & Scontras, in press; Schmid & Köpke, 2017). This factor seems to be what sets HSs apart: even if they have experienced the necessary rich and diverse input in childhood, the language balance often shifts toward the language of the environment once they start school, causing them to miss out on this consolidation period.

Research findings thus suggest that some, but not all, late bilinguals may eventually use and process their L1 in a way that differs from monolingual processing/use due to transfer or language attrition (e.g., Schmid & Köpke, 2017). Early bilinguals, on the other hand, have the capacity to acquire their L1 or home language to a monolingual-like standard, but not all of them reach this target (Kupisch et al., 2014; for recent reviews see Kupisch & Rothman, 2018; Montrul, 2016; Polinsky, 2015), due to transfer, attrition, or divergent attainment (Polinsky & Scontras, in press). In this context, the importance of various aspects of input and exposure has often been stressed (e.g., Kupisch & Rothman, 2018). In particular, it has been suggested that the quality of the input may play a more important role than its pure quantity—being exposed to the language less frequently but in a variety of settings (e.g., domestic, educational, professional), from different speakers and in different modalities (spoken vs. written) may be more beneficial than highly frequent exposure but with few interlocutors, in limited contexts or in only one modality (e.g., Flores, Santos, Jesus, & Marques, 2017; Jia & Paradis, 2015; Kupisch & Rothman, 2018; Unsworth et al., 2014; see also Ortega, 2019). A better understanding of the interaction of age at acquisition and other factors is thus necessary both to increase our theoretical understanding of bilingual development and to support bilingual families and communities.

One of the reasons for the present lack of a more comprehensive understanding of the impact of age is that the study of the development of the first or native language has been, to date, somewhat artificially fragmented into investigations of late or mature bilinguals (language attrition) and of simultaneous or early bilinguals (heritage speakers). As was pointed out above, some of the available evidence does suggest that there may be a qualitative shift around puberty in the susceptibility of the native language to attrition (e.g., Bylund, 2009; Bylund & Ramírez-Galan, 2014; Montrul, 2008). In order to attain a full

picture, it is thus necessary to investigate populations comprising the entire range of the spectrum of age at onset (AaO) of bilingualism, from birth to adulthood.

The present study attempts to contribute to this research goal by investigating a language community where maintenance and acquisition of the L1 have typically been found to be unproblematic, in order to reveal how external factors related to language attitudes and use may contribute to relatively sustained command of certain linguistic features for individual speakers with varying AaOs. Focusing on a community in which the immigrant/heritage language tends to be well-preserved and frequently used will help ensure that a) at least some of the participants who are simultaneous or early bilinguals will have attained nativelike proficiency and b) that lower levels of proficiency among the younger learners are less likely to be the outcome of non-target-like input from the parent generation (e.g., Kupisch & Rothman, 2018; Łyskawa & Nagy, 2019). For these reasons, the population under investigation in this study are Turkish immigrants in the United Kingdom.

Turkish as an Immigrant Language in Western Countries

The bilingual development of Turkish migrants and guest workers in European countries has been the focus of a fair number of investigations in recent decades. This population is of particular interest for a number of reasons. First, and in contrast to most other strongly represented migrant populations within the European region, Turks speak a native language that is typologically distant from the majority language and has many linguistic features that may potentially be affected by language contact phenomena in interesting ways—see the next section for more detail. In addition, the Turkish migrant population is of interest to bilingualism research due to the size and characteristics of the community as well as the historical circumstances surrounding migration from Turkey to these countries (e.g., Karayayla, in press).

Compared to some other European countries (e.g., Germany and the Netherlands), the United Kingdom has a relatively small community of Turkish migrants (approximately 1% of the United Kingdom's total immigrant population, Karayayla, 2018). However, there are dense Turkish areas in many of the larger cities where communities exist that place a high regard on the maintenance of Turkish and use it predominantly or even exclusively in their informal daily interactions (Karayayla, 2018). Despite a tendency across such Turkish communities to remain loyal to their language and culture and a high level of endogamy (e.g., Backus, 2012), linguistic changes have been observed in a range of studies. These changes may affect all areas of the language, from

accentedness (Karayayla & Schmid, 2019; Stangen, Kupisch, Proietti Ergün, & Zielke, 2015) through grammatical (e.g., Gürel, 2004; Onar Valk & Backus, 2013; Yağmur, 1997; Yılmaz, 2011), morphological (Arslan, De Kok, & Bastiaanse, 2015; Karayayla, in press; Pfaff, 1993), and lexical (Backus, 2012; Karayayla, 2018; Treffers-Daller, Daller, Furman, & Rothman, 2016; Yılmaz & Schmid, 2012) complexity and sophistication.

In keeping with other research on language attrition and heritage language development, differences between the language used by Turkish immigrants or heritage speakers on the one hand and monolingual speakers in the country of origin on the other have found to be most strongly visible in the generations that were born in or moved to the host country at a young age (Pfaff, 1993; Treffers-Daller, Ozsoy, & van Hout, 2007), but have also been observed in those speakers who were mature monolinguals at the time of emigration (e.g., Gürel & Yılmaz, 2011; Yılmaz, 2013). To date, few comparisons have been made of populations with larger ranges of AaOs (but see Huls & van de Mond, 1992; Karayayla & Schmid, 2019).

Bilingualism Effects in Turkish as an Immigrant and Heritage Language

Word Formation Through Suffixation

Word formation in Turkish is achieved through suffixation (Göksel & Kerslake, 2005). Derivational suffixes are used to form new dictionary entries from nominals (nouns, adjectives, adverbs) or verbs (Göksel & Kerslake, 2005). Inflectional suffixes, on the other hand, express grammatical functions, are quite regular, salient, and mostly present one-to-one form-function mappings (Ketrez & Aksu-Koç, 2009; Slobin, 2001). Nominals, verbs, some postpositions, interjections, and question clitics can receive inflectional suffixes to construct morphologically complex word forms that are typically expressed by phrases or even sentences in Indo-European languages such as English (Göksel & Kerslake, 2005), as is the case for the Turkish word form *evlerimizdeymişler*:

(1)	ev	-ler	-imiz	-de	-ymiş	-ler
	home	PL	1PL.POSS	LOC	EV.COP	3PL

"Apparently they are/were at our homes."

(Göksel & Kerslake, 2005, p. 68)

In the first instance, nominals can be inflected for number, possessive, and case, while verbs can be inflected for person, voice, negation, and tense-aspect-mood (TAM) (Göksel & Kerslake, 2005). In addition, nominals in predicate

position and verbs carrying a nominalizing subordination suffix (i.e., nonfinite verbs) can take all of the verbal or nominal suffixes, respectively (Göksel & Kerslake, 2005; Ketrez & Aksu-Koç, 2009). Inflections appear early in the process of L1 acquisition and are used productively on both nouns and verbs from around age 2, probably aided by their regularity, saliency, and the transparency of the form-function mappings (Ketrez & Aksu-Koç, 2009). Bilingual Turkish-English speakers, on the other hand, make less productive use of frequently occurring inflectional suffix combinations than Turkish monolinguals (in particular on nominals) and in general rely on more high-frequency lemmas (Karayayla, under review; note that this last finding is in line with other investigations showing a tendency among attriters to rely on the more frequent segments of the vocabulary at their disposal for productive language use, e.g., Schmid & Jarvis, 2014).

Nonfinite Clauses and Embeddings

Complex embeddings are another grammatical feature that has been shown to be susceptible to change and attrition in the L1 of Turkish bilinguals (e.g., Yağmur, 1997; Yılmaz, 2011). Nonfinite verbs play an important role in the process of embedding, depending on the word class derived from the verb through suffixation. Note that we limit our discussion here to the basic categories of clauses—in many cases, the different suffixes have further implications for other properties such as possessiveness or tense (for details see Göksel & Kerslake, 2005).

1. Noun clauses. Nonfinite noun clauses have the same role as noun phrases (NPs) do in that they can be the subject (2) or the object (3) of the main clause.[1] In either case, the verb of the subordinate clause, the verbal noun (VN), is marked through suffixation with *–mAK, –mA, –DIK, –(y)AcAK,* or *–(y)Iş*.

(2) [Yabancı Dil Öğren -mek] kolay değil.
foreign language learn VN easy not
"It is not easy to learn a foreign language."

