2021-11-03

Emotion word development in bilingual children living in majority and minority contexts

Emotion Word Development in Bilingual Children Living in Majority and Minority Contexts

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Abstract: The lexicon of emotion words is fundamental to interpersonal communication. To examine how emotion word acquisition interacts with societal context, the present study investigated emotion word development in three groups of child Korean users aged 4–13: those who use Korean primarily outside the home as a majority language (MajKCs) or inside the home as a minority language (MinKCs), and those who use Korean both inside and outside the home (KCs). These groups, along with a group of L1 Korean adults, rated the emotional valence of 61 Korean emotion words varying in frequency, valence, and age of acquisition. Results showed KCs, MajKCs, and MinKCs all converging toward adult-like valence ratings by ages 11–13; unlike KCs and MajKCs, however, MinKCs did not show age-graded development and continued to diverge from adults in emotion word knowledge by these later ages. These findings support the view that societal context plays a major role in emotion word development, offering one reason for the intergenerational communication difficulties reported by immigrant families.

Keywords: bilingualism, emotion words, societal context, intercultural communication, minority language, Korean

Introduction

Emotion word competency is fundamental in interpersonal relationships and social communication. It is a key component of emotional intelligence, the "ability to monitor one's own and other people's emotions, to discriminate between different emotions and label them appropriately, and to use emotional information to guide thinking and behaviour" (Colman 2015). While emotion occurs as a personal and internal process, its perception and expression are highly influenced by social norms (e.g., Wierzbicka 1999). Thus, beyond reflecting one's general vocabulary in a language, emotion word competency may further indicate to what extent one is socialized within a culture associated with that language.

Research on emotion word development, which has mostly examined monolinguals assumed to be monocultural up to the time of study, stands in contrast to the exponential increase in global immigration in recent years, which has led to many people dealing regularly with multiple cultures, even at home in daily life.[1] For instance, the number of Asian immigrants to the US, along with their US-born children, is projected to increase to 40.6 million by 2050 (US Census Bureau 2008, as cited in Xia et al. 2013). The reality in a country like the US is therefore often one of coexistence of, and cross-pollination

[1] We consider the term "culture" to refer to an open system that reflects the dynamic changes of its social setting (Suh et al. 1998), acknowledging that variability exists both between cultures and within a culture. However, as our study examined children in immigrant families, whose parents' original cultures differed from their own current cultures, our use of "culture" in relation to emotion words is more focused on intercultural rather than intracultural variability. This focus is supported by research arguing that people embody cultural ideas in the form of emotions (Bruner 1996) and, within the same culture, share similar emotional norms (De Leersnyder et al. 2011).

between, two or more cultures or languages for a given language user. This reality needs to be accounted for in the study of emotion word development.

Traditionally, emotion-related expressions are considered to be learned first within the family during childhood and to remain a strong part of the first language (L1) vocabulary even after one becomes proficient in a later-learned language (Lx)[2] (e.g., Harris et al. 2003). However, when it comes to children born into immigrant families, who are exposed to two languages early in life and whose family language differs from the societal language, such a privileged position of the L1 for emotion words becomes less clear. How do emotion words develop among children in immigrant families who are early bilinguals? How does the context of learning language—family (L1 as a minority language) or society (L1 as a majority language)—influence the development of emotion language over time? These are the central questions motivating the present study, which investigated emotion word development among minority children with different domiciliary and societal languages in relation to age and the contrast between majority and minority language contexts.

Emotion Word Development in Monolingual and Bilingual Children

Emotion words (e.g., *happy*, *anger*, *worry*) refer to "emotional states, moods, or feelings" (Vigliocco et al. 2009: 222). Although they convey abstract meaning, emotion words can be physiologically perceived; thus, they may even comprise a word class independent from concrete and abstract words (Pavlenko 2012). One of their unique semantic features across languages is valence, which refers to how negative or positive the word is. Another unique feature is arousal, the intensity of the feeling that the word carries.

While many scholars analyze emotion words of Indo-European languages in terms of both valence and arousal, it is unclear whether arousal is a relevant dimension of emotion words in the target language of this study—Korean, a member of the Ural-Altaic language family (Ahn et al. 1993; Park and Min 2005). For instance, L1 Korean adults were found to classify basic Korean emotion words primarily based on valence instead of arousal (Park and Min 2005), which may be due to two reasons. One is that the intensity of Korean emotion words is usually better understood with reference to cooccurring adverbs. Another is that for emotional perception Korean users may tend to rely more on social contextual cues (Masuda et al. 2008) and vocal cues (Tanaka et al. 2010), similarly to Japanese users (Chung and Robins 2015). Given these findings, we focused on valence to evaluate Korean emotion words in this study.

Valence ratings have been used in many studies of emotion word development to examine children's knowledge of emotion words. For instance, Bahn et al. (2018) found no significant and only small differences between 9-year-old German children and adults in ratings of, respectively, valence and arousal of 48 emotion words, which led them to conclude that typically developing German children can develop adult-like perception of emotion words overall by age 9. Based on their findings, the use of adult ratings in the analysis of child data is justified. Valence ratings can also be useful as an indirect measure of emotion word knowledge for children and adults.

[2] We use "L1(s)" and "Lx" to refer, respectively, to the mother tongue (or tongues in the case of simultaneous bilinguals) and a later-learned language, in order to avoid relying on a "native" vs. "non-native" dichotomy. Further, we use the term "users" (as opposed to "speakers") for inclusivity (i.e., some users may listen to or read, but not necessarily speak, the given language), following Dewaele (2018).

In addition to indirect measures of emotion word knowledge, studies have also used direct measures, such as parents' reports (for young children) and self-reports (for older children and adolescents) on a vocabulary checklist. For example, Bretherton and Beeghly (1982) asked English-speaking mothers to report on their 28-month-olds' utterances and found that the children's ability to use basic emotion terms started late in the second year and burgeoned in the third year. Using an emotion word survey consisting of 336 English items, Baron-Cohen et al. (2010) found that the size of the emotion lexicon doubled every two years between ages 4 and 11, with subsequent flattening of the growth curve between ages 12 and 16. Further, in a replication of Baron-Cohen et al. (2010), Li and Yu (2015) found significant age effects on the Mandarin Chinese emotion lexicon, with a dramatic increase from age 6 to 8 and no significant difference in emotion lexicon size between their Chinese children and Baron-Cohen et al.'s British children from age 11 to 12. In short, monolingual children's ability to understand and use emotion words starts developing in their second year and reaches an adult-like level by early adolescence.

