

The Acquisition of Antonymous Dimensional Adjectives by Italian Preschoolers

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1. Introduction

Antonymy is identified as a lexical-semantic relation of opposition which plays a central role in the organization of the mental lexicon and discourse (Cruse 1988; Dees 1962; 1964; Jones 2002; Paradis and Willners 2006, a.o.). In a language with adjectives, adjectives are the best candidate to encode binary opposition according to speakers' judgments and represent the most frequent form of antonyms in a lexicon (Jones 2002; Paradis, Willners and Jones 2009).

The present study focuses on the acquisition of antonyms of relative gradable adjectives, such as *big* and *small*, that is those adjectives which evoke the notion of degree and can appear in comparative constructions such as *X is bigger/smaller than Y* (see Syrett 2007; Syrett, Bradley, Kennedy, and Lidz 2006; Syrett, Kennedy, and Lidz 2010 for the acquisition of gradable adjectives). Antonyms are at the same time minimally and maximally different from one another. Since they relate to the same conceptual domain, they are maximally similar; at the same time, since they occupy opposite poles of the very same domain, they are perceived as maximally different (Murphy 2003). For example, the adjectives *long/short* both relate to the dimension of length - therefore they are maximally similar; at the same time, they are maximally different since *short* occupies the negative pole, while *long* occupies the positive pole. Accordingly, members of antonymic pairs have been generally thought of in terms of polarity such that one member of a pair is the positive and the other one is the negative member (Lehrer and Lehrer 1982; Cruse 1986; Heim 2008). A number of quite distinct criteria have been proposed to determine the polarity of antonyms. According to a

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morphological criterion, in a pair like *happy/unhappy* the positive member is the one that lacks the negative prefix (Horn 1989). According to a semantic criterion, the positive member is the member whose associated scale is the one in which the relevant dimension is measured (von Stechow 1984; Bierwisch 1989; Kennedy 1997; Solt 2015). Hence, *long* is positive because its scale is the scale of length. Other approaches have suggested that polarity is defined according to subjective judgments of (un)desirability, according to which the positive member corresponds to the possession of the most desirable property (Horn 1989; Paradis, van de Weijer, Willners and Lindgren 2012; Sassoon 2013). Since Clark (1970), polarity has been associated with the notion of markedness. Evidence for the narrower distribution, and thus, markedness of negative adjectives, includes their non-licensing with measure phrases and ratio phrases. Likewise, only the unmarked positive member of the antonymic pair can have a nominal interpretation, i.e., it identifies a certain dimension or a scale on dimension as in ‘how tall is your son?’ and ‘he is 90 cm tall’ (Bierwisch 1989).

While theoretical works have proposed various arguments in support of a difference between the members of the antonymic adjectival pair, less is known on whether and how the polarity relation between the two members of antonyms is reflected in acquisition. Does a child need to know the meaning of *long* before knowing the meaning of *short*? Informally speaking, the following scenarios are conceivable. Since the positive member has a broader syntactic distribution, is associated with the dimension scale, and corresponds to the most desirable property, it is plausible that children first acquire the meaning of the positive member and later that of the negative counterpart. Alternatively, the acquisition of the positive adjective could be concomitant with learning its negative counterpart, given that members of antonyms co-occur in adult’s speech (Justeson and Katz 1991, 1992; Fellbaum 1995; Murphy 2003).

Our study investigates the acquisition of three antonymic pairs of gradable adjectives, *grande/piccolo* (*big/small*), *lungo/corto* (*long/short*), and *alto/basso* (*tall/little*) by Italian-speaking children between the ages of 3 and 5, and adults.

The structure of the paper is as follows: Section 2 reviews previous findings regarding the acquisition of adjectives and antonyms in child language; Section 3 describes the experiment; Section 4 reports and discusses the findings; Section 5 concludes the paper.

