

# Acquisition of adjectives across languages and populations: What's wrong with them?

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*This article presents a review of recent research on the acquisition of adjectives across languages and different learner groups. It has often been noticed in the literature that adjectives are problematic for different groups of learners (L1, L2, SLI, etc.) and that they are acquired later than nouns and verbs. This review aims to provide explanation of the adjective challenge based on empirical data from a number of recent studies. It is proposed that adjectives are difficult because they are relatively infrequent in the input, often have abstract meanings, depend on the nouns and because their learning involves enhanced attention control and theory of mind<sup>1</sup>.*

## 1. INTRODUCTION

I have been privileged to collaborate with Marianne Kilani-Schoch and other participants of the *Pre- and Protomorphology* project on the topic that has intrigued me for years – adjectives in child language. This collaborative endeavour has provided a lot of useful

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insights into the “adjective mystery”. This festschrift appears to be the perfect outlet for a review article that would bring these different insights together, place them in a broader perspective and try to provide some answers based on converging evidence from multiple studies.

So what do I mean by the “adjective mystery”? Adjectives are communicatively important, as they describe properties of people, objects and events. These can be physically perceived properties (e.g. *red, soft*) or more abstract properties such as internal states (e.g. *sad, happy*) and evaluation (e.g. *nice, boring*). This said, there is plenty of evidence that adjectives present a real challenge to different groups of learners. Adjectives appear in child speech (CS) later than nouns and verbs: Children start producing their first words around the age of 12 months, adjectives occasionally occur in CS in the second year of life, but it is not before age 1;8 that children start learning adjectives at high pace (Tribushinina *et al.* 2014). In fast-mapping tasks monolingual children associate nominal forms with a category-based match as early as 14 months of age (Booth & Waxman 2009). However, even 3-year-old toddlers are known to have trouble mapping novel adjectives onto properties (Tribushinina 2017). Adjective agreement is notoriously difficult for L2 learners (Blom, Polišenská & Weerman 2008), simultaneous bilinguals (Rodina & Westergaard 2017), deaf children with cochlear implants (Tribushinina, Gillis & De Maeyer 2013) and children with SLI (Orgassa & Weerman 2008).

What makes adjectives so challenging to language learners? In this review article I try to give some answers to this question based on recent research conducted in our group, primarily drawing on the results of the collaborative *Pre- and Protomorphology* project.

## 2. INPUT FREQUENCY

Part of the problem seems to be that adjectives are rather infrequent. Longitudinal case studies of children acquiring different languages report that adjective tokens constitute only 2–6% of all word tokens in child-directed speech (CDS) (Tribushinina, Voeikova & Noccetti

2015). Token frequencies of adjectives in CS grow fast between ages 2 and 3 and reach an adult-like level around age 3 (Tribushinina & Gillis 2012). Parents also increase their adjective use as a function of child's age (Tribushinina *et al.* 2014).

Frequencies not only affect the acquisition of the adjective category as a whole, but also influence the development of specific semantic classes. Semantic classes that are relatively frequent in parental speech (e.g. colour and size terms) emerge early in CS, and semantic classes barely used by the parents (e.g. internal state terms) are also barely used by the children. A corpus study reported in Tribushinina (2013b) has shown that the order in which spatial adjectives emerge in the speech of Dutch children is predominantly determined by the frequencies of these adjectives in the input.

The impact of frequency is particularly visible when it comes to children with language processing difficulties. For example, children with SLI have difficulty processing the input, which means that they need more exposures to the target item (e.g. word, morpheme) before they acquire it. Since adjectives are infrequent in the input, it often takes children with SLI much longer to acquire adjective morphology compared to typically developing peers (Marshall & Van der Lely 2007; Tribushinina & Dubinkina 2012).