While monolingual children's emotion word development is well-documented, bilingual children have not played a large part in this research area. Most research on bilingual children has focused on general language development, with the goal of seeing if bilinguals have developed, or received enough input for, age-appropriate levels in general lexical competence of their majority Lx (e.g., Park and Chough 2012; Shiro 2016). To reiterate, however, knowledge of emotion words is important for both social adaptation and interpersonal relationships, and is even more so for bilingual children, who regularly face two linguistically and culturally different situations in their daily life. Bilingual children are known to be sensitive to different languages and linguistic environments (e.g., Werker and Tees 1984; Kuhl et al. 1992), voluntarily switching languages according to context as early as 20 months (Döpke 1992; Kasuya 1998). As such, one can surmise that the minority L1 of bilingual children, including its emotion lexicon, may be vulnerable in an environment that applies social pressure toward a majority language and does not support the use of minority languages. How the emotion lexicon develops in bilingual children, especially in relation to the language's status as a majority or minority language, is thus a question in need of research.

Emotion Word Processing in Bilinguals

The processing of emotion words in bilinguals' L1 and Lx provides some clues about the possible trajectory of emotion word development in bilingual children. In monolinguals, emotion words, especially negatively-valenced ones, tend to be processed in a distinctive way. Specifically, negatively-valenced words trigger long-lasting effects in the amygdala (Naccache et al. 2005) and are better identified (e.g., Gaillard et al. 2006) than neutral words.[3] In bilinguals, the unique processing of emotion words differs between the L1 and Lx; however, these differences interact with the bilingual's acquisitional profile, including characteristics such as age of acquisition (AoA), learning context, and

[3] According to Authors (2015, p. 29), "[t]he mechanisms underlying this distinctive processing are still under investigation," although one possibility is that negatively-valenced words, as threatening stimuli, prevent the disengagement of attention (Fox et al. 2001, as cited in Eilola et al. 2007; see also Estes and Adelman 2008). Given the possibility of valence effects on emotion word perception, the present study included separate analyses of valence ratings by valence group, further discussed in the results section.

frequency of use, resulting in inconsistent findings (Dewaele 2010).

In regard to late unbalanced bilinguals (mean Lx AoA > 8 years), research using varied methodologies tends to show stronger emotional resonance of emotion words in the L1 than the Lx. For example, L1 Turkish-Lx English users' skin conductance responses to auditorily presented negative emotion words and taboo words were stronger in the L1 than the Lx (Harris et al. 2003), consistent with Dewaele's (2004) findings showing that multilinguals perceived the emotional force of taboo words more strongly in their L1 (dominant language) than their Lx. In addition, L1 German-Lx English and L1 Finnish-Lx English users' pupillary responses to high- vs. low-arousal words (e.g., *hate* vs. *door*) were influenced by arousal manipulation more in the L1 than the Lx (Toivo and Scheepers 2019). L1 Mandarin-Lx English users also showed priming effects caused by automatic translation of negative words significantly more in the L1 than the Lx (Wu and Thierry 2012). Together, these findings imply reduced emotionality in the Lx. That is, late bilinguals show stronger physiological and behavioral reactions to emotion-related expressions in their L1 than their Lx, which may be related to the fact that early language develops at the same time as emotional regulation systems and, therefore, becomes tightly connected with the brain's emotional system (Caldwell-Harris 2014).

However, an advantaged position of the L1 in emotionality is not always guaranteed. Especially when extensive exposure to an Lx starts early in life, before emotion word competency in the L1 is fully established (i.e., adult-like), emotionality may shift from the L1 to the Lx as language dominance switches. For example, Sutton and colleagues (2007) tested bilinguals who immigrated to the US before age 7 in an emotional Stroop paradigm, where emotional words (e.g., *depressed*), if automatically activated, cause a significant delay in color judgments as compared to neutral words (e.g., *window*). These early bilinguals showed stronger emotional Stroop effects in their Lx than their L1, suggesting that language use and learning context (i.e., immigration or immersion) play a crucial modulating role in developing emotionality in a given language.

Indeed, there has been increasing evidence that, with frequent use in immersion contexts, an Lx can come to feel as emotional as the L1 despite later exposure. For instance, Authors (under review) compared adult late bilinguals, who started learning Lx Korean in college, and L1 Korean users on an emotional Stroop task according to amount of Lx use in daily life in Korea, finding that the high-use group of late bilinguals (top 25% in Lx use) showed significant emotional Stroop effects similar to those of L1 Korean users. Furthermore, examining event-related potentials (ERPs) in sequential unbalanced bilinguals during the reading of emotional and neutral words, Opitz and Degner (2012) found that the amplitude of the early posterior negativity (EPN; about 280–430 ms after word onset), reflecting enhanced processing of emotional compared to neutral words, appeared similar in the L1 and Lx. Taken together, these findings suggest that emotion words in an Lx can become as embodied as in an L1 user's mind, even later in life, when assisted by frequent Lx use. This means that Lx users in the current study could in principle pattern like L1 users in their processing of emotion words.

Research Questions

Although emotional intensity in bilinguals' later-learned or less dominant language is known to vary according to language use, learning context, and AoA, to our knowledge there is no published research on bilingual children's emotion word development, leaving

open the question of how bilingual children acquire emotion words. This question is worth asking because early bilinguals' emotion word development may be at risk if one of their languages is a less commonly used and/or minority language. Therefore, in the current study we investigated when, to what extent, and in what learning contexts bilingual children develop emotion word competency, focusing on the as-yet unexamined case of child users of Korean. The two research questions we addressed were:

Q1: How do Korean emotion words develop as a function of age in functionally monolingual Korean children using Korean inside and outside the home, in relation to adult norms?

Q2: How does age-graded Korean emotion word development change as a function of the societal status of Korean (i.e., as a majority or minority language)?

To address Q1–Q2, we conducted a cross-sectional study of valence perception and emotion word knowledge, comparing three groups of child Korean users: children using Korean inside and outside the home, those using Korean mainly outside the home as a majority language, and those using Korean mainly inside the home as a minority language.

Methods

Participants

To determine the number of participants to recruit for the study, we carried out a power analysis anticipating multiple linear regression models with up to 15 coefficients apart from the intercept (accounting for participant group, participant age, and item valence group predictors, along with all possible interaction coefficients) and assuming 80% power, an alpha level of .05, and a medium-size model R^2 of .1. Using the `pwr.f2.test()` function in the `pwr` package (Champely 2018) in R (R Development Core Team 2016), we determined the target number of participants to be 200. The final dataset thus consisted of a total of 213 participants across four groups.