2. The acquisition of adjectives and antonyms in child language

In general, adjectives are learned later than nouns and verbs and most evidence comes from English (Berman 1988; Caselli, Bates, Casadio and Fenson 1995; Davies, Lingwood, Ivanova and Arunachalam 2021; Ninio 1988). Children up to the age of 3 have difficulties in understanding that a novel adjective refers to properties of objects and not to categories (Waxman and Booth 2003) and can extend adjectives only to object belonging to the same category, unless supported by linguistic or extralinguistic context (Klibanoff and Waxman 2000; Mintz and Gleitman 2002; Waxman and Booth 2003). Young children also tend to make

substitution errors: they use more general adjectives instead of specific ones (e.g., *big* is used instead of *long* or *tall*) (Clark 1972; Clark 1973).

Focusing on antonyms, previous literature generally showed that negative antonyms are mastered later than their positive poles (Barner and Snedeker 2008; Donaldson and Wales 1970; Ehri 1976; Klatzky et al. 1973, Palermo 1974; Townsend 1976, a.o.). Substitution errors similar to those described above are also found with antonyms, whereby the positive term of a pair is used as if it were the negative (e.g., children tend to use *big* for *little* or *wide* for *narrow*) (Clark 1970). The delayed acquisition of negative antonyms could be explained by looking at the acquisition of relative gradable adjectives which are usually first interpreted ‘neutrally’, signalling a relevant property. For instance, *tall* and *short* are initially interpreted ‘nominally’, i.e., both as referring to objects/individuals that have a vertical dimension (Clark 1970; Panzeri and Foppolo 2012, Panzeri, Foppolo and Guasti 2013). This explanation could be extended to antonyms and could explain why negative antonyms are acquired later: children first access the nominal use of antonyms, so that both members of the antonymic pair mean “having the property X”. Only in a second step, the contrastive meaning of the adjectives is acquired. Conversely, these results can be interpreted as evidence that words consist of features and children learn the word with fewer feature specifications earlier than the word containing more features following the semantic feature hierarchy (Clark 1973). Accordingly, in an antonymic pair like *long/short*, both adjectives have the feature [dimension: length] but *short* has the additional feature [polarity].

Opposite findings have been reported in other studies, which showed that children comprehend both antonymic members as having opposite meaning from very early on (Carey 1978; Gathercole 1979; Phillips and Pexman 2015; Wannemacher and Ryan 1978).

Our work intends to add to previous research on the asymmetry between positive and negative antonymic terms, by investigating whether polarity affects the comprehension of antonymic adjectives and how children’s comprehension develops through age. We focus on Italian, a language on which very little research has been devoted to antonymy (see Noccetti, 2015; Foppolo and Panzeri 2011, Panzeri and Foppolo 2012; Panzeri, Foppolo, and Guasti 2013 for previous work on the acquisition of adjectives in Italian).

On the basis of previous acquisition studies, two research questions were formulated: (i) Does polarity affect the comprehension of antonymic adjectives?; (ii) How does children’s comprehension of antonyms develop through age?. In order to do so, we run a comprehension study with Italian preschoolers and adults.

3. Experiment

3.1. Participants

We tested 73 monolingual Italian-speaking children in three kindergartens located in the north-east of Italy. All parents gave written consent for their children’s participation in this study. A parental questionnaire ensured that none of the child participants had signs of language impairment, language delay, or

hearing problems. We also tested 20 adults as a control group: they included students recruited at the University of Padua and some of their parents. Adult participants gave written consent for their participation in this study. Children were tested individually at the kindergarten whereas controls were tested in a quiet room at the university in the case of students and at home in the case of their parents. We excluded from the analyses participants who did not choose the most extreme object (i.e., the biggest/tallest/longest one for positive items; the smallest/shortest/littlest one for negative items) more than 25% of the time, as this could be taken as a sign of a lack of understanding of the task, a lack of attention or a not complete mastering of the meaning of the adjective. On the basis of this criterion, a total of 4 children were excluded. Therefore, the analysis included 69 children: 19 3-year-old children (age range 38-48 months; mean age 43.5 months; SD 3;1 months); 25 4-year-old children (age range 49-59 months; mean age 54 months; SD 3;12 months); 25 5-year-old children (age range 60-72 months; mean age 66 months; SD 3;57 months) – and 20 adults.

