

*Exploring Processability Theory-based hypotheses  
in the second language acquisition of a child  
with autism spectrum disorder*

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## 1. Introduction

Delays and deficits in structural language and social communication are common features of autism spectrum disorder (ASD), but the exact nature of these problems is unclear. In particular, little is known about grammatical development in children with high functioning autism spectrum disorder (HFASD). An understanding of how language develops in this population may provide valuable insight into how underlying processing difficulties contribute to speech delays. The aim of this study is to explore whether a child with HFASD is able to acquire a second language. This study adopts Pienemann's (1998) classic Processability Theory (PT) approach in order to predict and measure how early inflectional morphology develops in this child when acquiring Italian L2, compared with typically developing children.

### *1.1. High functioning autism spectrum disorder*

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental disorder first described by Kanner (1943). The criteria for diagnosing ASD are based on impairments in two domains: (i) social communication and interactions, and (ii) restricted and repetitive behaviours and interests, often obsessive in nature (APA 2013). Language outcomes vary greatly (Kim, Paul, Tager-Flusberg & Lord 2014), but functional use of language prior to age 5-6 years is predictive of increased communication and independent living skills in adulthood (e.g., Lord & Venter 1992; Howlin, Goode, Hutton & Rutter 2004). Some distinct language features in children with ASD who acquire spoken language are: a prolonged period of echolalia, pronoun reversals, repetitive play with words, significantly better expressive language skills than receptive ones (which is the opposite of typically developing chil-

dren), difficulties in perceiving and attending to speech, and an unusual and idiosyncratic use of language (cf. Boucher 2012; Kim et al. 2014 for overviews). Pragmatic language deficits are universal in ASD and lead to difficulties in maintaining conversations. Social interaction skills are thus impaired.

High Functioning Autism Spectrum Disorder<sup>1</sup> (HFASD) is a label used by researchers and clinicians to refer to children diagnosed with ASD but without intellectual impairment, that is, with IQ above 70 (e.g., Mesibov, Shea & Adams 2001). Even among verbal children with HFASD there is considerable heterogeneity in language skills in the areas of semantics, morphology, syntax and phonology. At least two language-based groups have been identified: those with normal, or age-appropriate, linguistic skills (HFASD-N), as measured on standardised tests, and those with language impairments (HFASD-I), some of which are similar to those found in Specific Language Impairment (SLI: Kjelgaard & Tager-Flusberg 2001; Tager-Flusberg & Joseph 2003; Tek, Mesite, Fein & Naigles 2014). The participant in this study falls into the first HFASD-N group, with age-appropriate linguistic skills at the time of the study, despite experiencing language delays during the preschool years.

### 1.2. *Grammatical development in autism spectrum disorder*

Longitudinal studies during early stages of L1 acquisition could provide valuable insights into the underlying linguistic mechanisms that lead to delays and deficits experienced in ASD (Tager-Flusberg 2004). However, relatively few ASD studies have investigated grammatical development in either L1 (Boucher 2012; Kim et al. 2014) or L2 acquisition (Ohashi et al. 2012). This is due partly to the fact that a diagnosis occurs between 2 and 4 years of age (Coonrod & Stone 2005; Filipek

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1 The term HFASD here replaces High Functioning Autism (HFA) to reflect the new DSM-5 (APA 2013) diagnostic terminology. HFA previously referred to a child diagnosed with *Autistic Disorder*, who has no intellectual impairment, IQ>70, as categorised under the criteria of the Diagnostic and Statistical Manual of Mental Disorders – Fourth edition (DSM-IV) (APA 1994). Importantly, a diagnosis of *autistic disorder* implied onset prior to 3 years of age *with initial language delays*. This was in contrast to other high functioning individuals, for example, those with *Asperger Syndrome* which implied an onset later than 3 years of age and *no early language delays*. However, because the DSM-5 (APA 2013) has since replaced its five distinct pervasive developmental disorders (i.e., autistic disorder, Asperger Syndrome, Rett's Disorder, child disintegrative disorder, pervasive developmental disorder not otherwise specified (PDD-NOS)) with one overarching category of *Autism Spectrum Disorder* (Volkmar, Reichow, Westphal & Mandell 2014) we will use HFASD, and then specify the participant's language history and status at the time of the study.