According to their direct report or that of their legal guardian, participants in the final four groups had no history of speech or language impairment, and all gave informed consent (either directly or via their legal guardian) prior to their entry into the study. The first group was a control group of L1 Korean adults (KAs), while the other three groups were the experimental groups of children: functionally monolingual Korean children who used Korean both inside and outside the home (KCs), children residing in Korea who used Korean primarily outside the home as a majority language (MajKCs), and children residing in the US who used Korean primarily inside the home as a minority language (MinKCs).[4] Demographic information about these groups is summarized in Table 1. The three child groups did not differ significantly in age [$F(2.0, 90.1) = 1.208$, $p = .304$ in Welch's one-way ANOVA], with a median age of 8 in all child groups.

[4] The child participants' mono-/bilingual status was double-checked directly and indirectly (with guardians and/or teachers), before recruiting and at the time of testing. Older KCs were not strictly monolingual as they received English classes at school; however, like younger KCs, they were born and raised in Korea using Korean as their primary language both outside and inside the home with their L1 Korean parents.

Although matched in terms of age, the three child groups differed along a number of language background dimensions (reported verbally or by questionnaire), in a manner consistent with the nature of their Korean language experience (see Table 2 in the supplementary material at `URL-redacted-for-review`). Whereas KCs were consistently exposed to, and consistently used, Korean as the primary language both at home and at school, this was not the case for the MajKC or MinKC groups. MajKCs were consistently exposed to Korean as the primary language at school, but not at home; in fact, a sizable portion of this group (36%) was not exposed to Korean at home at all. For both those not exposed and those exposed to Korean (to varying degrees) at home, the primary home language was instead a different language (e.g., Mongolian, Nepali, Vietnamese) because, for every member of this group, one or both parents were not L1 Korean users. Crucially, the non-Korean home language for MajKCs was never English, meaning there was no overlap between MajKCs and KCs in language profile. On the other hand, MinKCs were consistently exposed to Korean as the primary language at home, but mostly exposed to English as the primary language at school.[5] Consequently, compared to MajKCs, MinKCs reported significantly lower levels of current Korean exposure [$F(1.0, 74.8) = 4.152$, $p = .045$] and Korean use [$F(1.0, 74.6) = 16.840$, $p < .001$], which translated to a lower Korean receptive vocabulary level at the time of the study (as measured by the Receptive and Expressive Vocabulary Test; Kim et al. 2009) than both KCs and MajKCs [$F(2.0, 88.9) = 8.380$, $p < .001$]. By contrast, MajKCs' vocabulary scores were not significantly different from KCs' [$F(1.0, 84.8) = 0.750$, $p = .389$].

Materials

Development of the test materials occurred in four stages. First, we compiled a list of 199 Korean emotion words (100 negative, 99 positive) from those commonly found in previous Korean emotion vocabulary lists (Lee and Jeong 2004; Park and Min 2005; Lee 2015; Lee 2018). Second, we estimated the AoA of each of these words based on survey responses from six Korean school teachers (with an average of 16.2 years of teaching experience), and then reduced the list down to 100 words with an AoA earlier than age 5. Third, we piloted three KC children (ages 5, 6, and 11) on these 100 words to identify those which elicited consensus judgments (i.e., target-like valence ratings from all three). Finally, from the 75 candidate words which elicited consensus judgments, 61 were chosen to balance the words across 'positive' and 'negative' valence groups (ultimately comprising 28 and 29 words, respectively) in terms of part of speech, word frequency, AoA, and word length (see Table 3 in the supplementary material).

The target items for the valence rating task thus comprised 61 emotion words varying in frequency, emotional valence, and AoA. Mean frequency of the target items in The Korean National Corpus (National Institute of the Korean Language 2005) was 151 (*SD* 352); mean emotional valence, as evaluated by the L1 Korean adults in Park and Min (2005) on a 1–7 scale (1: 'very unpleasant', 7: 'very pleasant'), was 4.1 (*SD* 1.5); and mean AoA, estimated through the above-mentioned survey responses, was 3.1 years (*SD*

[5] There were two exceptions, siblings who attended a Korean daycare in the US (where Korean was a medium language at the time of testing). These participants still met the description of the MinKC group (i.e., they were exposed to Korean, a minority language in the society, as the primary language at home, but to English, the majority language, for most domains outside the home), so they were not excluded.

1.4). Thus, the majority of items were words typically acquired by age 5. The items were classified into one of three valence groups based on the groupings of Lee (2018) and the valence scores in Park and Min (2005): 'positive' ($N = 28$), 'negative' ($N = 29$), or 'other' ($N = 4$). The full list of items is accessible at `URL-redacted-for-review`.

Audio recordings of the items for the rating task came from two L1 Korean adults in their 30s, one female and one male, who read the target items (in isolation and in random order) under specific instructions to pronounce the items neutrally (i.e., without any particular emotional inflection). The recordings were made in a quiet room at 44.1 kHz and 16 bps using the QuickRec app on a Samsung Galaxy 8 smartphone, positioning the built-in phone mic about 10 cm away from the speaker's mouth; the recordings were then edited into individual sound files in Praat (Boersma and Weenink 2016) with a normalized average intensity of 70.0 dB SPL. These sound files were then submitted to perceptual evaluation by a separate group of three L1 Korean listeners to confirm that the speech sounded emotionally neutral; any file which was evaluated as sounding emotional was re-recorded and then re-evaluated, such that all of the sound files used in the rating task were rated as sounding neutral by at least two listeners.

Procedure

The valence rating task was administered via an online survey in Qualtrics (Qualtrics 2016). Following introductory screens (in Korean) going through the consent process, basic demographic questions, and written instructions, the survey moved on to an initial practice session consisting of two practice trials, which had the same structure as the test trials but tested items (/ul-da/ 'to cry', /us-da/ 'to smile') that were not part of the test materials. After the practice session, the survey moved on to the test session, consisting of 61 test trials presented in random order.

Each trial in the rating task consisted of audio presentation of the target word and the written prompt (in Korean) 'How positive or negative is this word?'. The participant was allowed to replay the audio an unlimited number of times before responding, and made their response by selecting one emoji from a seven-point, emoji-based valence scale ranging from 'very unpleasant' (1, represented by the saddest-looking emoji) to 'very pleasant' (7, represented by the happiest-looking emoji) or, alternatively, the option 'don't know'. The emoji-based valence scale is shown in Figure 1.

In addition to the valence rating task, participants in the MajKC and MinKC groups completed, with the help of their parents as needed, a detailed language background questionnaire that collected information about their language learning history, language exposure, language use, and language proficiencies, as well as those of their family. This questionnaire was also administered via Qualtrics and is accessible at `URL-redacted-for-review`.