(3) [Türkiye′ -ye Taşın -dığ -ı -nı] söyle -di.
Turkey DAT Move VN 2SG.POSS ACC tell d-past
"(S/he) said that s/he moved to Turkey."

2. Relative clauses. Relative clauses are similar to adjectives in that they modify the nouns and noun phrases that they precede in a sentence (4). A participle (PART) is formed by attaching relativizing suffixes *–(y)AN (*subject participle) or *–DIK*/*–(y)AcAK* (object participles) to the embedded verbs.

(4) [Ev -e gel -en] sütçü.
house DAT come PART milkman
"The milkman who comes/has come to the house."

3. Adverbial Clauses. Like adverbs, adverbial clauses express possibility, time, manner, purpose, quantity, degree, and so on. The nonfinite verb that occurs in an adverbial clause, the converb (CV), is usually marked with a converbial suffix (e.g., *–(y)ArAk*, *–(y)IncA*, *–(y)Ip*) as illustrated in (5).

(5) Ayşe merdiven -ler -i [koş arak] çık -tı.
Ayşe stair PL ACC run CV go up d-past
"Ayşe went upstairs running [i.e., ran up the stairs]."

Both late bilinguals with Turkish as a L1 (Yılmaz, 2011) and Turkish Heritage Speakers (HSs) (Treffers-Daller et al., 2007) show different distributional patterns of use of these grammatical structures in free speech, avoiding complex embeddings and nonfinite structures in general and showing a preference for straightforward, finite main clauses relative to Turkish speakers living in Turkey (Onar Valk & Backus, 2013).

Evidentiality

Evidentiality is a grammatical indication of how information has been acquired (Aikhenvald, 2004). All finite Turkish verbs in the past tense have to be marked with one of two inflectional suffixes: the direct experience marker *–DI* for events the speaker has directly witnessed/observed or the indirect experience marker *–mIş* for nonwitnessed events. In (6), for example, the presence of *–DI* is an indication that the past event was seen by the speaker.

(6) Minik kedi Süt -ü iç -ti.
small cat milk ACC drink d-past
"The small cat drank the milk."

Depending on the source of the information available to the speaker, the choice of the indirect experience marker *–mIş* in (7) could either indicate that the speaker inferred (inferential) what happened from the resultative states of the event (an empty milk bowl) or was told (hearsay/reportative) what happened by a third party (Aksu-Koç, 1988; Slobin & Aksu, 1982).

(7) Minik kedi Süt -ü iç -miş.
small cat milk ACC drink m_{IFR}past/m_{REP}past
"The small cat (apparently/reportedly) drank the milk."

Previous research has shown that the *–DI* past is fairly unproblematic for both late Turkish–English bilinguals and Turkish HSs in an English-speaking context. The *–mIş* forms, and in particular the reportative, on the other hand, pose more of a problem for early bilinguals (Karayayla, in press). Similar patterns have been found for other languages encoding evidentiality grammatically (see, e.g., the findings on Quechua HSs reported by Putnam & Sánchez, 2013).

Summary and Research Questions

The brief overview presented above points to a wealth of cumulative evidence on changes to the L1 Turkish of individual speakers under close and productive proximity with typologically distant (Indo-European) languages. However, there is to date little insight into how the circumstances of a particular speaker (*external factors*) impact on these processes of change. The strongest predictive role appears to be played by the age at which a speaker becomes bilingual, with later onset of the acquisition of an L2 facilitating a more nativelike performance in the L1 for all the phenomena discussed above. This factor is, however, anything but deterministic: under certain conditions, younger and simultaneous bilinguals can attain the same command of their birth language as monolinguals, while some older learners may also fall outside this range.

One of the difficulties in attaining an overall understanding of how AaO may interact with other variables linked to exposure and attitudes lies in the fact that, to date, most investigations have focused *either* on simultaneous/early *or* on late bilinguals, with very few taking into account the full age range. The current study attempts to contribute to a fuller understanding through an analysis of a range of linguistic features of Turkish in a population of Turkish–English bilinguals spanning the full AaO range, from birth to middle age. We aim to investigate which external factors can help bilingual speakers attain and maintain similar levels of complexity, accuracy, and diversity as do monolingual speakers.

We focus on a community and a population where speakers have easy access to a network of other bilingual Turkish–English speakers, a high level of education, and a good level of literacy in both languages, in order to ensure that at least some of them would have experienced optimal conditions for L1 acquisition and maintenance. Our bilingual participants were therefore recruited from the large and dense community of Turkish speakers in London. The measures of native language proficiency were designed to cover a wide range of aspects of language production, and we tried to elicit as much information as possible about participants' background, language habits, and attitudes.

Our research questions are:

1. In what areas of language proficiency and use can we observe differences between monolingual speakers of Turkish and bilinguals with a range of AaOs?
2. To what extent can factors linked to personal background, language exposure, and attitudes (henceforth: external factors) predict the overall complexity, accuracy, and diversity of productive L1 use of Turkish among a diverse population of Turkish–English bilinguals?
   a. What is the impact of age at onset of bilingualism (AaO)?
   b. What is the impact of the frequency of exposure to L1 in a range of contexts?
   c. What is the impact of attitudes?
3. Does the interaction of external factors predict different performance on a range of linguistic tasks at different stages of language development?

The Study

Participants

A total of 92 adult Turkish–English bilingual speakers living in the United Kingdom (50 females) participated in our study. A reference group of 44 monolinguals (22 females) living in Turkey was recruited to establish the native baseline. Bilingual participants were selected to cover a wide AaO range (0–42 years, mean = 11.48, *SD*: 9.08) with a minimum period of residence (LoR) of 9 years (mean = 21.24, *SD*: 6.76). In keeping with previous research (e.g., Schmid, 2011), a maximum age at testing of 67 years (monolinguals: 18–67, mean = 33.82, *SD*: 11.81, bilinguals: 18–65, mean = 31.76, *SD*: 9.94) was set to exclude potential effects of advancing age on language abilities. The bilingual and monolingual groups were carefully matched with respect to age at testing, level of education, and city of birth (for details, see Karayayla, 2018). The overall level of education was high, with 57 participants in the bilingual and 25 in the monolingual group (62% and 57%, respectively) having a university degree, and 31/16 (34%/36%) having completed secondary education. All participants, including the simultaneous and early bilinguals, reported that they were able to read and write in Turkish.

All speakers were born to L1 Turkish parents and none were predominantly[2] exposed to languages other than Turkish (and English, in the case of the early/simultaneous bilingual participants) in childhood.

Instruments

The test battery employed for the current study included a variety of instruments (for full details, see Karayayla, 2018).

Background variables

- Personal background questionnaire (PBQ), adapted from Yılmaz (2013). This questionnaire, comprising a total of 97 items, was used to gather information on participants' background, language use and exposure, self-rated proficiency, and attitudes (http://www.let.rug.nl/languageattrition/Sociolingquest/SQTurkish_Attriters.pdf).

Free Speech

- A semi-structured interview (SSI) to elicit spontaneous speech was conducted by a native speaker of Turkish (the second author of this study), lasting between 10 and 40 minutes and based on a set of questions designed to encourage participants to employ the full range of linguistic features available to them for productive language use while still feeling free to talk informally and casually. In order to encourage the use of a diverse range of past-tense evidential morphemes, the SSI contained four questions specifically aimed at eliciting such forms (e.g., the participant was asked to retell a childhood event that s/he did not recall but had been told about, and to play out a telephone call to the police in which they reported a break-in that had supposedly occurred at their house; for more detail, see Karayayla, in press). The total number of transcribed tokens in the pruned data (i.e., not counting proper nouns, code switches, retractions/reformulations/repetitions, fillers, and hesitation markers) across all participants was 153,175 (between 332–2,948 tokens per speaker, mean = 1,158).
- Picture description task (PDT): In this task, participants were shown five pictures of incidents/events (originally published in the Turkish newspapers *Milliyet* and *Hürriyet*, see Karayayla, 2018). All pictures showed protagonists dealing with the aftermath of a disaster or accident, and participants were asked to speculate on what had caused the scene. This task was specifically designed to elicit past-tense evidential structures; it elicited a total of 30,289 tokens of pruned speech (118–678 tokens per speaker, mean = 276.21).