et al. 1999; Tager-Flusberg 2005), and partly to the sparsity of longitudinal studies since the introduction of robust and well-accepted diagnostic criteria.<sup>2</sup>

A recent study reports that children with ASD produce syntactically less complex utterances than typically developing children matched on non-verbal IQ, despite a similar vocabulary size (Eigsti, Bennetto & Dadlani 2007). With regard to early morphological development, studies on English-speaking children with ASD report conflicting results (Tager-Flusberg, Paul & Lord 2005). Some claim morphological development is deviant (e.g., Bartolucci, Pierce & Streiner 1980; Howlin 1984), others that it develops the same way as in typically developing children (e.g., Jarrold, Boucher & Russell 1997; Tager-Flusberg & Calkins 1990; Waterhouse & Fein 1982; Tek, Mesite, Fein & Naigles 2014). This controversy has partly been resolved with the identification of at least the two distinct groups among verbal children with ASD mentioned above, that is, those with apparently normal age-appropriate linguistic ability, and those with language impairments in phonological processing and grammatical morphology, some of which are similar to those found in children with SLI (Kjelgaard & Tager-Flusberg 2001; Roberts, Rice & Tager-Flusberg 2004; Tager-Flusberg & Joseph 2003; Tek et al. 2014).

Most recently, Tek et al. (2014) investigated grammatical development longitudinally in eight participants with a diagnosis of ASD and later categorised as highly verbal (ASD-HV) (age range = 2;2 to 3;1) in comparison to a group of 18 typically developing children (age range = 2;3 to 2;8), over a period of 12 months. They tracked increases of productive use of several aspects of basic grammatical abilities and found that the ASD-HV and TD groups both increased productive use of most of the same grammatical structures and at a similar pace. However, authors later noted that the ASD-HV group had been receiving an average of 14 hours per week of Applied Behaviour Analysis (ABA) therapy, which directly targets communication and speech production (Tek et al. 2014: 83). This greatly limits any conclusions that could be inferred from the results, and furthermore highlights the difficulties of obtaining true natural spontaneous L1 speech data for very young children diagnosed with ASD.

Researchers have started to monitor speech development of potentially high-risk (HR) infant siblings of older children with ASD. Because some of them may eventually receive an ASD diagnosis, this would potentially allow retrospective reconstruction of their language development (Tager-Flusberg 2005; Zwaigenbaum et al. 2005; Hudry et al. 2014). However, this approach is high-

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2 That is, the diagnostic criteria provided in the DSM-IV (APA 1994) and ICD-10 (WHO 1993) and, more recently, the changes in diagnostic criteria and terminology published in the DSM-5 (APA 2013). The latter are hoped to be more sensitive to ASD behavioural symptoms in infants and toddlers under 3 years of age.

ly resource intensive and has a relatively low likelihood of payoff, as the recurrence of ASD within the same family is estimated at 18.7% (Ozonoff et al. 2011). In these studies, to date, researchers have only administered broad language measures at periodic time intervals of 6 months or greater (cf. Hudry et al. 2014 for an overview). In one such longitudinal study, authors report that even with a large number of HR infant siblings involved, they had modest sample sizes because of the necessary separation of the larger HR infant siblings group into smaller diagnosis-outcome-based subgroups, that is, those later diagnosed with ASD, those with atypical development but not ASD, and those with typical development (Hudry et al. 2014). In this study we take the novel alternative approach of examining the beginning acquisition of an L2 in a child with HFASD-N.

Studies of L2 and bilingual language acquisition in ASD are very few. In the absence of empirical studies, Jelinek, Toppelberg, Snow & Tager-Flusberg (1999) suggest that children with ASD should avoid L2 learning and bilingual education, reasoning that their pragmatic language deficits and difficulty in initiating and maintaining conversation will make them poor L2 learners. Yet there is evidence that at least some children with ASD can learn an L2 (e.g., Hambly & Fombonne 2012, 2014; Kanner 1971; Kay-Raining Bird, Lamond & Holden 2012; Ohashi et al. 2012; Petersen, Marinova-Todd & Miranda 2012; Seung, Siddiqi & Elder 2006; Valicenti-McDermott et al. 2012). However, these L2 studies in ASD have been largely observational and/or exploratory and report a wide variety of outcomes (cf. Hambly & Fombonne 2014 for an overview). None of them report on grammatical development. Most useful would be information about how children manage the earliest building blocks of L2 acquisition. In this study we look at the development of productive use of L2 inflectional morphology in NPs. Mastering inflectional morphology requires the child to grasp that alternating a specific phonological subunit changes the meaning of a word.