Results

Correlation with Adult Valence Ratings

As the first part of the analysis, we calculated correlations between each participant's set of valence ratings and those of the control group (KAs), in order to provide a global metric of how adult-like each participant's valence ratings were. To do this, we took the vector of 61 valence ratings for each participant and computed a Pearson's correlation

coefficient (R) for the correlation between that vector of ratings and a vector consisting of the 61 mean valence ratings for the KA group; to correct for the non-normal distribution of Pearson's R, we then transformed the R values to Fisher's Z values (see, e.g., De Leersnyder et al. 2011). A Shapiro-Wilk test of normality (Shapiro and Wilk 1965) was consistent with a normal distribution of the children's Z values [Shapiro-Wilk $W = 0.984$, $p = .059$], so they were analyzed with parametric statistics. These correlations are shown in Figure 2.

As seen in Figure 2, all three child groups showed high, albeit not yet adult-like, correlations by ages 11–13, but there were differences among them in terms of the progression of the correlations with age. These patterns were reflected in the results of a two-way omnibus analysis of variance (ANOVA) on the correlations, which indicated a significant main effect of both Age [$F(1, 205) = 4.768$, $p = .030$] and Group [$F(3, 205) = 42.216$, $p < .001$] and a significant Age × Group interaction [$F(3, 205) = 14.520$, $p < .001$]. Post-hoc tests via one-way ANOVAs revealed that the interaction arose because there was a significant age effect for both KCs [$F(1, 67) = 32.610$, $p < .001$] and MajKCs [$F(1, 50) = 12.790$, $p < .001$], but not for MinKCs [$F(1, 37) = 0.797$, $p = .378$] or KAs [$F(1, 51) = 0.985$, $p = .326$]. Thus, whereas KCs and MajKCs showed a clear age-graded path of development toward KAs, MinKCs showed a more irregular developmental trajectory that was not closely linked to age. However, at ages 11–13 (the latest ages tested) all of the child groups were still significantly different from KAs [Fs > 8.147, ps < .01].

Development in Valence Ratings by Valence Group

The second part of our analysis examined age-graded development in valence ratings by item valence group, focusing on the two main valence groups of 'positive' and 'negative' valence. Mean valence ratings for items in these two valence groups are shown in Figure 3, which evinces both apparent age-graded development and a lack of such development depending on the participant group. For example, whereas KCs showed clear age-graded development on both valence groups, MinKCs did not, on either valence group.

To analyze the valence ratings statistically, we built three linear mixed-effects models on the valence ratings, using `lmer()` in the `lmerTest` package (Kuznetsova et al., 2017). The omnibus model, Model 1, had a fixed-effects structure consisting of Age (centered; as a continuous variable), Group (treatment-coded, with reference level 'KA'), and ValenceGroup (treatment-coded, with reference level 'positive') and a random-effects structure comprising by-participant and by-item intercepts. An ANOVA on this model, using `Anova()` in the `car` package (Fox and Weisberg 2019), revealed significant main effects of Age [$\chi^2(1) = 4.121$, $p = .042$], Group [$\chi^2(3) = 9.175$, $p = .027$], and ValenceGroup [$\chi^2(1) = 713.939$, $p < .001$], and interactions of Age × Group [$\chi^2(3) = 13.959$, $p = .003$], Age × ValenceGroup [$\chi^2(1) = 9.079$, $p = .003$], Group × ValenceGroup [$\chi^2(3) = 89.105$, $p < .001$], and Age × Group × ValenceGroup [$\chi^2(3) = 116.433$, $p < .001$], reflecting the variation in age effects seen in Figure 3.

The fixed-effect coefficients of Model 1, and of all other models, are summarized in the supplementary material at `URL-redacted-for-review`. Starting with the results for 'positive' valence items (Figure 3a), the model confirmed, consistent with the results for the correlations discussed above, that there was no age effect for KAs [ß = 0.0005, $t = 0.071$, $p = .944$]. By contrast, there was a significant, positive age effect for KCs and

MajKCs [ßs > 0.133, *t*s > 5.396, *p*s < .001], but not MinKCs [ß = 0.019, *t* = 0.647, *p* = .518], such that by the middle of the age range (ages 13–14, i.e. adolescence) KCs and MajKCs were modeled as not differing from KAs on 'positive' valence items [*t*s = 1.406, *p* > .1] while MinKCs were modeled as still marginally below the level of KAs [ß = -0.133, *t* = -1.749, *p* = .081].

Turning now to the results for 'negative' valence items (Figure 3b), there was a large effect of valence group, with 'negative' valence items being given significantly lower valence ratings than 'positive' valence items by KAs [ß = -3.769, *t* = -25.273, *p* < .001]. The model also confirmed that there was no age effect for KAs [ß = 0.005, *t* = 1.055, *p* = .291]. By contrast, there was a significant, negative age effect for KCs and MajKCs [ßs < -0.137, *t*s < -6.810, *p*s < .001], but not MinKCs [ß = -0.018, *t* = -0.779, *p* = .436]. This resulted in KCs being modeled as going below KAs' ratings on 'negative' valence items by adolescence [ß = -0.324, *t* = -2.519, *p* = .012], whereas MajKCs and MinKCs were both modeled as remaining above the level of KAs [ßs > 0.301, *t*s > 2.331, *p*s < .05].

Because the results of Model 1 suggested that the strength of age effects differed across the three child groups, we built two additional models, Model 2 and Model 3, to directly compare the child groups to each other as opposed to KAs. Models 2 and 3 had the same structure as Model 1, except that the Age predictor was recentered to the age range of the child groups only and the Group predictor was coded with reference level 'KC' in Model 2 and 'MinKC' in Model 3. These models converged with Model 1 in showing that, on 'positive' valence items, there was a significant, positive age effect for KCs [ß = 0.137, *t* = 5.214, *p* < .001], which did not differ significantly in strength or directionality for MajKCs [ß = 0.018, *t* = 0.457, *p* = .648], but no significant age effect for MinKCs [ß = 0.021, *t* = 0.638, *p* = .524]. Similarly, on 'negative' valence items, there was a large switch in the age effect from positive to negative for KCs [ß = -0.166, *t* = -8.378, *p* < .001] and little difference in the magnitude of this switch for MajKCs [ß = 0.029, *t* = 0.978, *p* = .328]; however, for MinKCs, there was a major reduction in the magnitude of this switch [ß = 0.152, *t* = 4.808, *p* < .001], resulting again in no significant age effect [ß = -0.014, *t* = -0.560, *p* = .575]. Direct comparison of MajKCs and MinKCs further showed that age effects for MajKCs were significantly larger than those for MinKCs, on both 'positive' [ß = 0.135, *t* = 3.129, *p* = .002] and 'negative' [ß = -0.124, *t* = -3.784, *p* < .001] valence items.