3.2. Design and procedure

We restricted our investigation to three types of antonymic adjectives, i.e., *grande/piccolo* ‘big/small’, *lungo/corto* ‘long/short’, and *alto/basso* ‘tall/little’. The choice of these three pairs was motivated by the fact that they are reported to be good exemplars of opposable word pairs (i.e., canonical antonyms, see Paradis et al. 2009; Paradis and Willners 2006; van de Weijer, Paradis, Willners, and Lindgren 2012) and to be the first adjectives to be acquired (Clark 1973; Murphy and Jones 2008; Tribushinina et al. 2015).

The former member of each pair is positive while the latter is negative, as demonstrated by morphological facts. In Italian the dimension to which these adjectives refer is morphologically derived from the positive member: *alt-ezza* ‘height’, *lung-ezza* ‘length’, *grand-ezza* ‘size’.

A card selection task was designed to test children’s comprehension of antonymic dimensional adjectives modifying novel nouns. Pseudo nominal expressions which obeyed the phonotactic and morphological constraints of Italian were created and used to refer to novel objects in order to avoid semantic biases, the influence of previous ostensive learning, or world knowledge. The pseudo object-names were 12, that is 4 object-names per each pair of adjectives. For the *grande/piccolo* (*big/small*) adjectival pair the pseudowords used were: *mavorbi*, *catabombi*, *niodòli*, *falafurfe*; for the *lungo/corto* (*long/short*) adjectival pair, the pseudowords used were *cruffi*, *bruldi*, *divuchi*, *loniterpi*; for the *alto/basso* (*tall/little*) adjectival pair, the pseudowords used were: *fontepidi*, *gempi*, *plemboni*, *zarchi*.

For each test item one novel object was presented in 9 different sizes. The objects’ sizes were kept constant across all sets of items and varied gradually from object 1 (the biggest/longest/tallest object, i.e., 14.7 cm) to object 9 (the shortest/smallest/smallest object, i.e., 4.8 cm). Each object was printed on a card; the nine cards were arranged pseudo-randomly on a sheet of white cardboard of 100 x 70 cm (see Figure 1). The cards were attached to the cardboard with hook

and loop fasteners. The order in which the cards were arranged was kept for all participants and across conditions for all the test items.

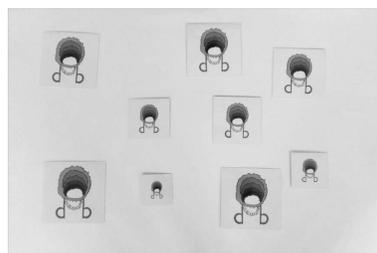


Figure 1. Arrangement of the nine objects on the white cardboard (test item: *catabombi*)

At the beginning of the experimental trials, the child was told s/he was about to enter Fantasyland, where there are creatures and objects that do not exist in the real world, and that s/he had to select some of them according to what the examiner would tell her/him. Adjectives were always tested in pairs, thus presenting the linguistic contrast to the participant, with the positive member presented before the negative one: *alto* vs. *basso* (*tall vs little*); *lungo* vs. *corto* (*long vs short*); *grande* vs. *piccolo* (*big vs small*). Hence, for each set (that is, for each sheet of pseudo-randomly arranged objects of the same type) two trials were comprised: one for the positive member of the antonymy and one for the negative one. On the back of each card there was a number corresponding to the size of the object in the 1-9 scale, so that the examiner could register the child's answer.

When the child was shown a new set of objects, s/he was asked to select the cards which according to her/him represented the *big/long/tall* N, where N stands for the plural name of one of the relevant items. An example of an item is given in (1). The child would then remove all of the selected cards and put them in a box to indicate her/his choice.

- (1) Guarda! Questi sono dei catabombi. Scegli i catabombi grandi.
'Look! These are some catabombi. Select the big catabombi.'