Controlled/Elicited linguistic Data

- Verbal fluency task (VFT): Lexical access and retrieval difficulties are among the phenomena most often associated with language attrition and heritage language development, and the verbal fluency task has been used in many

studies in the past to measure such phenomena. In keeping with previous research (Schmid & Jarvis, 2014), the version of the task used in the present study employed two semantic categories (animals and fruit/vegetables) and asked participants to name as many exemplars of each of these two categories as they were able to within one minute. Each correctly and uniquely named item was awarded one point, and an average was subsequently created for each participant across both categories.

- C-Test: The C-Test has been recommended as a test for holistically assessing higher-level and controlled language proficiency (e.g., Müller & Daller, 2019), as it forces participants to integrate information from all linguistic levels and make full use of the inbuilt redundancy of the text (Grotjahn, 2010), and has been frequently used in language attrition research (e.g., Schmid, 2011). In this test, participants are presented with short texts from which parts of words have been deleted according to a predetermined scheme and are asked to fill in these gaps. The C-Tests used in this study consisted of two Turkish texts with a total of 40 gaps (https://languageattrition.org/resources-for-researchers/experiment-materials/c-test/). Each correctly filled item was awarded one point, so that the maximum possible score was 40.
- Evidentiality experiment: Following Arslan, Aksu-Koç, Maviş, and Bastiaanse (2014), we included an experimental task to assess the ability to use the past tense markers *–DI* and *–mIş* in the context of a more formal task. Ten short video clips (10 to 50 seconds), 10 picture pairs, 10 auditory stimuli, and 10 fillers were created. Each video showed a self-contained scene that was completed within the video (e.g., a woman feeding dogs), while each picture pair showed the initial and the resultative state of an event (e.g., a man at the top of the stairs about to descend the first step and the same man lying at the bottom of the stairs). In the auditory stimuli the speaker described an action that they had witnessed directly (i.e., using the *–DI* past) and the participant was asked to report the action to the researcher. Stimuli were presented in randomized order and followed by a prompt consisting of a bare verb and an incomplete sentence that they were asked to complete based on the stimulus.

Data Analysis

Predictor Variables

We established a set of variables related to personal background and self-reported L1 use and attitudes at the time of testing. For the compound variables relating to exposure and attitudes, we followed the recommendations by Schmid and Dusseldorp (2010), who present an analysis of data collected by the same instruments from different populations and, based on a principal component

analysis, suggest these factors as having high internal consistency (see also Schmid, 2011).

1. Age at onset of bilingualism (AaO). This measure reflects the age at which the participant arrived in the United Kingdom and began learning English (see for details the section on participants above). Due to the nature of the population, the data were not normally distributed with a cluster of participants with AaOs between 0 and 3 (see Supplementary Materials, Figure 1). Unfortunately, it proved impossible to correct this skewed distribution by means of procedures such as log- or square-root-transformation, so we had to accept it as a naturalistic representation of the population under investigation.
2. Length of residence (LoR). This variable measured the amount of time (in years) each individual had spent in the United Kingdom. The original variable was somewhat positively skewed, but a square-root transformation resulted in an approximately normal distribution (Kolmogorov-Smirnov [K-S] $= .087$, $p > .05$).
3. Frequency of use of/exposure to Turkish. As was pointed out above, it has been suggested that an important aspect modulating frequency of exposure is not merely how often a speaker has the opportunity to use the L1 but also the variety of contexts. We therefore derived two measures: one an average of the frequency with which the speaker reported using Turkish within her family (with (grand)parents, siblings, partners, children and other relatives) and one outside the family (with friends and neighbors). While the use of Turkish with friends across the population showed a normal distribution (K-S $= .076$, $p > .2$), the measure of use within the family was negatively skewed. This skewness disappeared after the original measure had been square-root-transformed (K-S $= .073$, $p > .2$).
4. Attitudes toward the Turkish language and culture. This variable reflects the relative value the participants place on their linguistic and cultural background, it is an average of the responses to questions on how important they see it to maintain this language and to pass it on to their children, on which culture and language (Turkish or English) they prefer and whether, given a free choice, they would like to return to Turkey. Again, the variable turned out to be negatively skewed, but a square root transformation reduced this skewness to acceptable levels (K-S $= .113$, $p = .014$).

In order to make the interpretation of the statistical models more intuitive, all predictor variables discussed above (including AaO and LoR) were standardized to a value between 0 and 1 for all participants. In each case, 1 represents

the level of the variable theoretically most strongly associated with a high level of maintenance—a later age of onset, short period of residence, high level of exposure, and very positive attitude—while 0 represents very early bilingualism, long period of residence, low levels of exposure, and negative attitude toward Turkish, respectively.

Outcome Variables

Since it was the aim of the present study to obtain a holistic perspective on how factors related to speaker background, L1 exposure, and attitudes affect the *overall* level of proficiency in a native or home language in long-term immersed bilingual speakers, we attempted to gain a broad view on both the range and the accuracy with which our speakers were able to use a variety of linguistic structures and mechanisms, covering lexical access, clausal structure, and inflectional and derivational morphology in both informal, automatic contexts and in more formal and controlled settings.

Since lexical access has so often been invoked as one of the features most affected by language attrition, the first outcome variable to be included in this analysis was the score on the verbal fluency task. The scores for this task were distributed normally across the bilingual speakers (K-S = .078, $p > .2$). The monolingual population named, on average, 16.47 items (range = 8.5–28.5), while the bilinguals named 15.08 (range = 6.5–25). These differences were significant ($t(134) = 2.007$, $p < .05$, Hedges's $g = .37$).

A second area of interest was to what extent participants would be able to avail themselves of the full range of morphosyntactic devices during free speech production. In order to assess this, all spoken data were orthographically transcribed in CHAT format (for details of the conventions adopted, see Karayayla, 2018), and, subsequently, the following variables were coded/assessed:

1. Allomorphic diversity: In order to obtain an impression of the range and diversity of the suffix-chains that each participant was able to use, all spoken inflected nouns ($n = 30{,}236$) and verbs ($n = 34{,}233$) in the pruned data were automatically parsed with the aid of a morphological parser and disambiguator developed by Sak, Güngör, and Saraçlar (2008). Parsing of each item was subsequently checked manually, yielding a total of 1,489 unique suffix chains (types). The frequency of each of these chains in the overall data was assessed and log-transformed to eliminate the Zipfian distribution. For each speaker, the average log frequency of the suffix chains used was established.

2. Clause types: The spoken data were segmented into clauses. This yielded a total of 37,389 clauses (27,630 finite main clauses, 2,106 adverbial clauses, 4,280 nominal clauses, and 1,946 relative clauses, see 3.2 above). For each participant we calculated the proportion of the four clause types. Since there was no difference between monolingual and bilingual participants on any clause type except relative clauses, the proportion of relative clauses was the only measure included in the morphosyntactic complexity measure.
3. Evidentiality: All inflected verbs used in the corpus (total $n = 20{,}181$) were coded as *past* ($n = 11{,}311$) vs. *nonpast* ($n = 8{,}870$) and all verbs in the past tense were coded based on the allomorph required by the context (*–DI* or *–mIş*). Instances of *–mIş* were further classified as inferential ($m_{IFR}past$) or reportative ($m_{REP}past$). The corpus contained 7,176 instances of *d-past*, 2,694 instances of $m_{IFR}past$ ($n = 2{,}694$), and 1,441 instances of $m_{REP}past$. Coding was done based on the target tense, not on the tense that was actually used, and those cases where there was a discrepancy between the two were coded as inaccuracies. There was only one single case of the *–DI* suffix being replaced by *–mIş*, while there were 213 overuses of *d-past*. Thirty-seven of those were used in contexts that called for $m_{IFR}past$ and thus accounted for 1.4% of the total of these contexts, while 176 were used instead of $m_{REP}past$ (13.9% of all $m_{REP}past$ contexts). With the exception of four cases of the use of *–DI* in an $m_{REP}past$ context, all inaccuracies occurred in data from the bilingual participants. For each bilingual participant, an accuracy score for $m_{REP}past$ and $m_{IFR}past$ was calculated. For $m_{REP}past$, the average score across bilinguals was 98.1% (range = 60%–100%), while for $m_{IFR}past$ it was 87.7% (range = 0%–100%).

Logarithmic suffix frequency, proportion of relative clauses and accuracy on $m_{REP}past$ and $m_{IFR}past$ were all standardized from 0 to 1 (with 1 indicating the highest rate of complexity in the data and 0 the lowest) and then averaged together for each participant. The resulting measure of morphosyntactic complexity was moderately negatively skewed, but a log-transformation resulted in a normally distributed measure (K-S = .064, $p > .2$).