### 1.3. *The targeted structures*

Italian L2 was chosen for this study because of its morphological richness and morphophonological suffix alternation patterns at NP level affecting Ns and their modifiers, such as adjectives (e.g., *gatt-o ner-o*, 'black.M.SG CAT.M.SG'). As a stem-based language, its nouns and modifiers take an obligatory suffix that indicates number and gender through a matrix of final vowel alternations, as represented in (1). For the analysis that will follow in § 3, it is worth noting that two of the three main classes of nouns and adjectives have *-i* in their plural form. For this reason, *-i* is considered the default plural ending, and is usually acquired before the more marked plural *-e* ending (Di Biase 2002; cf. also ch. 3, § 3.1, this volume). Unlike English, which adds the morpheme *-s* to noun in order to indicate plurality, Italian

number and gender features are fused into one vowel at the end of the noun and adjective. Furthermore, within a NP, the same values of both these features of the head N must be expressed on all nominal modifiers, such as determiners, demonstratives and adjectives. In other words, for our purposes here, learners must learn to compute the agreement within a NP, and mark adjectives in attributive position with the number and gender values of the head N. In this study we ignored agreement of the article, which according to Di Biase (2002) is not convincing evidence of the activation of phrasal procedure, for two different reasons: on the one hand, because of its frequency it is often formulaically learned with the N; on the other hand, because of the complexity of its form–function mapping, its completely accurate use is usually achieved very late in both L1 and L2 acquisition (Caselli, Leonard, Volterra & Compagnoli 1993).

(1) *Ending alternation in the main classes of Italian nouns and adjectives (after Vincent 2011, examples added)*

	SG	PL	GENDER	EXAMPLE
NOUNS	–o	–i	masc.	<i>cavallo/cavalli</i> [horse/horses]
	–a	–e	fem.	<i>scimmia/scimmie</i> [monkey/monkeys]
	–e	–i	masc. or fem.	<i>leone/leoni m.</i> [lion/lions] <i>tigre/tigri f.</i> [tiger/tigers]
ADJECTIVES	–o	–i	masc.	<i>giallo/gialli</i> [yellow]
	–a	–e	fem.	<i>rossa/rosse</i> [red]
	–e	–i	masc. or fem.	<i>verde/verdi</i> [green]

PT provides the theoretical framework (Pienemann 1998; ch. 1, this volume) for our examination of the acquisition of Italian number/gender morphology by our participant. This theory serves our purpose well for two main reasons. Firstly, it is psychologically plausible and formally testable (cf. ch. 1, this volume). Secondly, it has already been applied to Italian L2 (cf. ch. 3, § 3), and tested for both adults (Di Biase & Kawaguchi 2002) and typically developing children (Di Biase 2002), allowing a straightforward basis of comparison for our participant’s pattern of morphophonological acquisition. PT proposes a universal hierarchy of specific procedural skills which allow for the development of L2 morphology according to a predictable and implicational order (cf. ch. 1, § 4.2.1, this volume). In this study we consider the first three procedures: the lemma access procedure, yielding single words and formulas used in an unanalysed way; the category procedure, yielding lexical form variation; and the phrasal procedure, computing agreement between

nouns and adjectives, as they apply to Italian L2 (cf. the developmental stages based on these procedures illustrated for Italian in § 3.1, ch. 3, this volume, and partly repeated here in (2)).