Adjective morphology is less problematic for children with language disorders acquiring a morphologically rich language (Tribushinina & Dubinkina 2012) than for language-impaired children whose L1 is morphologically scarce (Blom *et al.* 2008; Orgassa & Weerman 2008). One of the reasons is that morphologically rich languages give learners ample evidence of the relevant distinctions. Also, for languages with sparse morphology word order is a more reliable cue, whereas for morphologically rich languages inflectional morphology is more informative (Dressler 2005).

The acquisition of adjective vocabularies is less impaired than the acquisition of inflectional morphology (Tribushinina & Dubinkina 2012); so lexical acquisition appears to be less susceptible to the effects of reduced intake in SLI compared to the acquisition of ad-

jective morphology. Similar findings have been reported for deaf-born children with cochlear implants: The frequencies of adjective tokens are similar in the speech of cochlear-implanted children and normally hearing peers (Herzberg 2010; Tribushinina, Gillis & De Maeyer 2013). The size of adjective vocabularies (lexical diversity) also seems rather unproblematic in this population, at least for patients who were implanted in the first two years of life (Tribushinina, Gillis & De Maeyer 2013); later surgery is associated with significantly reduced exposure and negatively affects the size of adjective lexicons (Le Normand, Ouellet & Cohen 2003). However irrespective of the age of implantation, the acquisition of adjective morphosyntax is significantly delayed in children with cochlear implants, most likely due to low perceptual salience of free and bound morphemes needed to produce full syntactic structures and to realize adjective-noun agreement (Herzberg 2010; Szagun 2000; Tribushinina, Gillis & De Maeyer 2013).

Reduced frequency also makes adjective acquisition problematic for children who have less exposure to the target language. For example, early sequential bilinguals often have a hard time acquiring adjective agreement in the L2, especially in languages such as Dutch where adjective morphology is scarce and non-transparent (Blom *et al.* 2008; Orgassa & Weerman 2008). In the same vein, recent work in our lab shows that simultaneous Dutch-Russian bilinguals growing up in the Netherlands with limited exposure to Russian have smaller adjective vocabularies compared to Russian monolingual peers (with and without SLI). Furthermore, adjective-noun agreement seems to be affected to the same extent by both reduced input (in simultaneous bilingualism) and reduced intake (in SLI), as evidenced by frequent agreement errors in both groups.

### 3. SELECTIVE ATTENTION

Imagine a toddler playing with a colourful Lego train. The mother is sitting next to the child and says *What a long train!* If the child does not know the meaning of *long*, how can she succeed in mapping it

onto the relevant property? To begin with, the language learner has to figure out that the novel word refers to a property rather than to an object or action. Initially, children tend to map novel words onto whole objects (Markman 1990). If the child already knows the word *train*, she will have to look further and may hypothesize that *long* refers to a property or to a part of the train. But this is a demanding enterprise because learning new adjectives requires the child to inhibit the whole-object-bias and to attend selectively to a property. Even though children are able to distinguish nouns from adjectives based on syntactic cues by the age of 14 months (Booth & Waxman 2009), they still have trouble ignoring the whole object and focusing specifically on its properties. An experiment reported by Yoshida, Tran, Benitez & Kuwabara (2011) has revealed that 3-year-old monolinguals perform at chance in a task where they have to choose between a category match (noun interpretation) and a property match (adjective interpretation). Selective attention (*i.e.* ability to shift attention from the whole object and selectively attend to its properties) was shown to be a significant predictor of success in adjective learning. Bilinguals are known to have an advantage in inhibitory control (due to massive experience of inhibiting one of their languages) and this cognitive advantage helps them in adjective learning. Unlike monolinguals, bilingual 3-year-olds in Yoshida *et al.* (2011) were able to choose a property match at a rate above chance. It is interesting to notice in this connection that our recent work on adjective production by older bilingual children has presented similar evidence of bilingual advantage in adjective learning: Even though bilinguals' adjective vocabularies are smaller than in monolinguals, they make relatively few semantic errors, such as substituting a specific dimensional adjective (e.g. *long*) by a more general term (e.g. *big*).