In summary, the analysis of valence ratings by item valence group revealed no age effects for KAs or MinKCs, but significant age effects for KCs and MajKCs, which went in complementary directions for 'positive' and 'negative' valence items. On 'positive' valence items, KCs' and MajKCs' valence ratings went up with increasing age, whereas on 'negative' valence items they went down with increasing age. Thus, for both item valence groups there appeared to be age-graded development toward adult-like valence ratings. Crucially, however, these age effects were found only for KCs and MajKCs and not for MinKCs.

Emotion Word Knowledge

The final part of our analysis concerned emotion word knowledge, as reflected in the number of items identified by participants as unknown in the valence rating task. Recall that in this task participants had, as a response option, a 'don't know' option in addition to the 1–7 scale; that is, the task did not force a rating. Instead, participants could opt not

to provide a rating for any given item, and we interpret the selection of this option as indicating that the participant either did not know the word at all or did not know the word well enough to provide a judgment of its emotional valence. For the current purposes, the distinction between these two possible causes for choosing the 'don't know' option is not important, so we conflate both under the cover term of an item being 'unknown'. The numbers of items thus identified as 'unknown' are shown in Figure 4.

To analyze the likelihood of child participants (not) knowing the target items, we recoded their valence ratings into a binary variable (0: 'unknown'; 1: 'known', i.e. known enough to be given a valence rating), which was then submitted to two logistic mixed-effects models using `glmer()` in `lmerTest`. Both models (Model 4 and Model 5) had a fixed-effects structure consisting of Age (centered; as a continuous variable) and Group (treatment-coded, with reference level 'KC' in Model 4 and 'MinKC' in Model 5) and a random-effects structure comprising by-participant and by-item intercepts. An ANOVA on Model 4 revealed significant main effects of Age [$\chi^2(1) = 60.073$, $p < .001$] and Group [$\chi^2(2) = 16.701$, $p < .001$] and an Age × Group interaction [$\chi^2(2) = 22.290$, $p < .001$], reflecting the age effects, between-group differences, and variation in age effects across groups seen in Figure 4.

Models 4–5 indicated that there was a significant, positive age effect on KCs' likelihood of knowing the items [ß = 0.832, $z = 6.809$, $p < .001$], an effect that did not differ significantly in strength for MajKCs [ß = -0.043, $z = -0.243$, $p = .808$]; however, there was no significant age effect for MinKCs [ß = 0.150, $z = 1.376$, $p = .169$]. Thus, by the middle of the age range (age 8), both KCs [ß = 1.609, $z = 4.967$, $p < .001$] and MajKCs [ß = 1.219, $z = 3.630$, $p < .001$] were significantly more likely to know the items than MinKCs were. Like MinKCs, KAs showed no significant age effect [ß = 0.133, $z = 1.349$, $p = .177$] as indicated by a separate, single-predictor (Age) model run just on KAs' data.

In short, while the likelihood of knowing the target items increased with increasing age for KCs and MajKCs nearly to the level of KAs (who generally knew all of the target items; see Figure 4), it did not for MinKCs. An additional single-predictor (Group) model further confirmed that at ages 11–13, the latest ages tested, MinKCs continued to differ significantly from KAs [ß = -4.691, $z = -4.091$, $p < .001$]. Thus, consistent with the results of the correlation analyses and the valence rating analyses discussed above, MinKCs patterned distinctly from KCs and MajKCs in terms of the age-graded development of emotion word knowledge in Korean.

Discussion

The purpose of the present study was to investigate bilingual children's emotion word development according to the societal status of the target language. Comparing bilingual children born into immigrant families in Korea (majority language context; MajKCs) or the US (minority language context; MinKCs) to functionally monolingual Korean children (KCs) and adults, we addressed two research questions, focusing on valence perception and word knowledge (lexicon size) in Korean.

Q1: Age-Graded Development in Korean Monolinguals

In regard to our first question, we found that, in terms of both emotion lexicon size and valence perception, KCs progressively converged toward adult norms with increasing

age, although they were still not quite adult-like at ages 11–13 in valence perception. Our results concerning emotion lexicon size are congruent with Baron-Cohen et al.'s (2010) finding of a lexical plateau at age 11 for L1 English children in Britain, implying that the emotion lexicon may develop along similar trajectories across languages. Our finding that KCs' knowledge of emotion words significantly improved during ages 6–8 is also consistent with Li and Yu's (2015) claim that ages 6–8 might be a sensitive developmental period for emotion word comprehension. In short, what previous studies and the present study have in common is the finding that the emotion lexicon develops dramatically during the early school years, with a plateau at or around age 11.

On the other hand, our results concerning valence perception contrast with previous results in certain respects. In particular, KCs remained significantly different from adults in valence perception at ages 11–13, suggesting that the point at which children become adult-like in this respect may be later than age 9 as found by Bahn et al. (2018) for German children. In addition, whereas Li and Yu (2015) found valence effects on emotion word comprehension for Chinese children (i.e., positive words developed earlier than negative words), we found no such valence effects on KCs' emotion word development. Given that these studies used different sets of emotion words in different languages, the disparity in developmental trajectories observed may be due in part to the specific words included in each study (cf. Baron-Cohen et al. 2010). For instance, our 61 emotion words could have had a later AoA than assumed, unlike those in previous studies. While Bahn et al. (2018) obtained the AoA of their stimuli from 411 ordinary L1 German users, we did so from six experienced Korean schoolteachers, under the logic that experts could give us more precise estimates of AoA. However, whether normative AoA can be better estimated by a large sample of ordinary users or a small sample of experts is an open question. Moreover, considering the limited sample size of the latest age band (ages 11–13) of KCs in this study ($N = 9$ total; 6 for age 11, 2 for age 12, 1 for age 13), we believe that this age band's non-adult-like performance in valence perception may be due to sampling bias; that is, it is possible we might see adult-like performance for this age band if we had a larger sample.

To our knowledge, this is the first study to combine measures of valence perception and lexicon size in service of examining the dynamics of emotion word acquisition. This combined approach allowed us to observe similar age-graded patterns in KCs' development of valence perception and word knowledge. Such congruent developmental patterns in valence perception and word knowledge additionally confirm the validity of using a valence rating task to assess emotion word development as done in previous studies (e.g., Bahn et al. 2018).