(2) *First developmental stages hypothesised for Italian L2 inflectional morphology in noun phrases (after Di Biase & Kawaguchi 2002)*

PROCEDURE	MORPHOLOGICAL OUTCOME/STAGE	STRUCTURE	EXAMPLE
PHRASAL PROCEDURE	NP morphology	agreement within NP	<i>un gatto nero / due gatti neri</i> [one black cat / two black cats]
CATEGORY PROCEDURE	lexical form variation	plural marking on N	<i>un gatto / due gatti</i> [one cat / two cats]
LEMMA ACCESS	single words; formulas	single words; formulas	<i>mi chiamo Piero</i> [my name is Piero] <i>un gatto / due gatto</i> [one cat / two cat]

#### 1.4. Research questions

The broad objective of this study was to investigate whether a child with HFASD-N is able to learn Italian L2 grammar beyond the production of single words and formulaic expressions. Specifically, for moving from the lemma access stage to the first grammatical stage of form variation, we address two interrelated aspects of morphophonological alternation in the L2 that do not occur in the child's L1 (English). Development in Italian L2 requires that an English-speaking child learn two grammatical principles: the final vowel of an Italian N must be changed in order to mark plural number, and the specific vowel alternation used depends on the class of the N. This entails two novelties for an English-speaking child: first, number is marked by changing a final vowel, rather than by adding a consonantal suffix as in English; and secondly, Ns divide into classes that require different vowel alternations, unlike English, where purely phonotactic principles guide pronunciation of the final /-s/ for number-marking. Then, in order to progress to the phrasal procedure stage, gender and number values must be not only computed separately on head Ns and adjectives, but also unified between them. Because of the different N and adjective classes, our learner must be able to produce such NPs as *gatto nero* / *gatti neri* ('black cat / black cats') and *gallina nera* / *galline nere* ('black chicken / black chickens'). In this study the stimuli avoided N and adjective agreements with a combination of different vowel suffixes, such as *gatto verde* ('green cat'), *gallina verde* ('green chicken') for singular contexts, and *galline verdi* ('green chickens') for plural ones.

It is already known that early language development is delayed in the majority of children with ASD. Hence we address two possible sources of that delay: first, the social and communication deficits associated with ASD may decrease language input and interaction; secondly, language delays in ASD may be caused by underlying language processing difficulties/deficits. In the former case, if the primary cause of language delay is social, then a child with HFASD-N with no apparent cognitive and linguistic deficits should be able to acquire the means to mark the plural on Ns and compute the agreement within NP when taught under instructional conditions suited to the child's social and attentional limitations (cf. below). In the latter case, that is, if language delays are caused by language processing difficulties/deficits, we predict that, even under suitable instructional conditions, a child with HFASD-N learning Italian L2 should still demonstrate difficulties with acquiring the new morphophonological and grammatical principles of Italian. This would entail that our participant is slower than, or different from the typical children studied by Di Biase (2002), and that, in particular, the child with HFASD-N will first overextend the default singular forms to plural contexts, and then use the more common default vowel *-i* for marking plural Ns and adjectives for a longer period, and be delayed in learning to apply the rarer non-default *-e* ending.

## 2. The Study

### 2.1. *The participant*

The child participant, Chris (a pseudonym), is a six-year old boy from an Australian English L1 background. His parents became concerned about his language and social development prior to age 2;0 when he seemed to stop learning new words, had difficulty with social interactions, and frequently exhibited high levels of distress. Chris also failed to use gesture to communicate, displayed very little eye contact, and seemed to use language out of context, in an echolalic manner. At times he appeared deaf, not responding to his mother's voice nor turning his head towards the speaker when his name was called.

Chris was first diagnosed with ASD at age 2;4 by a developmental paediatrician, in accordance with DSM-IV criteria set (APA 1994). He immediately began weekly sessions of speech and language intervention. By age 5;1, his overall level of cognitive and language development and functioning was within the normal range, according to results in the Brigance (1991) K-1 screen, which assesses receptive language, expressive language and cognitive skills. As a result, Chris' diagnosis was reclassified to HFASD: his grammatical development was appropriate to his age, but his conversational skills were pragmatically impaired.

At the time of the study, Chris was aged 6;5 and his CELF-IV (Semel, Wiig & Secord 2003) results placed his speech production within normal range. However, he still presented with some receptive language difficulties relating to comprehension of pronouns.

Chris' paternal grandfather is a native Italian speaker, and both parents studied Italian L2 at university level. From age 3;0, the child had received some limited exposure to Italian L2 by means of Italian stories and cartoons. Moreover, he had attended an Italian story-time group for preschoolers. At the start of the study, he was thus able to count to 20, and label many animals, food items and colours in Italian, but he had acquired no grammar and was at the lemma access stage.