To return to the above example, let us assume that our toddler was able to assign a property (rather than an object) interpretation to the novel word *long*. Now, how does she know which of the many properties of the Lego train is referred to? Even if the adjective

denotes a visually perceived property, as is the case with *long*, the child is confronted with the problem of richness of perception (Gleitman 1990). *Long* introduced in the sentence *What a long train* could potentially refer to any property, such as colourfulness, size or attractiveness. Furthermore, as shown by Beekhuizen, Bod & Verhagen (2017), there is often a temporal mismatch between the child focusing on a property and the parent mentioning the corresponding adjective.

So what helps our toddler to discover the meaning of *long*? There is converging evidence from experimental and corpus-based studies that contrast plays a facilitating role in mapping adjectives onto target properties. Research by Waxman and associates has demonstrated that without a visual contrast toddlers can only generalize adjectival meanings *within* categories (*long train* to another long train), but not across categories (*long* from a long train to a long caterpillar). However, when presented with a novel adjective in a contrastive context, 3-year-olds are able to extend the adjective to members of a different category as well (Waxman & Klibanoff 2000). To resume the above example, if the mother of our toddler contrasts the long train with a short train, the child would be likely to map the adjective onto the relevant property and even to extend it to a different basic-level category (e.g. long caterpillar).

Corpus research shows that parents might be sensitive to the facilitating role of contrast relations and often use adjectives in contrastive contexts (e.g. *This train is long and that train is short*) (Murphy & Jones 2008). However, there are large individual differences between parents. For example, the parents of the French-speaking children studied by Kilani-Schoch (2015) barely used semantically related adjectives in the same contexts. In contrast, the parents of the Russian-speaking children studied by Tribushinina (2015) used co-occurring antonyms in almost a third of all adjective tokens. A growth-curve analysis reported in Tribushinina *et al.* (2013) has revealed that these individual differences in CDS are predictive of the speed with which adjectives are acquired by child-

ren. Children of heavy antonym users tend to acquire adjectives faster than children of light antonym users.

Contrast appears to be particularly useful in semantic domains such as colour and size. From a relatively young age children know that they should answer the question *What colour is the train?* with a word such as *red*, *blue* or *green* (Sandhofer & Smith 2001). But for a very long time they would use colour terms haphazardly or apply a single word to all colours. However, the accuracy of colour term use increases when a child is presented with same-kind objects that only differ on the dimension of colour (Cruse 1977).

Recent eye-tracking experiments in our lab have revealed that children as young as 3 years of age are able to predict the upcoming noun based on the contrastively used spatial adjective. In the condition with two same-kind objects (e.g. a big chair and a small chair) and a distractor (e.g. butterfly as big as the bigger chair) toddlers start looking at the big chair, already upon hearing the adjective 'big'; they expect that the adjective would refer to a member of the contrastive pair, even though the distractor in the picture is as big as the target. This finding suggests that children use contrastive information in the processing of (dimensional) adjectives from the earliest stages of adjective acquisition.

Before closing this section, it is important to emphasize the important role that semantic diversity plays in the consolidation of the adjective class. In the *Pre- and Protomorphology* project we tested the hypothesis that semantic diversification of adjectives is a prerequisite to their grammatical development. We tested this hypothesis by establishing how many different semantic classes of adjectives (e.g. colour, size, value, physical property) should be present in CS before children start inflecting adjectives and using them in full-fledged syntactic constructions (attributive, predicative, adverbial). Interestingly, there was a lot of individual variation in terms of the number of different adjective lemmas. For example, the two French-speaking children (Emma and Sophie) studied by Kilani-Schoch (2015) differed significantly in the number of adjective lemmas in the their

speech at the time that the children started inflecting more than 10% of their adjective tokens and using more than 10% of adjectives in their typical syntactic positions. For Emma the transition to the morphosyntactic stage happened when she actively used 7 adjective lemmas, whereas for Sophie this happened when she already had over 25 diverse adjectives in her active lexicon.