Finally, we were interested in how our bilinguals would be able to apply their knowledge of language in a more controlled and formal situation. In order to assess this, we created a third variable, based on an average of the standardized scores on the C-Test and the evidentiality experiment. On the C-Test, the monolinguals achieved on average 30.23 points (range = 12–37), while the bilinguals attained 25.54 (range = 3–40). These differences were significant ($t(117.8) = 3.722$, $p < .001$, Hedges's $g = .60$). Accuracy on the

evidentiality experiment was high, with the monolinguals attaining an average of 27.91 out of a possible 30 experimental items (range = 22–30), while the bilinguals scored 25.8 (range = 10–30) ($t(133.6) = 3.486$, $p < .01$). For *–DI* past, there were 19 errors (2.06%) in the bilingual group and seven errors (1.59%) among the monolinguals ($t(111.8) = .534$, $p = .59$). For $m_{REP}past$, the bilinguals had 63 errors (6.85%) while the monolinguals had only two (.45%) ($t(98.8) = 2.885$, $p < .01$, Hedges's $g = .37$). The most difficult category was $m_{IFR}past$, with bilinguals giving inaccurate responses in 304 instances (33.04%) and monolinguals in 83 (18.9%) ($t(129.1) = 3.105$, $p < .01$, Hedges's $g = .47$). The averaged total was negatively skewed but became normal upon being log-transformed (K-S = .087, $p > .05$).

Results

Comparison Monolinguals Versus Bilinguals

In order to determine whether the outcome variables were indeed influenced by bilingualism (RQ1), we first compared the performance of the bilingual speakers to that of the monolingual baseline. Group comparisons (independent sample *t*-tests) showed that the bilinguals were significantly outperformed by the monolinguals on all three sets of variables: lexical access (average .39 vs. .45, $t(134) = 2.007$, $p < .05$, Hedges's $g = .37$), morphosyntactic complexity (.54 vs. .67, $t(134) = 5.243$, $p < .001$, Hedges's $g = .80$), and formal accuracy (.47 vs. .60, $t(133) = 3.753$, $p < .001$, Hedges's $g = .63$) all significantly differed with medium to strong effect sizes, showing a consistent bilingualism effect across linguistic subskills.

Our first step toward attempting to account for the variability found across our bilingual speakers with respect to these linguistic measures was to conduct stepwise linear multiple regressions. For each component, we entered AaO and LoR and the three measures of exposure and attitudes described above into the model. For all three measures, AaO was selected as a significant predictor; in addition, LoR reached significance for the morphosyntactic complexity measure. None of the measures of exposure or attitude were selected for the final models, and explained variance (adjusted R^2) was modest, ranging from .18 to .29. All predictors in this and the other models we are describing below had variance inflation factors (VIF) of <2.0, indicating no multicollinearity problems (full covariance matrices are given in the Supplementary Materials, Table 1).

While these findings point to a moderate impact of AaO on L1 proficiency, they do not help us answer our question of which external factors may support or obstruct L1 acquisition and maintenance in a bilingual setting. Figures 1a,

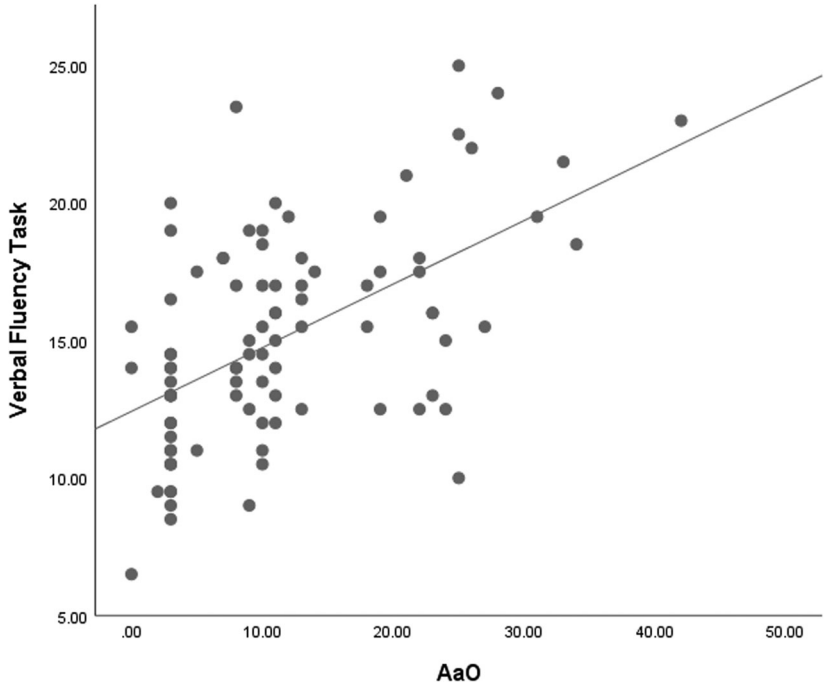

Figure 1a Scatterplot of age at onset and score in the verbal fluency test.

1b, and 1c illustrate that, while it is clear that AaO has an important role to play in the development of bilingualism, it is not as overridingly important as these analyses seem to suggest: in particular, in the younger segment of our population, there is considerable variance in ultimate attainment, with many of the youngest bilinguals matching the performance of those who became bilingual at much later ages. For the verbal fluency task, there are bilinguals across the full range of AaOs who fall clearly outside the monolingual range. On the morphosyntactic and formal tasks, on the other hand, an AaO above around 5 and 10 years, respectively, does seem to guarantee a higher performance (the bottom right quadrant of Figures 1b and 1c is therefore virtually empty).

Although there must be some reason why some participants with AaOs between 0 and 5 have become so highly proficient while others have apparently lagged behind, the analyses we conducted reveal no clue as to what this reason might be. It therefore seems to us that analytical techniques are needed that are able to capture the extent to which all of these factors contribute to an overall construct capturing the overall setting in which the language user is acquiring,

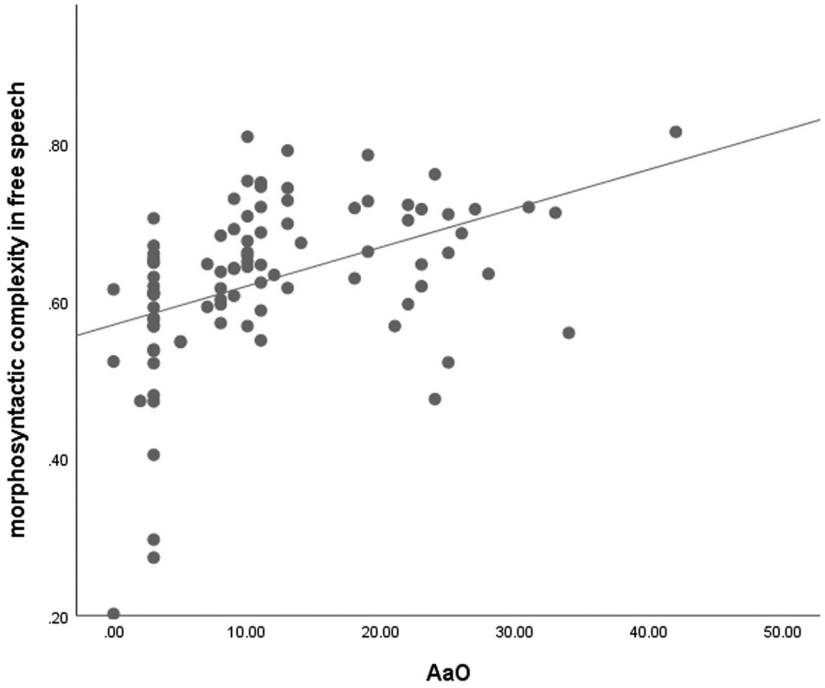

Figure 1b Scatterplot of age at onset and level of morphological complexity in free speech.

maintaining, or losing her L1. Regression models, in which each subsequent predictor is applied to the residuals from the previous predictor, cannot achieve this. When it comes to the reality of bilingual experience, the fact that some of the factors invariably correlate with each other (for example, speakers with a lower AaO tend to have a longer LoR—in our sample, these two variables were weakly to moderately correlated at $r = –.351$, $p < .01$—note, again, that VIFs were well within tolerance limits, indicating that this correlation was not problematic in terms of conducting regression analyses) means that the impact of at least one of the factors will always be underestimated, as the variance associated with this predictor has already been accounted for by a previous one.