## 2.2. *The data*

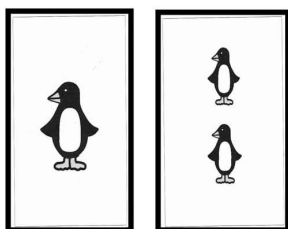
To investigate the participant's grammatical development in Italian L2, a short-term longitudinal study was carried out. Over a 12-week period, Chris received 9 lessons of developmentally planned and communicative style teaching of Italian (cf. Di Biase 2002). Lessons lasted one hour each and were provided in a one-to-one teaching environment by an Italian native speaker. Data was collected five times, including a pre-test and post-test, then transcribed by the researcher, and checked against the video tape by an Italian native speaker. Rather than analysing Chris' linguistic production during the lessons, the acquisition of the targeted structures was monitored by means of specific tests. This is because, during the lessons, contexts contrasting the targeted number and gender forms for the same referent occurred rarely, making it difficult to determine whether emergence of these structures had occurred. Furthermore, during instruction sessions, it is difficult to determine how much the teacher's corrective feedback affects the child's performance. On the other hand, the tests were set at the very beginning of the lesson, and the teacher was instructed to refrain from providing any corrective feedback during the testing tasks. The five tests make up the corpus for this study. In addition to the pre-test in week 1 (t1) and delayed post-test in week 18 (t5), the other three tests occurred in lesson 4 /week 4 (t2), lesson 7 /week 7 (t3), and lesson 9/week 12 (t4). Each test lasted 5 to 10 minutes.

All five data collection sessions used picture-naming tasks. The stimuli were wordless picture cards, designed to elicit contrasting singular and plural Ns and adjectival NPs, and the child was asked to name the pictures in Italian, including their colour. An example of the stimuli is provided in (3). Most vocabulary items used for the tasks were familiar to the informant, but new items were also included to assess the child's skills in generalising number and gender feature markers. Other strategies designed to minimise formulaic responses (i.e., language 'chunks' or vocabulary items rote learnt in their plural or singular forms) included variation



of presentation (e.g., photographic stickers were used in one session, and hand-drawn pictures in the next); shifts in language domains (e.g., food items in one session, and farm animals in the next); change in the quantities of repeated plural probes (e.g., 47 penguins in one session, and 2 penguins in the next). The changes in the stimuli for each testing session helped ensure the learner was not producing unanalysed language chunks or routines he associated with specific stimuli, an important control to assure linguistic rather than associative rote knowledge, especially when testing children with ASD.

(3) *An example of the stimuli used for the picture-naming tasks*



In order to provide an indication of the child's progress over the period of the study, in (4) we present the numbers of Italian word types produced by Chris for each testing time, and the mean length of turns (MLT), that is, the average number of words per utterance he produced. When calculating MLT, the number of Italian tokens in a turn excludes: English or ambiguous words (e.g., *okay* or *no*, which can be English or Italian), repetitions, incomplete-, unclear- or echoic-items, fillers and hesitations. Also excluded are counting routines up to the final number followed by a N (e.g., in *un due tre giraffe*, only *tre giraffe* is considered). The number of turns refers to any turn in which Chris supplied Italian tokens. When more than one probe response was produced in a turn, only the longest response was counted for that turn. As the table shows, both the vocabulary size and MLT increased consistently from one session to the next. Cumulative vocabulary increased more than sixfold (from 24 word types in t1 to 165 in t5), and also MLT scores show good progress, almost doubling from 1.4 at t1 to 2.3 by t5.

(4) *Italian language production during testing times*

	T1	T2	T3	T4	T5
TOTAL N. OF LEXICAL TYPES	24	94	111	150	165
MEAN LENGTH OF TURN	1.4	1.8	1.9	2.0	2.3

### 3. Results

In accordance with PT's developmental and non-normative perspective, all occurrences of plural marking in the learner's system are counted, irrespective of accuracy. So, for instance, if the learner supplies a default plural *-i* suffix to mark a plural context, this counts as plural marking even if the native Italian system would use a different suffix for that context. Following Pienemann (1998: 132-140), the distributional analysis presented in (5) places plural *-i* and *-e* markings on Ns in obligatory contexts at the category procedure stage, and number and gender agreement between N and adjective(s) at the phrasal procedure stage.