However, when we look at the number of adjectives from diverse semantic classes (rather than the number of individual adjective lemmas), the picture becomes much more uniform. Across languages, children start using adjectives in single-word utterances and telegraphic phrases (e.g. *Hot!*); the transition to the adjectival syntactic constructions (mainly attributive and predicative use) happens when children use adjectives from about 6 different semantic classes. Consistent inflection emerges when children have about 7 adjective classes in their active lexicon.

Why would it be the case that the diversity of semantic classes is more important in the consolidation of the adjective category than lexical diversity as such? I would like to suggest that diversification of adjective classes contributes to the development of selective attention to properties. For a young child it is rather hard to inhibit the whole object and start focusing on one of its dimensions (e.g. only colour or only shape). Adjectives, as it were, invite the child to attend to a variety of different properties so that the child gradually comes to realize what a PROPERTY actually is: it is a characteristic of an object, which is not the object itself. In order to grasp the abstract notion of PROPERTY, the child has to discover commonalities between such different properties as colour, size, shape, taste or smell. By generalizing over these diverse properties, the child understands what properties are, and this understanding creates a communicative need to talk about properties. This need urges the child to use adjectives as attributes (e.g. *the blue ball*) or predicatives (e.g. *the ball is blue*). Inflection then arises as a direct consequence of syntactic consolidation, since syntactically used adjectives have to agree with their nouns in, for example, gender or number.



To conclude, in my view, the process of adjective learning is bi-directionally related to the development of selective attention. Adjectives channel the child's attention to individual properties, which fosters the development of attention control. Enhanced selective attention, in turn, bolsters adjective learning, as convincingly demonstrated by Yoshida and colleagues (2011).

#### 4. NOUN DEPENDENCY

Adjectives might also be problematic because of their secondary status, since they depend on nouns in multiple ways. Morphologically, adjectives tend to agree with nouns in gender, number and/or case. Syntactically, adjectives modify nouns either as prenominal attributes or predicatives. Semantically, adjective meanings are commonly determined by noun meanings (cf. *red blood* vs. *red hair*). Developmental studies reveal that the acquisition of adjectives is interwoven with and facilitated by the knowledge of modified nouns (Graham, Cameron & Welder 2005; Mintz 2005; Mintz & Gleitman 2002). These studies show that in order for adjective acquisition to be successful, a property denoted by the adjective must be mapped onto a specific taxonomic class of entities; a vague category label such as *one* is not sufficient for adjective learning. In a similar vein, corpus-based longitudinal studies reported in Tribushinina (2008, 2013b) have shown that early adjective production hinges on the specific adjective-noun combinations attested in CDS. Children keep track of adjective-noun combinations (or adjective-object pairings) in the speech of their caregivers and initially only apply adjectives to this restricted set of entities. Later, around age 3, children start using adjective-noun phrases productively; this is when first combinability errors are attested. Early sensitivity to adjective-noun combinations is also supported by the finding that 3-year-olds can predict the noun based on the prenominal adjective. For example, Dutch-speaking toddlers are more likely to look at a tower than at a candle upon hearing the adjective *hoog* 'high/tall' (Tribushinina & Mak 2016).

The various aspects of noun dependence have been shown to cause difficulties in acquisition. For instance, gender agreement between pronominal adjectives and their head-nouns is one of the most persistent problems in SLI. A recurrent finding in the literature is that gender marking on adjectives might be particularly vulnerable in SLI, more so than determiner-noun agreement (see Leonard, Salameh & Hansson 2001 for Swedish; Orgassa & Weerman 2008 for Dutch; Roulet-Amiot & Jacobowicz 2006 for French; Silveira 2011 for Brazilian Portuguese). One explanation that has been proposed in the literature is that determiner-noun combinations can be retrieved via lemma look-up, whereas adjective agreement involves an inflectional process that might be impaired in SLI (Rakhlin, Kornilov & Grigorenko 2014; Silveira 2011). Another possible explanation is that adjectives are optional and much less frequent than determiners (Roulet-Amiot & Jacobowicz 2006).