Q2: Societal Impact on Emotion Word Development

In regard to our second question, we found that age-graded development of Korean emotion words in bilingual children was significantly mediated by societal context: patterning behind KCs early in primary school, MajKCs eventually caught up with KCs by age 9 in valence perception and emotion lexicon size, whereas MinKCs did not show such age-graded development during the same time period.[6] Since MajKCs and MinKCs

[6] We are careful to point out that, since MinKCs may very well reach L1 adult-like norms in their majority language (as MajKCs did in Korean in this study), considering MinKCs' emotion word competency over both of their languages jointly could lead to a different picture (e.g., one in which MinKCs' emotion word

came from different societal contexts with different ratios of Korean input and use, these results therefore revealed significant effects of societal context—namely, a facilitation effect of the majority language context and an inhibition effect of the minority language context during primary schooling.

First, in regard to the majority context effect, we observed broad similarity in age-graded developmental patterns between KCs and MajKCs, which is notable considering their starting and ending points. At ages 4–5, MajKCs tended to outperform KCs in terms of proximity to adult-like valence ratings, a pattern that can actually be attributed to their limited emotion lexicon. That is, MajKCs' valence ratings were based on the words that they knew instead of all 61 target words, and they marked about 17 words (28%) as unknown, thus showing the smallest emotion lexicon size in our child samples. Given fewer known emotion words, they could use these words more frequently, which could in turn strengthen valence perception of these words more than in other children with a greater variety of emotion words. The smaller emotion lexicon of the youngest MajKCs may be related to reduced input, which would dovetail with Park and Chough's (2012) finding of significant disparities in vocabulary size and receptive and expressive language development for 4- to 5-year-old children of immigrant families in Korea vis-a-vis monolinguals due to a lack of Korean input at home. However, despite reduced input at home and a smaller emotion lexicon before primary school, the majority context of MajKCs appeared, over time, to counteract the disadvantage of limited early exposure to Korean. MajKCs' acquisition of emotion words burgeoned once they started school, leading to a KC-like, even closer to adult-like, level by age 11. In light of their relative position before primary school, which would have kept them behind KCs throughout the observed period had there been only an age effect on emotion word development, the MajKCs' trajectory can be considered remarkable.

Thus, the notable improvement of MajKCs is suggestive of a deep societal impact on the psychological/mental processes by which emotion words are learned. Boiger and Mesquita (2012) argued to conceive of emotions as ongoing, dynamic, and interactive processes that are socially constructed. Likewise, language acquisition is greatly influenced by the social environment, which motivates people to learn and use the language dominantly spoken in that environment, leading to higher frequency of language choice and, presumably, higher proficiency in that language (Kasuya 1998; Ożańska-Ponikwia and Dewaele 2012). In this sense, by entering schools with a majority language (the target language) and culture (that associated with the target language) and being exposed to the majority culture elsewhere, MajKCs could experience a good deal of transformation and psychological adjustments motivated by a sociocultural and linguistic environment favoring the association of norms with the target language and culture. Thus, MajKCs would have been well-positioned to develop emotion words in Korean efficiently.

From a mechanistic point of view, MajKCs' remarkable emotion word development could also be related to overall increased "fluency" in the target language, as reflected in vocabulary size and/or use. To explore this possibility, we calculated correlations

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competency is, instead, richer than KCs', allowing them to flexibly choose between more available forms of expression according to situation or linguistic environment). However, when considering the minority language only, it is fair to say that MinKCs' emotion word competency showed less development than that of children in a majority language context (i.e., MajKCs and KCs).

between MajKCs' Korean receptive vocabulary scores and most recent Korean use estimates (see the supplementary material at `URL-redacted-for-review`) on the one hand, and their correlations with Korean adults' valence ratings (Figure 2) and unknown item counts (Figure 4) on the other hand. These exploratory analyses indicated that MajKCs' proximity to adult-like valence ratings was significantly positively correlated with overall Korean receptive vocabulary size [Pearson's $R(43) = .538$, $t = 4.189$, $p < .001$] and marginally positively correlated with Korean use [Spearman's $\rho = .262$, $S = 7862.5$, $p = .051$], while their unknown item counts were significantly negatively correlated with both Korean receptive vocabulary size [Spearman's $\rho = -.476$, $S = 22413$, $p < .001$] and Korean use [Spearman's $\rho = -.390$, $S = 14812$, $p = .006$]. Given the moderate size of these correlations, these results are consistent with the view that "fluency" variables are related to MajKCs' observed emotion word outcomes, but do not fully account for them. Future research should further explore the contribution of these variables, as well as their relationship to the sociocultural and psychological adjustments mentioned above. In this regard, studies using a longitudinal design, which effectively factors out the differences between age bands that are hard to fully control for in a cross-sectional study, have great potential to strengthen our cross-sectional findings on MajKCs' developmental trajectory.

In contrast to the majority context, the minority context appeared to exert an inhibition effect on bilingual children's emotion word development in the target language. MinKCs, whose primary home language was consistently Korean, showed the highest performance both on valence ratings and word knowledge at ages 4–5, which is before entering primary schools. After this point, however, they did not show any significant change and thus diverged from KCs and MajKCs by ages 11–13, particularly in knowledge and valence perception of 'positive' valence items. As for why the minority context exerted this type of effect, one possibility is that, as MinKCs feel more peer and societal pressure toward the majority language over time, this may affect their motivation to develop emotion words, as well as possibly other types of words (see the vocabulary scores in the supplementary material), in their minority (heritage) L1 even if they generally want to maintain this language; this may parallel what could be happening in MajKCs' minority L1s, which we did not directly examine. Due to reduced input and use of their L1 during schooling, MinKCs' proficiency in that language may soon become insufficient to freely communicate in it, causing them over time to further reduce their use of the L1 even at home. Thus, multiple factors, including motivation, input, proficiency, and use, may be involved here; future work teasing these factors apart would contribute to a fuller picture of the inhibition effect of the minority language context.

The use factor in particular is already well-documented in terms of the loss of *domains* among immigrants speaking various minority languages. A domain is a cluster of situations that directly influences language choice or shift (Fishman 1972; 1982). While the local majority language is chosen for use in many formal domains such as school, family is one of the few domains where a minority language may predominate. However, as "young children who attend school are likely to acquire the majority language and to use it in daily interactions so as to become more like the local children" (Urzúa and Gómez 2008), they may shift to the majority language even at home, eventually leading to minority language loss. For example, Fishman (1972) reported that the mean number of words named by young schoolchildren in the family domain was

much higher in their minority L1 (Spanish) at ages 6–8, but then higher in their majority language (English) at ages 9–11. Such domain loss in a minority (heritage) language may be attributed to weaker loyalty toward this language (as individual and societal attitudes toward heritage language use may be negative rather than positive) and/or to weaker resistance to adopting the majority language, at least in the domains over which minority language users can exercise full control, such as the family domain (e.g., Arriagada 2005). Notably, evidence suggests that complementary pressure to maintain the minority L1 without practical assistance is not helpful for its maintenance (Tseng 2021), meaning that counteracting the inhibition effect of the minority language context will be more complex than insisting on the use of the minority language at home.