(5) *Chris's progress from the pre-test to the (t1) delayed post-test (t5)*

STRUCTURE	T1	T2	T3	T4	T5
NOUN <i>-i</i> + TWO ADJECTIVES <i>-i</i>					-3
NOUN <i>-e</i> + ADJECTIVE <i>-e</i>				+3	-1
NOUN <i>-i</i> + ADJECTIVE <i>-i</i>		-2	+2-3>1	+1-2	+7-9>4
PLURAL <i>-i</i> ON ADJECTIVE		-1	+1-2	-1	
PLURAL <i>-e</i> ON NOUN	-3	+2 >1		+3	
PLURAL <i>-i</i> ON NOUN	+2-4>1	+11-1	+4-1	+7-1>1	

+ = supplied in obligatory context (correct)  
 > = oversupplied in a singular context (error)  
 - = not supplied in obligatory context (error)  
 empty cell = no context

At t1, the pre-test provided the learner with the opportunity to produce 9 nominal forms in the plural, 6 of them with an *-i* suffix and 3 with an *-e* suffix. No contexts were provided for adjectival forms on their own or NPs requiring agreement. In the *-i* context, Chris produced two target-like forms. These however cannot be taken as sufficient evidence for productive use of number variation at the category procedure stage, as specified in (45), § 5, chapter 1 of this volume. This is because, although *cagnolini* ('little dog'), shown in (6), is correct, *pesci* ('fish') is used also in a singular context, so there is an instance of oversuppliance, as shown in (7).

- (6) t1 Chris uno due tre quattro cinque sei \*cagnollino  
 [one two three four five six little dog-MASC.SG]  
 Teacher ah [filler]  
 Chris cagnollini sei cagnollini  
 [little dog-MASC.PL six little dog-MASC.PL]

- (7) t1 Chris \*pesci (in response to a picture of one fish)  
 [fish-MASC.PL]  
 Teacher guarda . quanti? uno due tre quattro . quattro?  
 [look . how many? one two three four . four?]  
 Chris pesci  
 [fish-MASC.PL]

In the remaining four plural *-i* contexts, the default singular forms were used: three times with an *-o* N (*cinque \*gattino*, ‘five cat’; *due \*cavallo*, ‘two horse’; *due \*elefanto*, ‘two elephant’), and once with an *-e* N (*\*tigre*, ‘tigre’). Likewise, in all three plural *-e* contexts, Chris invariantly produced the singular suffix *-a* in both plural and singular contexts (e.g., *un giraffa* vs. *tre \*giraffa*, ‘one giraffe’ vs. ‘three giraffe’). We can conclude that at the beginning of the instructional period, Chris was still at the lemma access stage.

At t2, after three weeks of Italian instruction, Chris showed remarkable progress. The test provided more varied contexts for producing plurals: 14 single-N contexts, 12 of them for *-i*, and two for *-e*; one single-adjective context in *-i*; and two phrasal contexts with both items ending in *-i*. All single Ns but one were correctly inflected for plural, whether the singular vs. plural alternation is *-o* vs. *-i* (*un coniglio* vs. *due conigli*, ‘one rabbit’ vs. ‘two rabbits’), *-e* vs. *-i* (*un maiale* vs. *tre maiali*, ‘one pig’ vs. ‘three pigs’), or *-a* vs. *-e* (*due mucche* vs. *una mucca*, ‘two cows’ vs. ‘one cow’). Furthermore, there was evidence that this target-like production extended to new lexical items. As shown in (8), when presented with the picture of an unknown referent (a camel), Chris first produced *un camel* (‘a camel’) with Italian phonology, which the teacher recasted with its proper singular *-o* suffix as *cammello*; then, with no prompts, albeit after a self-repair, Chris correctly produced *otto cammelli* (‘eight camels’).