Between trials, cards were returned to their original positions on the cardboard, therefore children could select the same object(s) in both trials, i.e., an object could be labelled, for instance, as both *big* and *small* (or neither *big* nor *small*). Therefore, after the objects had been relocated on the cardboard, the child was asked to look again at all of the N and select the cards which according to him/her represented the *small/short/little* N:

- (2) Adesso guarda di nuovo tutti i catabombi e scegli i catabombi piccoli.
'Now look again at all of the catabombi and choose the small catabombi.'

In total, each participant was tested on 24 items: 4 object-names presented twice for each of the three antonymous adjectival pairs.

4. Results and discussion

We calculated the range of objects selected by each participant for each item. Recall that the 9 objects differed in size from object 1 being the *long-/tall-/biggest* to object 9 being the *short-/little-/small-est*. For positive adjectives (*big, long, tall*), the range is the distance between the biggest object (object 1) to the smallest object (object 9) chosen. For negative adjectives it is the converse, that is to say it is the distance between the smallest object (object 9) to the biggest object (object 1) chosen. For example, a chosen range of 7 for *tall* means that the participant chose all the objects except the two smallest ones. A chosen range of 4 for *small* means that the participant chose the four smallest objects. Notice that this procedure allows for gaps, i.e., in the first example one of the seven big objects might not have been chosen, still the range is 7.

We first conducted a preliminary inspection of the response patterns. As already reported in Section 3.1, four children were excluded from the analyses since they did not select the extreme objects in more than 25% of the cases, so these children are not included in this analysis.

We started by analyzing the percentage of cases in which the extreme object was not selected (see Table 1) as this result might be interpreted as a not yet mature understanding of the adjectives, or as an indication of difficulties in the execution of the task.

Table 1. Percentages of cases in which the most extreme object was not chosen, for each group and for each adjective.

group	adjectives					
	big	small	long	short	tall	little
3-year-olds	0%	3.94%	0%	11.84%	0%	3.94%
4-year-olds	1%	2%	1%	11%	1%	3%
5-year-olds	0%	1%	1%	4%	2%	1%
adults	0%	0%	0%	1.25%	0%	0%

The results suggests that the task was not particularly difficult for children; in fact, when looking at positive adjectives, there is no difference between adults and children. Adults did not choose the most extreme object only in 1 item out of 80 for the *short* adjective. Children did not choose the most extreme object in few cases, and they did so especially in the negative adjective conditions. When groups are considered, 3 and 4-year-old children are those who did not choose the extreme object more often. When adjectives are considered, the extreme object was not chosen most often for *short*; this result might suggest that in terms of acquisition, *short* is the most challenging adjective. Nevertheless, these results suggest that children know the meaning of the adjectives used in the experiment.

We then looked at cases in which only the most extreme object was selected (Table 2). Interestingly, the results show a prevalence of this type of responses for negative adjectives, which are interpreted by some 5-year-olds and adults as relative superlatives. This result is in contrast with previous findings showing that children exhibit extreme labelling, i.e., when they are asked to judge a series of objects decreasing along a relevant dimension, young children tend to apply the relative term only to the extremes of that series (Foppolo and Panzeri 2011; Smith, Cooney, and McCord 1986; Syrett 2007, a.o.).

Table 2. Percentage of cases in which only the most extreme object was selected, for each group and for each adjective

group	adjectives					
	big	small	long	short	tall	little
3-year-olds	0%	2.63%	0%	0%	0%	1.31%
4-year-olds	1%	5%	2%	2%	0%	1%
5-year-olds	0%	5%	0%	5%	1%	7%
adults	0%	6.25%	0%	6.25%	0%	6.25%

Finally, we looked at cases in which all nine objects were selected (Table 3). The results show that this response pattern is found in particular in 3-year-olds, yet in very few cases.

Table 3. Percentage of cases in which all 9 objects were selected, for each group and for each adjective

group	adjectives					
	big	small	long	short	tall	little
3-year-olds	6.58%	0%	6.58%	0%	5.26%	2.63%
4-year-olds	0%	0%	0%	0%	0%	0%
5-year-olds	2%	1%	2%	1%	2%	2%
adults	0%	0%	0%	0%	0%	0%

In sum, these preliminary analyses prove that the task was feasible for children, even if they were faced with nine novel objects. Furthermore, they suggest that children did not encounter major problems in the understanding of the adjectives used in the experiment.