We therefore turned to structural equation modeling (SEM), a statistical technique capable of describing overall unobserved, or latent, constructs through sets of observed and measurable variables. SEM allows us to identify to what extent the measured outcome components (lexical access,

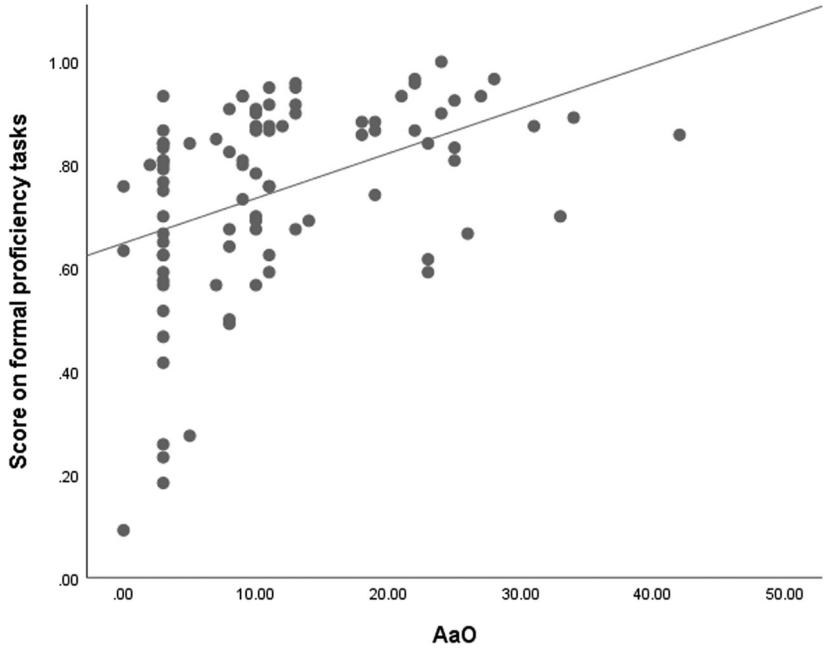

Figure 1c Scatterplot of age at onset and score on formal tasks.

morphosyntactic complexity, and formal accuracy) load onto a latent construct *proficiency*, how the background factors (AaO, LoR, exposure, and attitudes) load onto a latent construct *background*, and to what extent this background construct can predict the proficiency construct.

The SEM was fitted using the lavaan package (Rosseel, 2012) for R 3.4.4 (R Core Team, 2018). In the first instance, the two latent constructs proficiency and background were defined on the basis of the relevant measured variables (the three proficiency variables and the five background factors), and subsequently, proficiency was regressed onto background.

The resulting model is schematically represented in Figure 2 (for the covariance matrix please see Supplementary Materials, Table 1). The model summary indicates a good fit of the model: The goodness-of-fit test (χ^2) is not significant ($p = .12$) and the relationship between the chi value (24.948) and the degrees of freedom (19) is below 2 (1.31). The comparative fit index (CFI) is above the threshold of .95 (.961) and the root mean square error of approximation (RMSEA) is below .06 (.059) (see Schumacker & Lomax, 2016, for generally accepted thresholds on model fit criteria). All in all, this indicates that the

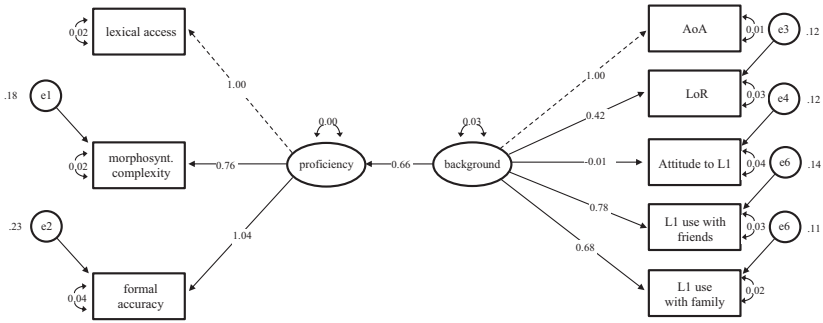

Figure 2 Structural equation modeling plot, all bilinguals. LoR = length of residence; L1 = first language.

distribution of our data provide confirmation for the assumptions made in the theoretical model that the combination of background factors and proficiency measures entered into the model not only load onto the two latent constructs, but that these constructs show a relationship with each other.

In terms of the individual measures entered into the model, it is important to note that the relationship between the latent construct and whichever measure is entered first into the model is, by default, fixed to 1, and that therefore all further measures have to be interpreted with relation to this baseline (this is necessary to establish the scale of the latent construct—since this is not measured, a fixed baseline has to be adopted[3]). In the case of proficiency, the model depicted in Figure 2 shows that the measures relating to lexical access and formal accuracy have a stronger loading than morphosyntactic complexity: while the proficiency variable increases by 1 for every increase by one unit on the lexical access measure ($r^2 = .47$) and by almost the same amount for the formal accuracy measure ($r^2 = .29$), the morphosyntactic complexity measure contributes only .76 ($r^2 = .25$). All the measures contribute significantly at $p < .001$.

With respect to the background measures, it is clear that AaO is the strongest predictor in this model ($r^2 = .694$), as had been suggested by the regression analyses conducted above. However, three additional significant factors are now identified: LoR (estimate = .421, $r^2 = .14$) and L1 use with friends (estimate = .775, $r^2 = .36$) and family (estimate = .681, $r^2 = .423$) all contribute to this measure at $p < .001$, and only the attitudinal measures are unrelated to the overall construct. In this model, Proficiency and Background are significantly correlated (estimate = .659, $p < .001$, $r^2 = .91$).

This finding is interesting, since it suggests that, in contrast to what the regression models run previously had indicated, informal L1 use with friends and family makes a significant contribution toward attaining and maintaining proficiency in the L1. However, we hypothesized that the directionality of the effect might be different for the younger and the older learners in particular since we are focusing here on the use of Turkish with other bilinguals in the United Kingdom. Speakers who had acquired Turkish more or less fully prior to their emigration might rely on opportunities to use their L1 in order to maintain it and therefore have higher proficiency *because of* higher levels of use. For the younger learners, on the other hand, the maximum level of proficiency they have reached might feed into language use differently: speakers feeling less certain of their proficiency and less comfortable with the language might show an overall preference for English. In other words, the cause-and-effect relationship between language use and language proficiency might be reversed from the younger to the older learners. Such an effect could lead to a discontinuity of the impact of AaO, which cannot be detected by models assessing this factor as a continuous variable (as was done in the model described above).

We therefore divided the sample into two subpopulations of roughly equal size (keeping sample sizes equal was necessary in order to ensure the model strength could be compared): bilinguals who had begun to acquire English before age 10 ($n = 44$), and late bilinguals who had been 10 or above ($n = 48$). Using this age as a cutoff not only yielded two subsets of approximately equal size but also appeared to be in line with the age at which proficiency levels across the outcome variables investigated here appeared to stabilize (see Figures 1a, 1b, and 1c above). It is also in line with theoretical predictions relating to the role of AaO for susceptibility to L1 erosion (e.g., Bylund & Ramírez-Galan, 2014). We should note here that the resulting sample sizes are relatively small for this type of analysis, and that results are therefore to be interpreted with caution and as preliminary indications.

We reran the same SEM model specification for these two subpopulations (see Figures 3 and 4; covariance matrices are supplied in Supplementary Materials, Tables 2 and 3). For the earlier bilinguals, the model provides an excellent fit: the χ^2 is not significant ($p = .395$) and the relationship between the chi value (19.991) and the degrees of freedom (19) approximates 1 (1.05). The CFI is above the threshold of .95 (.977) and the RMSEA is .034.