- (8) t2 C ah well oh eh un camel (spoken with an Italian accent)  
 [one-MASC.SG camel]  
 T cammello  
 [camel-MASC.SG]  
 C cammello un cammello  
 [camel-MASC.SG one-MASC.SG camel-MASC.SG]  
 T è un cammello e questi?  
 [it is one-MASC.SG camel-MASC.SG and this-MASC.PL?]  
 C uno d oh I’m counting them uno due tre quattro cinque sei sette otto  
 [one two three four five six seven eight]  
 T otto?  
 [eight?]  
 C otto cammellia li ... cammelli  
 [eight ... camels-MASC.PL]

On the other hand, at t2 Chris missed a plural suffix once, when presented with a picture of ‘many’ penguins. Despite their high number, he decided to count them all in Italian, but needed scaffolding from the teacher beyond number 20. When he finally counted the forty-seventh penguin independently, he produced *quarantasette \*panguino* (‘forty-seven panguin’, with a mispronunciation of a vowel in the stem and, more importantly, a singular ending). Furthermore, Chris also oversupplied plural *-e* on a N in a singular context (*un l g la \*galline* vs. *due la galline*, ‘one chicken’ vs ‘two chickens’), and left the unmarked default *-e* ending on the single adjective, producing *\*marrone* (‘brown’) instead of *marroni* with reference to *sette cammelli* (‘seven camels’) said by the teacher.

We can conclude that after only three weekly lessons, Chris had clearly moved one step up in the developmental path, from the lemma access stage to the category procedure stage. On the other hand, when provided with two contexts for a structure requiring the activation of the phrasal procedure, Chris failed to mark the agreement on the adjective, whether in the singular that ends in *-o* (*elefanti \*grigio*, ‘grey elephants’) or in *-e* (*\*marrone asini*, ‘brown donkeys’, with English word order), albeit in both cases the N was correctly marked as plural. As a matter of fact, it is worth reporting here that, before producing these two NPs, when first required to name animals and their colours, Chris seemed agitated and began with false starts and repetitions even if the adjective was *rosa*, which remains unchanged in all contexts. We could infer that at this stage the very production of a two word NP seemed to be a problem for Chris.

At t3, Chris continued to improve. He correctly produced four examples of plural *-i* marking on single Ns, using singular *-o* only once (*due \*pinguino*, ‘two penguin’). Interestingly, this occurred when Chris was prompted to produce this N with two adjectives (i.e., ‘two black and white penguins’), even though during the same task he had just produced the correct plural form on its own. Now that he could categorically mark Ns with confidence, Chris began to also mark adjectives at the category procedure stage, and produced a correct plural *-i* marker on a single adjective in one context (*bianchi* ‘white,’ referring to ‘penguins’) out of three. In the other two contexts the adjectives were used in their default singular form. A clear step forward at t3, however, was shown by agreement within NP, when Chris produced two target-like singular vs. plural agreement contrasts (*l’elefanti grigi* vs. *una l’elefante grigio*, ‘the grey elephants’ vs. ‘one grey elephant’; *un gatto nero* vs. *due gatti neri*, ‘one black cat’ vs. ‘two black cats’) out of a total of 5 contexts. In both of these cases, the plural adjectives require an *-i* suffix like their head Ns. In the remaining 3 contexts the adjectives bear default singular forms: *pinguini \*nero* (‘black.M.SG penguin.M.PL’); *due gatti \*arancione* (‘two orange.M.SG cat.M.PL’); and *pulcini \*giallo* (‘yellow.M.SG chick.M.PL’).

At t4, there are 7 examples of plural *-i* marking on Ns, five of which contrast with singular *-o* contexts, and two with singular *-a* contexts (e.g., *una torta*.F.SG vs.

*due \*torti.F.PL*, ‘one cake’ vs. ‘two cakes’). These latter two cases are not target-like, yet they were scored with a plus in (5) not only because Chris supplied a plural suffix but also because this overgeneralisation of *-i* provided further evidence that he was applying it productively. For the first time now, however, Chris also used *-e* for marking plural on Ns, and produced three examples of this suffix, albeit two of them were not target-like insofar as they contrast with singular *-o* contexts (e.g., *un fungo* vs. *tre \*funghe*, ‘one mushroom’ vs. ‘three mushrooms’). On the other hand, the third example contrasts with singular *-a* contexts accurately (*mela* vs. *mele*, ‘apple’ vs. ‘apples’). This step forward with the expansion of the *-e* production at category level was further confirmed at phrasal level. Whereas at t3 there were only two cases of *-i* + *-i* agreement, at this test session Chris produced three of *-e* + *-e* agreements, one of which is shown in (9).