We then inspected the frequency distribution across groups for each condition, which is reported in Figure 2. The histogram shows that in all the conditions, children showed a tendency to choose a wider range of objects when compared to adults, except in the *tall* condition, in which adults and children's response pattern seems very similar, in line with the results reported by Booij and Sassoon (2013). However, this pattern is the opposite of what has been previously reported in the majority of developmental studies (e.g., Tribushinina et al. 2015). When we focus on the child groups, we can appreciate that the ranges provided

by 3-year-olds tended to be larger than for those selected by 4- and 5-year-olds, which again is not consistent with previous findings demonstrating that 2- and 3-year-olds tend to attach size terms to the extremes of the scale (Berndt and Caramazza 1978; Ehri 1976; Smith et al. 1986; Syrett 2007; Syrett et al. 2006; Tribushinina 2013a). Furthermore, the histogram shows that only in few items the extreme object of a given series was the solely object chosen (e.g., range 1). This confirms the results reported in Table 2.

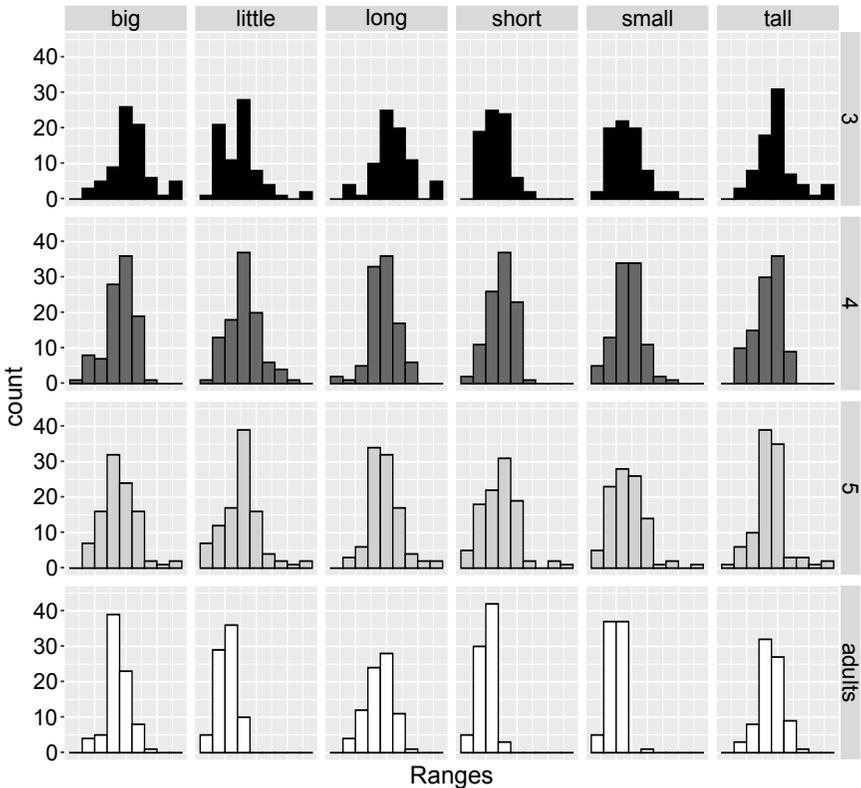


Figure 2. Distribution of ranges across groups per each condition. Columns are 1 through 9 from left to right.

For adults, on one hand we notice a tendency to choose objects up to range 4 or 5 for positive adjectives; on the other hand, we notice that the chosen ranges are skewed to the left for negative adjectives. Recall that in this study novel objects were used; for real-life objects we might expect the opposite asymmetry (Tribushinina 2013a). Besides the difference between novel and real-life objects, this result can be due to the procedure adopted, i.e., the negative adjective was always presented after the positive one. Hence, adult participants might have selected a number of objects as *big/long/tall* respectively and then they might

have chosen fewer objects for *small/short/little* because they took into account their previous choices. By doing so, they might have shifted the reference points, thereby affecting the available range (Barner and Snedeker 2008).