Research targeting children's sensitivity to semantic dependence of adjectives has primarily focused on the interpretation of relative adjectives (mainly size terms) by pre-schoolers. In one such study Smith, Cooney & McCord (1986) investigated the ability of 3- to 5-year-old children to interpret the English adjectives *high* and *low* in a context-sensitive way, *i.e.* on the basis of their knowledge of object classes (conceptual knowledge) and the extent of the visually given range (perceptual context). Smith *et al.* (1986) report that 3-year-olds only took one perceptual factor into account – extremes of the visually presented range (only the highest object is *high* and the lowest one is *low*). Four-year-olds were capable of shifting the cut-off points for *high* and *low* depending on an object category (birds vs. bunnies), but in a non-target-like way. Five-year-olds, like adults, took both the range of perceptual variation and the object category into account (see Tribushinina 2013a for similar results for Dutch).

To summarise, semantic and morphosyntactic dependence on nouns is another reason why adjectives might pose a challenge to a language learner. The acquisition of the adjective category requires

a consolidated noun category. Knowledge of noun meanings and morphology is a pre-requisite to successful learning of adjectives.

#### 5. PRAGMATICALLY ENRICHED USE

Adjectives are also complex because they are often used in pragmatically enriched contexts. In adult language, adjectives are rarely used for pure description. They are more often used for argumentative purposes. Imagine a child picks up a filthy stone from the street and the mother says *Darling, it's dirty*. In this case, which represents a very common context for using adjectives, the primary communicative intention of the speaker (mother) is to advise the child not to touch the filthy object rather than to describe the stone.

Tribushinina (2012) tested the ability of children aged 2–5 to infer the relevance implicature from such adjectival descriptions. In the context of a shopping game the children had to decide whether the customer wanted to buy the product based either on direct responses (e.g. *No, I do not want it*) or on indirect descriptions (e.g. *I find it boring*). Even the youngest participants in this study performed rather well in the indirect condition. However, all children had more difficulty with indirect than with direct utterances. Furthermore, 2-year-olds only succeeded in making the inference when there was joint attention between the child and the “customer”. In the absence of joint attention, 2-year-olds performed at chance with pragmatically enriched negative adjectives. These results reveal that adjective comprehension also depends on the social skills, such as intention reading and theory of mind.

Pragmatic uses of adjectives may also have a facilitating effect on adjective acquisition. A case in point is the pivot role of the French adjective *petit* in the development of the adjective category. As demonstrated by Kilani-Schoch & Xanthos (2013), pragmatic uses of *petit* (predominantly endearment and mitigation) drive the development of attributive phrase. Interestingly, purely semantic uses of *petit* are less frequent and emerge later in CS. The authors claim

that in French “pragmatics plays a language-specific central role in the settlement of a first pattern of noun phrase with adjective in modifier position” (Kilani-Schoch & Xanthos 2013, 118). *Petit* is the first adjective to enter morphological contrasts and the one combined with a wide variety of head-nouns in early CS.

For languages other than French it has also been noticed that evaluative adjectives are the most frequent adjective class in CDS, reflecting the affective nature of parent-child conversations. It is noteworthy that despite their abstractness, evaluative adjectives are among the first adjective classes to emerge in CS (Tribushinina *et al.* 2014), which might be due to amazing social skills of human infants.

## 6. FUTURE RESEARCH

This article has briefly reviewed some of the factors that might explain why adjective learning tends to be demanding across languages and populations. These explanatory factors range from purely linguistic variables (frequency, noun dependency morphological richness) to cognitive (selective attention, inhibitory control) and social skills (intention reading, theory of mind). In order to get more insights into the complex interplay between these different variables in adjective acquisition, we need to conduct more longitudinal studies, in which development of adjective form and meaning will be studied in tandem with environmental factors, as well as with cognitive and socio-emotional development of the child.

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