In terms of the individual measures contributing to the latent construct of proficiency, not much has changed from the model including all participants (see Figure 3): here, too, the lexical access measure contributes more strongly to the latent proficiency variable ($r^2 = .366$) than the measure of morphosyntactic

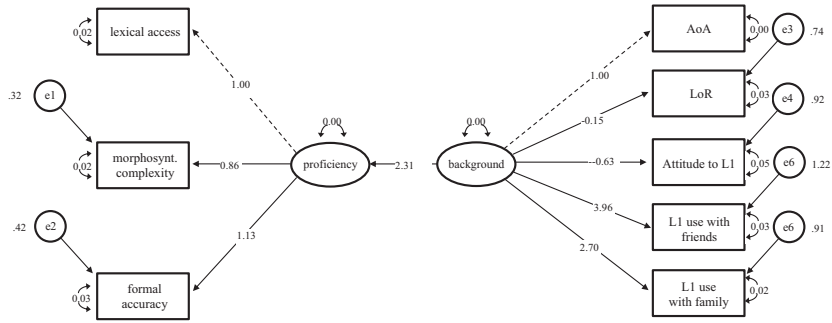

Figure 3 Structural equation modeling plot, early bilinguals (AaO < 10) only ($n = 49$). LoR = length of residence; L1 = first language.

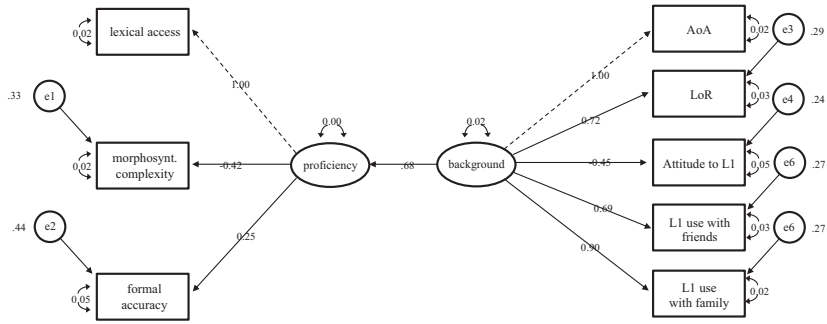

Figure 4 Structural equation modeling plot, late bilinguals (AaO = 10 or above) only ($n = 48$). LoR = length of residence; L1 = first language.

complexity (estimate = .857, $p < .01$, $r^2 = .276$) and somewhat less strongly than accuracy on formal tasks (estimate = 1.126, $p < .01$, $r^2 = .378$).

With respect to the background measures, AaO ($r^2 = .646$) is now strongly outpaced by the two language use measures, with self-reported frequency of use of the L1 with friends estimated at 3.96 ($p < .01$, $r^2 = .451$), and with family at 2.696 ($p < .01$, $r^2 = .339$). LoR and attitudes toward Turkish do not play a significant role in this model. Proficiency and Background are strongly related (estimate = 2.309, $p < .01$, $r^2 = .982$).

For the late bilinguals with AaOs above age 10, on the other hand, the model does not provide a good fit: while the χ^2 remains nonsignificant ($p = .271$) and the relationship between the chi value (22.277) and the degrees of freedom (19) below 2 (1.17), both CFI (.91) and RMSEA (.061) indicate a less than ideal fit. In addition, some of the lv variances estimated by the model are negative

and Proficiency and Background are not, in this model, significantly related to each other. We provide an overview of the model in Figure 4 for the sake of completeness, but do not discuss it further here.

Discussion

The findings presented above allow some interesting insights into and speculations about the development and maintenance of L1 proficiency in Turkish–English bilinguals, indicating that it is mainly for the younger learners that environmental factors such as the amount of L1 use in different settings, length of immersion, and age of bilingualism show a relationship to structural language proficiency. On the other hand, this study has not been able to substantiate the assumption that the attitudes the speakers hold toward their L1—whether it is important to them to maintain it or transmit it to their children, how they feel about the language and culture, and whether they could envisage eventually returning to the country of origin—contribute to its upkeep. While attitude has often been theoretically proposed as an important predictor of language maintenance, many previous studies have shown a similar lack of correspondence (see Yılmaz & Schmid, 2018, for an overview). Yılmaz and Schmid speculate that this might be due to methodological issues, as attitudes can only be assessed by means of self-reports and at a single point in time, which makes it difficult to assess their full complexity and fluidity.

To recap, we addressed the following research questions:

1. In what areas of language proficiency and use can we observe differences between monolingual speakers of Turkish and bilinguals with a range of AaOs?
2. To what extent can factors linked to personal background, language exposure, and attitudes (henceforth: external factors) predict the overall complexity, accuracy, and diversity of productive L1 use of Turkish among a diverse population of Turkish–English bilinguals?
   a. What is the impact of age at onset of bilingualism (AaO)?
   b. What is the impact of the frequency of exposure to L1 in a range of contexts?
   c. What is the impact of attitudes?
3. Does the interaction of external factors predict different performance on a range of linguistic tasks at different stages of language development?

In response to our first research question, we found that there were reliable differences between our monolinguals and our bilinguals with respect to a wide range of measures of lexical access, morphosyntactic complexity, and the ability

to accurately complete formal tasks. An interesting observation was the fact that there was comparatively little variability among all the outcome variables we measured among the later bilinguals (see Figures 1a, 1b, and 1c above), but a wide spread of scores among the earlier ones. This suggests that the early bilinguals/heritage speakers under observation in the present study are not, as has sometimes been suggested (e.g., Kupisch & Rothman, 2018), acquiring an attrited contact variety from the parental generation (i.e., converging perfectly on the variety of the language that they are exposed to), but have failed to fully master the more complex aspects of Turkish grammar despite having been exposed to a variety of Turkish that closely resembles that spoken in the country of origin (see also the findings reported by Łyskawa and Nagy, 2019, on Slavic languages in Toronto).

Addressing RQ2, our initial analysis of the three sets of linguistic measures revealed a predictive effect of AaO and a limited role of LoR, but no further contribution of the other background variables relating to language exposure and language attitudes. We hypothesized that this might be the outcome of the principles underlying multiple linear regression models, where each subsequent predictor is regressed onto the residuals from the previous one. In other words, any variability that has already been accounted for by one factor (e.g., AaO) is taken out of consideration when the effect of the next one (e.g., LoR) is assessed. Where there is a correlation between these factors—as is almost invariably the case in bilingual populations, not only for AaO vs. LoR (the younger you were when you first became bilingual, the longer you will likely have been exposed to that language) but also for other factors relating to exposure and use—this means that the impact of subsequent predictors is necessarily underestimated, as part of the variance it accounts for has already been ascribed to a previous predictor and therefore eliminated from the model. Note that this is the case even in analyses, such as the one described here, where there are no problematic levels of multicollinearity.

We therefore speculated that it might be more profitable to examine how a combination of factors may "conspire" to create an overall setting that is conducive to L1 maintenance in a bilingual context. In order to do this, we applied SEM. This allowed us to assume two latent factors—proficiency and background—that cannot be directly measured but are defined by a combination of other, measured constructs. Our assumption was proven to be valid by the outcome of the SEM models, which showed that, alongside AaO, informal daily interactions play an important role in determining structural proficiency. Attitudinal variables linked to how important the participant thought it was to maintain a high level of proficiency in Turkish and/or to ensure its transmission

to the next generation of speakers, on the other hand, were not linked with the degree of language maintenance.

In response to RQ3, we found that the link between background factors and proficiency was stronger among the earlier bilinguals, for whom exposure-related measures played a stronger role than AaO, but it was absent in the later ones, where the latent factor background did not significantly predict proficiency. This finding may suggest that younger speakers may be more sensitive to input and exposure factors, and that this sensitivity accounts for the larger range of variability with respect to proficiency often found among bilinguals with a lower AaO. This would suggest that the native language of monolinguals goes through a process of relative stabilization around puberty and, after that, becomes largely impervious to attrition regardless of how much input and output is experienced (this suggestion has been made by, e.g., Bylund, 2009; Flores, 2019; Montrul, 2008; Schmid, 2013). On the other hand, as pointed out above, there is the possibility of a causality reversal, indicating that those speakers who, for whichever reason, had retained a high level of Turkish proficiency into adulthood were more comfortable with using it and therefore had higher levels of use. Which of these two scenarios is the true explanation of our findings cannot be resolved on the basis of our data—only a longitudinal investigation could shed light on this question.

In summary, our findings indicate that participants who become bilingual before the age of 10 show a strong link between levels of exposure on the one hand and levels of proficiency on the other into adulthood: Participants with higher levels of interactive exposure to the L1 make use of more varied morphosyntactic devices in their free speech, are more accurate on formal and experimental tasks, and retain better lexical access. Speakers who became bilingual after the age of 10 appear to be less sensitive to factors linked to frequency of exposure and rarely deviate from the monolingual norms. In the present sample, no impact of attitudinal factors toward the Turkish language or culture was found.