We then ran linear mixed-effect models on the chosen range followed by Tukey multiple comparison using R (version 4.1.2). We analyzed pairs of antonyms separately: *big vs small*; *long vs short*; *tall vs little*. *short, little*. We used the packages *lmerTest* (3.1-1 version) to run linear mixed-effect models and the *multcomp* (version 1.4-17) to run multiple comparisons (Tukey contrasts). The models of each pair of antonyms included the maximal structure that allowed the models to converge (Barr, Levy, Scheepers, and Tily 2013).

Mean and standard error for each condition and for each group are shown in Figure 3. Let us start from the *big vs small* pair. The model contained two random intercepts – for participants and for items – and three fixed effects: Group (3-year-olds, 4-year-olds, 5-year-olds, adults), Condition (Big, Small), and the interaction of Group-by-Condition. As for reference levels, ‘adults’ was the reference level for Group; ‘big’ was the reference level for Condition. The results revealed significant main effects of Condition and of Group and a significant Group-by-Condition interaction. The significant effect of Condition showed that on average in the *small* condition the chosen range was smaller than in the *big* condition (*Estimate* = -1.92, *SE* = .18, *t value* = -10.94, *p* < .001). The significant effect of Group showed that only 3-year-olds differed from adults (*Estimate* = 1.01, *SE* = .25, *t value* = 4.09, *p* < .001). Tukey post-hoc comparisons of the main effect of Group showed that 3-year-olds differed from all the other groups (3-year-olds vs 4-year-olds, *p* < .01; 3-year-olds vs 5-year-olds, *p* < .001; 3-year-olds vs adults, *p* < .001). No difference was found among 4-year-olds, 5-year-olds and adults. Tukey post-hoc comparisons of the Group-by-Condition interaction showed that in the *big* condition, 3-year-olds differed from 4-year-olds, 5-year-olds and adults (all *p* < .01); in the *small* condition 3-year-olds (*p* < .01), 4-year-olds (*p* < .001), and 5-year-olds (*p* < .01) differed from adults.

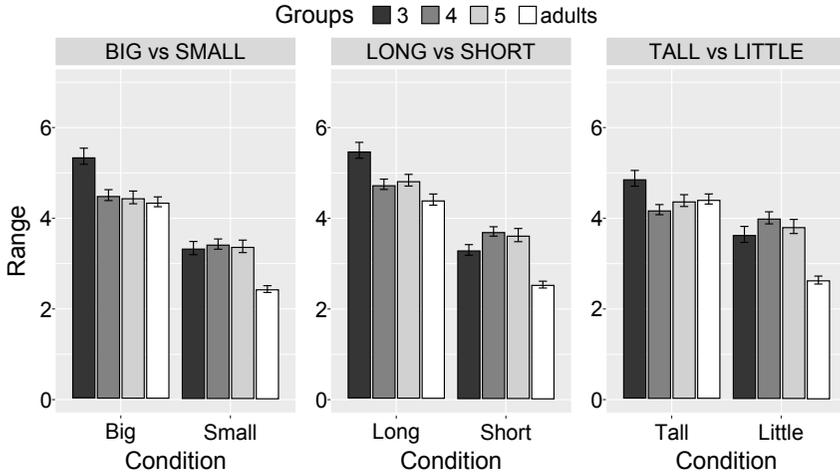


Figure 3. Mean range by condition for each group of participants. Vertical bars represent standard error.