Looking forward, it is worth reiterating that this study has glimpsed only part of bilingual children's language knowledge—namely, their knowledge of Korean—and a great deal more research is needed to understand the broader consequences of the minority language context, such as its role in bilingual repertoire development (i.e., including the majority language), translingual adaptation to diverse communicative circumstances, and/or domain-specific development by language. We do not yet know what MinKCs' emotion word development looks like in other languages (in particular, their majority language), although judging from MajKCs' Korean outcomes it is reasonable to think that MinKCs may achieve L1 adult-like levels of attainment in their majority language as they grow up. Given the goal of this study to compare bilingual children speaking the same language (as a majority or minority language), our focus did not extend to their full linguistic repertoire because examining emotion words in multiple languages, which denote different meanings across those languages (De Leersnyder et al. 2011), is very challenging. Nevertheless, this is in principle possible, and carefully designed future studies examining bilingual children across their two (or more) languages—including approaches that consider bilingual children in a continuous, as opposed to group-based, manner—will be beneficial for providing a more holistic view of their emotion word knowledge.

Conclusion

This study is the first attempt to reflect the contemporary reality of bilingualism in research on emotion word development and to demonstrate the impact of societal context on emotion word competency. By examining two aspects of emotion word development (namely, valence perception and word knowledge) as well as three different societal contexts of language learning, the present study provided a broad view of the dynamics of emotion word acquisition in relation to the acquisition environment.

A principal contribution of this study is in shedding light on developmental issues for a bilingual child's minority L1. In view of the importance of social context in emotions and emotional acculturation in immigrants (De Leersnyder et al. 2011; Boiger and Mesquita 2012), our findings encourage considering bilingual children's emotion word development as a 'macro' outcome of societal influence instead of a 'micro' outcome arising directly from the individual. Given that MinKCs' emotion word competency, including emotion lexicon size, did not significantly change during childhood (at least in comparison to children in the majority language context), after childhood their emotion word competency may very well diminish unless carefully supported. Nevertheless, it is noteworthy that MinKCs' valence perception of emotion words stayed stable, consistent

with a positive effect of early exposure on the connection between emotionality and emotional expressions learned during childhood (Harris et al. 2003). This pattern raises two related questions for future research. First, what does the developmental trajectory of emotion words look like after childhood? Second, what factors can promote (or, conversely, impede) maintenance and further development of emotion words in a minority language?

In closing, it is our hope that the present findings contribute to a deeper understanding of not only emotion word development but also societal context, which can be a starting point for considering how to support bilingual children's emotion word competency in the minority language, their mother tongue. The children of immigrant families are, in many ways, like the tomato-potato plant—more like a graft than a hybrid. Their very existence is based on (at least) two different cultures embedded in two languages. It is worth encouraging their emotion word competency in the mother tongue because this is not just a matter of lexicon size; it is the key to resolving difficulties in communication with their parents (Xia et al. 2013) and any generational gap (Tseng 2021) exacerbated by often-reported cultural differences in emotional concordance (De Leersnyder et al. 2011; Urzúa and Gómez 2008). By facilitating communication at home, a well-developed emotion lexicon in the mother tongue may also be instrumental in maintaining the language in the long run. To put it simply, sound fruits in sound roots: as a core part of the lexicon, well-developed emotion words may help save minority languages, thereby yielding fruitful outcomes for linguistic diversity in a multicultural society.

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Table 1. Demographics of the four participant groups. KA = L1 Korean adults; KC = children using Korean inside and outside the home; MajKC = children using Korean as a majority language; MinKC = children using Korean as a minority language.

Group	*N* total	*N* female	*N* male	M_{age} (yr)	Age range (*SD*)
KA	53	39	14	28.2	20–47 (7.5)
KC	69	47	22	8.1	4–13 (1.9)
MajKC	52	37	15	8.5	5–13 (2.1)
MinKC	39	27	12	7.8	5–12 (2.1)

Figure 1. Emoji-based valence scale used in the valence rating task.

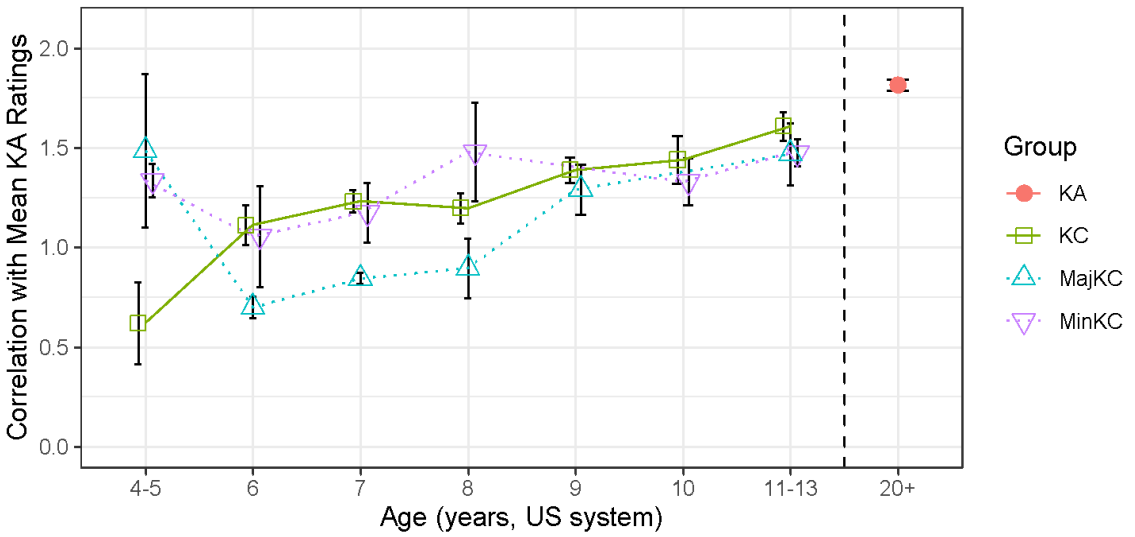
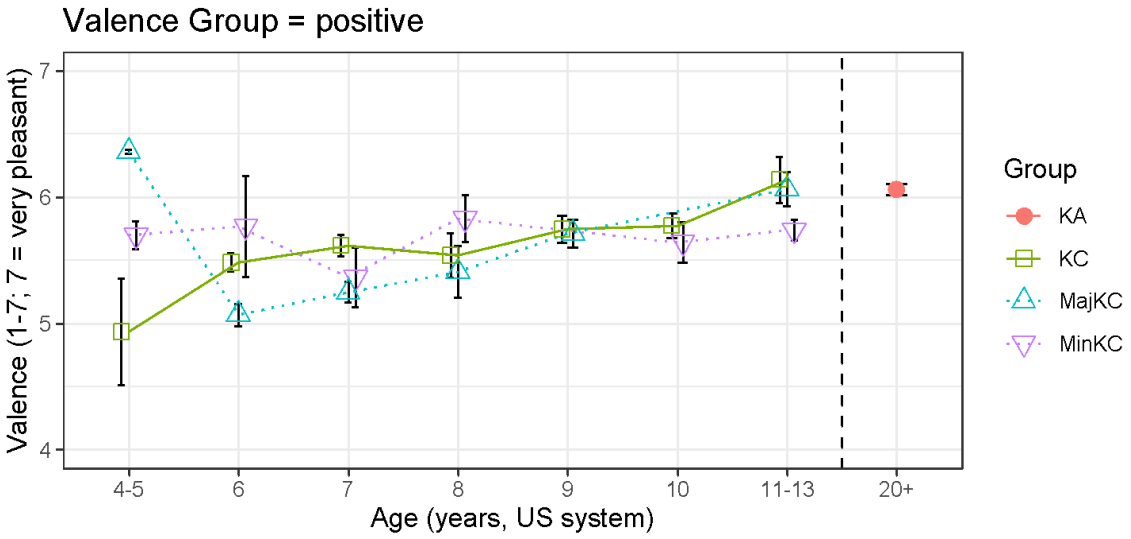