Conclusion

The findings from the present study suggest a complex interaction of a variety of factors in the process of bilingual development. In particular, they underscore the importance of a rich and varied environment for the development of languages learned in childhood, which has often been found in research on Heritage Languages: children will have a higher chance of ultimately reaching nativelikeness if they have the opportunity to use their L1 with different people and in different contexts (see Unsworth, 2016, for an overview). Interestingly,

the role of attitudes toward the native or heritage language appears to play much less of a role for our participants. We argue that investigations assessing the impact of AaO across the full spectrum are necessary in order to close the gap between the, largely but artificially separated, fields of language attrition on the one hand and heritage language development on the other, and thus to fully understand the role that AaO has to play for the susceptibility of a native language to transfer from a L2. The comparison of the results obtained by means of regression analyses and structural equation modeling suggests that in order to capture this complex interaction, studies investigating these processes should look beyond the commonly used statistical procedures in order to identify analyses capable of capturing these interactions.

Final revised version accepted 7 April 2019

Notes

1 Note that for ease of reference the subordinate clauses are shown in square brackets.
2 Some participants inevitably had knowledge of another language other than Turkish and English owing to the sociological diversity of the Turkish-speaking community in the United Kingdom. Thirteen participants who either had Kurdish roots or were born in the Turkish part of Cyprus but who claimed to have very limited knowledge (at receptive level) of the Kurdish language or not to have acquired the Cypriot Turkish variety (because their parents were from Turkey) were included in the current study.
3 An alternative is to fix the latent constructs themselves at 1.

References

Aikhenvald, A. Y. (2004). *Evidentiality*. Oxford, UK: Oxford University Press.

Aksu-Koç, A. (1988). *The acquisition of aspect and modality: The case of past reference in Turkish*. Cambridge, UK: Cambridge University Press.

Arslan, S., Aksu-Koç, A., Maviş, İ., & Bastiaanse, R. (2014). Finite verb inflections for evidential categories and source identification in Turkish agrammatic Broca's aphasia. *Journal of Pragmatics*, *70*, 165–181. https://doi.org/10.1016/j.pragma.2014.07.002

Arslan, S., De Kok, D., & Bastiaanse, R. (2015). Processing grammatical evidentiality and time reference in Turkish heritage and monolingual speakers. *Bilingualism: Language and Cognition*, *20*, 457–472. https://doi.org/10.1017/S136672891500084X

Backus, A. (2012). Turkish as an immigrant language in Europe. In T. K. Bhatia & W. C. Ritchie (Eds.), *The handbook of bilingualism and multilingualism* (pp. 770–790). Hoboken, NJ: Wiley. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/9781118332382.ch31/summary

Bousquette, J., & Putnam, M. (2019). Redefining language death: Evidence from moribund grammars. *Language Learning*.

Bylund, E. (2009). Maturational constraints and first language attrition. *Language Learning*, *59*, 687–715.

Bylund, E., Abrahamsson, N., & Hyltenstam, K. (2010). The role of language aptitude in first language attrition: The case of prepubescent attriters. *Applied Linguistics*, *31*, 443–464. https://doi.org/10.1093/applin/amp059

Bylund, E., & Ramírez-Galan, P. (2014). Language aptitude in first language attrition: A study on late Spanish-Swedish bilinguals. *Applied Linguistics*, *37*, 621–638. https://doi.org/10.1093/applin/amu055

Flores, C. (2019). Attrition and reactivation of a childhood language: The case of returnee heritage speakers. *Language Learning*. https://doi.org/10.1111/lang.12350

Flores, C., Santos, A. L., Jesus, A., & Marques, R. (2017). Age and input effects in the acquisition of mood in Heritage Portuguese. *Journal of Child Language*, *44*, 795–828. https://doi.org/10.1017/S0305000916000222

Göksel, A., & Kerslake, C. (2005). *Turkish: A comprehensive grammar*. London, UK: Routledge.

Grotjahn, R. (Ed.). (2010). *Der C-Test: Beiträge aus der aktuellen Forschung [C-test: Contributions from current research]*. Frankfurt am Main, Germany: Peter Lang.

Gürel, A. (2004). Attrition in first language competence: The case of Turkish. In M. Schmid, B. Köpke, M. Keijzer, & L. Weilemar (Eds.), *First language attrition: Interdisciplinary perspectives on methodological issues* (pp. 99–119). Amsterdam, Netherlands: John Benjamins.

Gürel, A., & Yılmaz, G. (2011). Restructuring in the L1 Turkish grammar: Effects of L2 English and L2 Dutch. *Language, Interaction and Acquisition*, *2*, 221–250. https://doi.org/10.1075/lia.2.2.03gur

Huls, E., & van de Mond, A. (1992). Some aspects of language attrition in Turkish families in the Netherlands. In W. Fase, K. Jaspaert, & S. Kroon (Eds.), *Maintenance and loss of minority languages* (pp. 99–117). Amsterdam, Netherlands: John Benjamins.

Jia, R., & Paradis, J. (2015). The use of referring expressions in narratives by Mandarin heritage language children and the role of language environment factors in predicting individual differences. *Bilingualism: Language and Cognition*, *18*, 737–752. https://doi.org/10.1017/S1366728914000728

Karayayla, T. (under review). *A usage-based approach to productive use of inflectional patterns and level of lemma sophistication in adult heritage speakers' performance: Convergence on the immigrant variety*. Manuscript submitted for publication.

Karayayla, T. (in press). Effects of first language attrition on heritage language input and ultimate attainment: Two generations of Turkish immigrants in the UK. In B. Brehmer, J. Treffers-Daller, & D. Berndt (Eds.), *Lost in transmission: The role of attrition and input in heritage language development*. Amsterdam, Netherlands: John Benjamins.

Karayayla, T. (2018). *Turkish as an immigrant and heritage language in the UK: Effects of exposure and age at onset of bilingualism on grammatical and lexical development of the first language* (PhD dissertation). University of Essex, Colchester, Essex.

Karayayla, T., & Schmid, M. S. (2019). First language attrition as a function of age at onset of bilingualism: First language attainment of Turkish–English Bilinguals in the United Kingdom. *Language Learnin*g, *69*, 106–142. https://doi.org/10.1111/lang.12316

Ketrez, F. N., & Aksu-Koç, A. (2009). Early nominal morphology in Turkish: Emergence of case and number. In U. Stephany & M. D. Voeikova (Eds.), *Development of nominal inflection in first language acquisition: A cross-linguistic perspective* (pp. 15–48). Berlin, Germany: De Gruyter.

Kupisch, T., Lein, T., Barton, D., Schröder, D. J., Stangen, I., & Stoehr, A. (2014). Acquisition outcomes across domains in adult simultaneous bilinguals with French as weaker and stronger language. *French Language Studies*, *24*, 347–376. https://doi.org/https://doi.org/10.1017/S0959269513000197

Kupisch, T., & Rothman, J. (2018). Terminology matters! Why difference is not incompleteness and how early child bilinguals are heritage speakers. *International Journal of Bilingualism*, *22*, 564–582. https://doi.org/10.1177/1367006916654355

Łyskawa, P., & Nagy, N. (2019). Case marking variation in heritage Slavic languages in Toronto: Not so different. *Language Learning*. https://doi.org/10.1111/lang.12348

Montrul, S. (2008). *Incomplete acquisition in bilingualism: Re-examining the age factor*. Amsterdam, Netherlands: John Benjamins.

Montrul, S. (2016). *The acquisition of heritage languages*. Cambridge, UK: Cambridge University Press.

Müller, A., & Daller, M. (2019). Predicting international students' clinical and academic grades using two language tests (IELTS and C-test): A correlational research study. *Nurse Education Today*, *72*, 6–11.

Onar Valk, P., & Backus, A. (2013). Syntactic change in an immigrant language: From non-finite to finite subordinate clauses in Turkish. *Eesti Ja Soome-Ugri Keeleteaduse Ajakiri* [*Journal of Estonian and Finno-Ugric Linguistics*], *4*, 7–29. https://doi.org/10.12697/jeful.2013.4.2.01

Ortega, L. (2019). The study of heritage language development from a bilingualism and social justice perspective. *Language Learning*. https://doi.org/10.1111/lang.12347

Pfaff, C. W. (1993). Turkish language development in Germany. In G. Extra & L. T. Verhoeven (Eds.), *Immigrant languages in Europe* (pp. 119–146). Bristol, UK: Multilingual Matters.