Turning to the pair *long vs short*, the model contained two random intercepts – for participants and for items – and three fixed effects: Group (3-year-olds, 4-year-olds, 5-year-olds, adults), Condition (long, short), and the interaction of Group-by-Condition. As for reference levels, ‘adults’ was the reference level for Group; ‘long’ was the reference level for Condition. The main effect of Condition and of Group were significant as well as the Group-by-Condition interaction. The significant effect of Condition showed that on average the chosen range in the *short* condition was smaller than the chosen range in the *long* condition (*Estimate* = -1.87, *SE* = .19, *t value* = -9.67, $p < .001$). As for Group, only 3-year-olds differed from adults *Estimate* = 1.1, *SE* = .23, *t value* = 4.71, $p < .001$). Tukey post-hoc comparisons of the main effect of Group showed that 3-year-olds differed from all the other groups (3-year-olds vs 4-year-olds, $p < .01$; 3-year-olds vs 5-year-olds, $p < .05$; 3-year-olds vs adults, $p < .001$), whereas no difference was found among the other groups. Tukey post-hoc comparisons of the Group-by-Condition interaction revealed that in the *long* condition, 3-year-olds differed from 4-year-olds ($p < .05$), from 5-year-olds ($p < .05$) and adults ($p < .001$); in the *short* condition 3-year-olds ($p < .05$), 4-year-olds ($p < .001$), and 5-year-olds ($p < .01$) differed from adults.

Finally, the model of the *tall vs little* pair contained two random intercepts – for participants and for items – and three fixed effects: Group (3-year-olds, 4-year-olds, 5-year-olds, adults), Condition (tall, little), and the interaction of Group-by-Condition. As for reference levels, ‘adults’ was the reference level for Group; ‘tall’ was the reference level for Condition. Here, only the main effect of Condition and the Group-by-Condition interaction were significant. The significant effect of Condition showed that on average the chosen range in the *little* condition was smaller than the chosen range in the *tall* condition (*Estimate* = -1.79, *SE* = 0.26, *t value* = -6.864, $p < .001$). As for Group, the difference

between adults and 3-years-old does not approach significance ($p < .06$). Tukey post-hoc comparisons of the Group-by-Condition interaction revealed that in the *tall* condition only the comparison between 3-year-olds and 4-year-olds was significant ($p < .05$), whereas, in the *little* condition, 3-year-olds, 4-year-olds and 5-year-olds differed from adults (all $p < .01$). A similar advantage for *tall* has been observed in a longitudinal study of spontaneous child speech in Dutch where it has been reported that *big* and *small* were the first adjectives to appear in child speech followed by *tall*. In contrast, *long* emerged, on average, eight months later (Tribushinina 2013b).

Our results showed that children comprehended the positive member of the antonymy in a more adult-like fashion than the negative member. While both children and adults agreed on the range of objects qualified as being positive-adjective, children differed from adults with respect to the objects considered as negative-adjective. For all the positive adjectives, 3-year-old children differed from all the other groups, including the other cohorts of children. However, already from age 4, children performed in an adult-like way in the interpretation of the positive adjectives. For the negative adjectives, all the three groups of children differed from adults, whereas no difference was found among the cohorts of children. This suggests that till age 5 children's comprehension of the negative adjectives is not yet adult-like. This conclusion is in line with previous literature that reports that when children exhibit differences in their ability to understand pairs of adjectives, it is the negative polar item that exhibits a delay (e.g., Donaldson and Wales 1970; Ehri 1976; Townsend 1976; Barner and Snedeker 2008). For those approaches that view the negative member as the negation of the positive counterpart (e.g., Kennedy 1999; Heim 2006, 2008; Büring 2008; a.o.), children's difficulty would lie in the comprehension of the negative operator. Moreover, the preliminary analyses and the distribution of responses show that very few participants chose exclusively the extreme object of a given series both for the positive and for the negative adjectives, with no discernible difference between children and adults.

5. Conclusion

We investigated the acquisition of antonymy in monolingual Italian-speaking children from age 3 to age 5. We asked whether the polarity of antonymy was mastered and whether there was a developmental change. With a card-selection task, we tested children's comprehension of three pairs of antonymic adjectives, *grande/piccolo* (*big/small*), *lungo/corto* (*long/short*), and *alto/basso* (*tall/little*). The results showed a positive/negative asymmetry in the acquisition of antonyms, since the positive members of all the antonymic pairs were comprehended better than the negative ones, thus supporting previous findings showing that negative antonyms are mastered later than their positive poles. While the positive members were mastered in an adult-like fashion at age 4, the negative ones were not mastered at any children's ages.

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