Figure 2. Correlations (in terms of Fisher's *Z*) between participants' valence ratings and the KA group mean valence ratings, by age band and group. Error bars represent standard error.

(a)



(b)

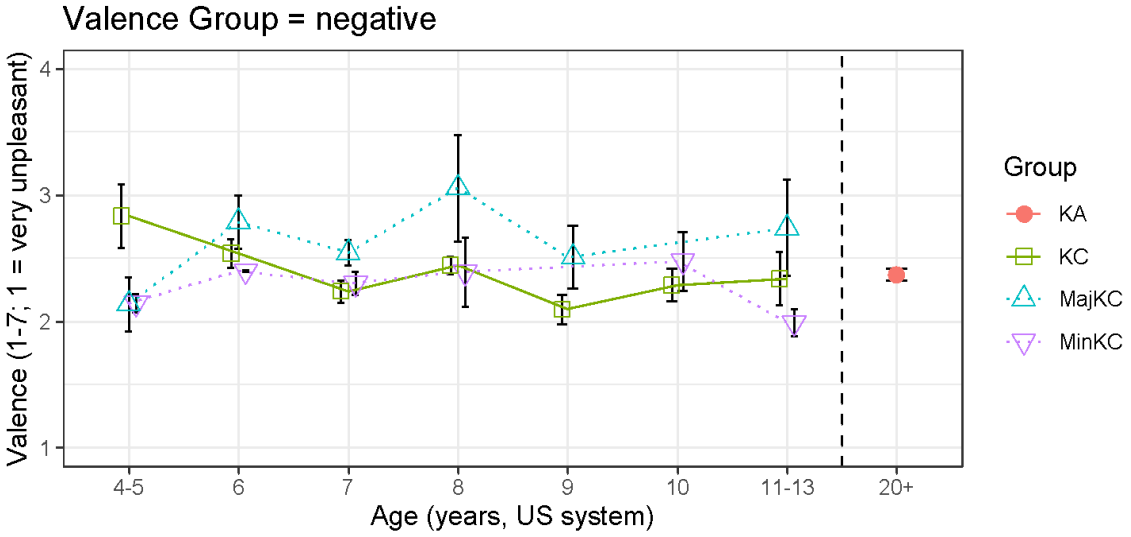


Figure 3. Valence ratings (on a 1–7 scale; 7 = very pleasant) for items in the 'positive' (a) and 'negative' (b) valence group, by participant age band and participant group. Error bars represent standard error.

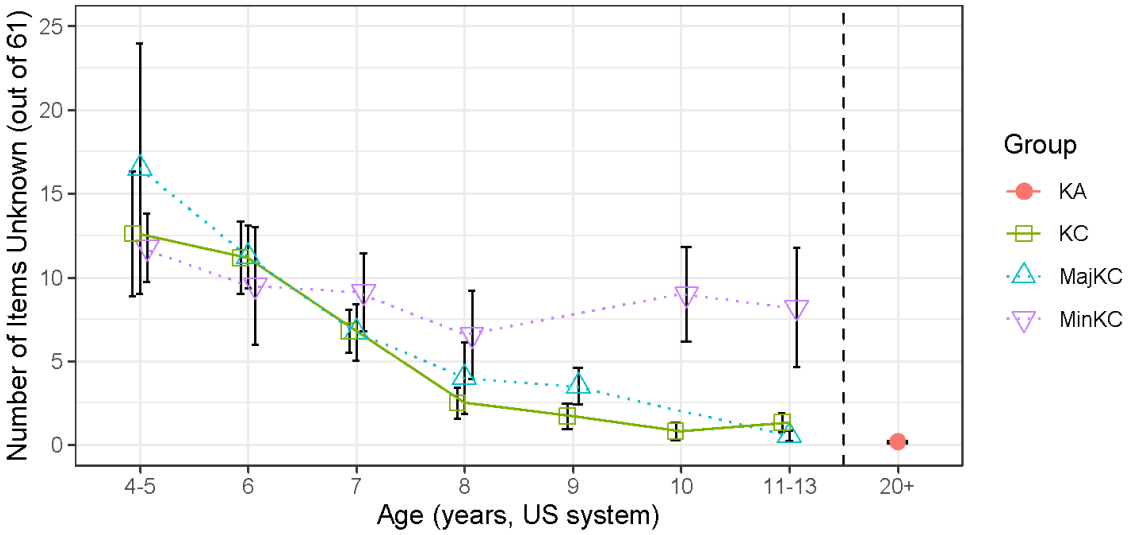


Figure 4. Numbers of unknown items (out of 61), by age band and group. Error bars represent standard error.