Polinsky, M. (2015). Heritage languages and their speakers: state of the field, challenges, perspectives for future work, and methodologies. *Zeitschrift für Fremdsprachenforschung* [*Journal for Foreign Languages Research*], *26*, 7–27.

Polinsky, M., & Scontras, G. (in press). Understanding heritage languages. *Bilingualism: Language and Cognition*.

Putnam, M. T., & Sánchez, L. (2013). What's so incomplete about incomplete acquisition?: A prolegomenon to modeling heritage language grammars. *Linguistic Approaches to Bilingualism*, *3*, 478–508. https://doi.org/10.1075/lab.3.4.04put

R Core Team. (2018). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/.

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*, 1–36. https://doi.org/10.18637/jss.v048.i02

Sak, H., Güngör, T., & Saraçlar, M. (2008). Turkish language resources: Morphological parser, morphological disambiguator and web corpus. In B. Nordström & A. Ranta (Eds.), *Advances in natural language processing GoTAL 2008* (pp. 417–427). Berlin, Germany: Springer. Retrieved from http://link.springer.com/chapter/10.1007/978-3-540-85287-2_40

Schmid, M. S. (2011). *Language attrition*. Cambridge, UK: Cambridge University Press.

Schmid, M. S. (2013). First language attrition. *Wiley Interdisciplinary Reviews: Cognitive Science*, *4*, 117–123. https://doi.org/10.1002/wcs.1218

Schmid, M. S., & Cherciov, M. (in press). Extralinguistic factors in language attrition. In M. S. Schmid & B. Köpke (Eds.), *The Oxford handbook of language attrition*. Oxford, UK: Oxford University Press.

Schmid, M. S., & Dusseldorp, E. (2010). Quantitative analyses in a multivariate study of language attrition: The impact of extralinguistic factors. *Second Language Research*, *26*, 125–160. https://doi.org/10.1177/0267658309337641

Schmid, M. S., & Jarvis, S. (2014). Lexical access and lexical diversity in first language attrition. *Bilingualism: Language and Cognition*, *17*, 729–748. https://doi.org/10.1017/S1366728913000771

Schmid, M. S., & Köpke, B. (2017). The relevance of first language attrition to theories of bilingual development. *Linguistic Approaches to Bilingualism*, *7*, 637–667. https://doi.org/10.1075/lab.17058.sch

Schumacker, R. E., & Lomax, R. G. (2016). *A beginner's guide to structural equation modeling*. New York, NY: Routledge.

Slobin, D. I. (2001). Form-function relations: How do children find out what they are? In M. Bowerman & S. C. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 406–449). Cambridge, UK: Cambridge University Press.

Slobin, D. I., & Aksu, A. (1982). Tense, aspect, and modality in the use of the Turkish evidential. In P. J. Hopper (Ed.), *Tense-aspect: Between semantics & pragmatics* (pp. 185–200). Amsterdam, Netherlands: John Benjamins.

Stangen, I., Kupisch, T., Proietti Ergün, A. L., & Zielke, M. (2015). Foreign accent in heritage speakers of Turkish in Germany. In H. Peukert (Ed.), *Transfer effects in multilingual language development* (pp. 87–107). Amsterdam, Netherlands: John Benjamins.

Treffers-Daller, J., Daller, M., Furman, R., & Rothman, J. (2016). Ultimate attainment in the use of collocations among heritage speakers of Turkish in Germany and Turkish-German returnees. *Bilingualism: Language and Cognition*, *19*, 504–519. https://doi.org/10.1017/S1366728915000139

Treffers-Daller, J., Ozsoy, A. S., & van Hout, R. (2007). (In)complete acquisition of Turkish among Turkish-German bilinguals in Germany and Turkey: An analysis of complex embeddings in narratives. *International Journal of Bilingual Education and Bilingualism*, *10*, 248–276. https://doi.org/10.2167/beb443.0

Unsworth, S. (2016). Quantity and quality of language input in bilingual language development. In E. Nicoladis & S. Montanari (Eds.), *Bilingualism across the lifespan: Factors moderating language proficiency* (pp. 101–123). Washington, DC: APA.

Unsworth, S., Argyri, F., Cornips, L., Hulk, A., Sorace, A., & Tsimpli, I. (2014). The role of age of onset and input in early child bilingualism in Greek and Dutch. *Applied Psycholinguistics*, *35*, 765–805. https://doi.org/10.1017/S0142716412000574

Yağmur, K. (1997). *First language attrition among Turkish speakers in Sydney*. Tilburg, Netherlands: Tilburg University Press.

Yılmaz, G. (2011). Complex embeddings in free speech production among late Turkish-Dutch bilinguals. *Language, Interaction and Acquisition*, *2*, 251–275. https://doi.org/10.1075/lia.2.2.04yil

Yılmaz, G. (2013). *Bilingual language development among the first generation Turkish immigrants in the Netherlands* (PhD dissertation). Groningen, Netherlands: University of Groningen.

Yılmaz, G., & Schmid, M. S. (2012). L1 accessibility among Turkish-Dutch bilinguals. *The Mental Lexicon*, *7*, 249–274. https://doi.org/10.1075/ml.7.3.01yil

Yılmaz, G., & Schmid, M. S. (2018). First language attrition and bilingualism. In D. Miller, F. Bayram, J. Rothman, & L. Serratrice (Eds.), *Bilingual cognition and language: The state of the science across its subfields* (pp. 225–249). Amsterdam, Netherlands: John Benjamins.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1. Supplementary Materials.

Appendix: Accessible Summary (also publicly available at https://oasis-database.org)

The Older the Better? The Complex Role of Age of Bilingualism for Native Language Acquisition and Maintenance

What This Research Was About and Why It Is Important

It is widely assumed that all children will fully learn the language that their parents use with them, and that this knowledge will remain stable for the rest of their lives. Recent research has shown, however, that both children and adults who frequently use a language other than their first "home" language (bilinguals) often do so in a way that is less complex and less accurate than speakers of only one language (monolinguals). However, it is poorly understood what drives variability in first language proficiency. For example, why does one sibling from the same immigrant family end up speaking their parents' language perfectly while another can barely comprehend it? And why does one immigrant remain fluent after decades in a country while another fumbles for words and has a marked foreign accent much earlier? Intuitively, it would seem that this will depend on a range of factors, for instance, how old the speakers were when they became bilingual, how long they have lived in another country, how often they use their first language, and how they feel about their language and culture of origin. However, these factors work together in ways that are not straightforward. In this study, the researchers attempted to better understand what contributes to the success of home language acquisition and maintenance, with the goals of supporting bilinguals and their families and developing a more accurate model of bilingual development.

What the Researchers Did

- The researchers investigated a large and diverse sample of 92 bilingual Turkish–English adults in the United Kingdom who arrived there between the ages of 0 and 42.
- They assessed the bilinguals' background by means of extensive questionnaires and interviews.
- They also measured their proficiency in Turkish through a range of instruments, such as naming as many animals as possible within one minute, filling in gaps in a written text, and completing sentences. They also assessed the accuracy and complexity of the bilinguals' speech in an interview and a picture description task.

What the Researchers Found

- The researchers found that the age at which a speaker became bilingual played the most important role. The first language Turkish speakers who learned English after age 10 resembled monolingual Turks in Turkey. In contrast, the speakers who were younger when they started learning English showed a much broader range in proficiency in Turkish.
- How often a speaker used their first language also correlated with how proficient they were in it.
- The link between amount of use and proficiency was strong among the early bilinguals but disappeared for speakers who were above 10 years old when they learned English.
- Attitudinal factors did not appear to play a role, at least in this dataset.

Things to Consider

- Speakers who remained monolingual until puberty appeared to develop a stable level of proficiency in their first language; any differences between them and monolinguals were minor even after decades of being in another country.
- In earlier bilinguals (those who immigrated to the United Kingdom as young children), first language proficiency levels were much more variable. Some did attain nativelike levels of proficiency, but others were more similar to foreign language learners' levels.
- Proficiency levels were modulated by other factors, such as the amount and quality of bilinguals' language exposure and use.
- Do these findings mean that early bilinguals who use the language more become more proficient, or that early bilinguals who are more proficient make more use of the language? Longitudinal studies, tracking individuals over time, are needed to answer this question.

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