- (9) t4 C una mela  
[an apple-FEM.SG]  
T bravo che colore?  
[good what colour? ]  
C \*rosso  
[red-MASC.SG]  
T ross?  
[re?]  
C *I don't want . sso [(re)d]*  
T una mela rossa  
[a red-FEM.SG apple-FEM.SG]  
C una mela rossa  
[a red-FEM.SG apple-FEM.SG]  
T e queste?  
[and these?]  
C oh quattro mele rosse  
[oh four red-FEM.PL apple-FEM.PL]

Notice, however, that here again Chris seemed to be reluctant to say longer phrases, and when pushed further his resistance became explicit: ‘I don’t want three words’. Nevertheless, we can conclude that his progress at t4 consisted mainly of a consolidation of the *-i* plural marker and an expansion of the *-e* marker, not only at category level but also within the phrase.

At t5, 6 weeks after the final 9<sup>th</sup> lesson, Chris’ progress continued insofar as he appeared to overcome his initial feeling of distress in producing longer phrases. He ventured in this direction in two different ways. First, he began to respond to task probes with three-word grammatical phrases consisting of a numeral, the head N and an adjective: this happened altogether 31 times out of 40 at t5. Of these 40 three-word phrases, 16 were in a plural context, and 7 out of them had the *-i*

marker on both elements, which he over-generalised several times in place of *-e*, as in *quattro \*banani \*gialli* ('four yellow bananas'). Secondly, for the first time, Chris tried to produce NPs with more than one adjective. Although he was unsuccessful in marking the plural for the second adjective (e.g., *pinguini neri \*bianco*, 'white and black penguins'), the attempt is evidence of further ease in handling longer stretches of his L2 language.

In sum, our initial research question posed in § 1.4 can now be answered positively. First, we have shown convincingly that our participant with HFASD-N was able to acquire the morphophonology of an L2. Furthermore, we have illustrated that he acquired the plural marking on Ns and adjectives along the developmental path predicted by PT generally, and tested specifically among children learning the same Italian structures by Di Biase (2002). That is, Chris produced singular and plural contrasts first on single Ns and adjectives at the category procedure stage, and then also on Ns and adjectives at the phrasal procedure stage. Because no phrasal structure was produced before he could activate the category procedure, PT's implicational hierarchy is respected. Finally, data shows that Chris gradually learned to overcome his initial reluctance to produce longer strings in Italian, and eventually produced NPs that were both three word long and grammatically target-like.

With regard to the pace of his progress, a comparison between Chris and the typically developing children in Di Biase's (2002) study is not straightforward even though in both studies the instructional period targeted the same structures and lasted 12 weeks. On the one hand, Chris was 6;5 years old, had received minimal previous exposure to Italian, and was then taught for the study in a one-to-one situation. On the other hand, Di Biase's children were two-to-three years older, had already been learning Italian for three years (albeit without any progress beyond the lemma access stage), and were taught Italian all together in a large class. In (21) we show the delayed post-test results for Di Biase's children in the control and experimental groups regarding both single plural forms and phrasal agreement. Notice that in the Di Biase study both groups received focus-on-form type treatment similar to Chris', with the only difference that the experimental group received corrective feedback only on targeted structures. Figures in the table indicate that, while the overall improvement was remarkable, and particularly so in the experimental group, three children in the control group had not progressed beyond the lemma access stage, and that among those who had, the default *-i* marker was by far more accurate than the *-e* marker. Finally, even in the experimental group, who received the optimal treatment, most children (i.e., all but three: Chr, Kat and Lau) produce target-like plural agreement in less than half the required contexts. It is thus reasonable to conclude that Chris's progress was also well within the range of the average typically developing children. Further, he seemed to develop each new stage at a fairly rapid pace.

(21) *Delayed post-test production of plural forms and phrasal plural agreement in Di Biase's (2002) study*

CONTROL GROUP					EXPERIMENTAL GROUP				
	NOUNS		ADJECTIVES			NOUNS		ADJECTIVES	
	-I	-E	-I	-E		-I	-E	-I	-E
AMY	7	(2)	5		ADR	6	1	6	2
CAR	2		5		ALE	2	2	2	
CHR					ALL	3	4	7	5
COU					CHR	17		7	(1)
JOR	7	1	11	1	KAT	3	3	4	6
JOS	15		15		LAU	5	2	3	1
KIE	7	(1)	12		MAT	4	2	3	(2)
NIK	5	3	8		SAR	3	1	2	3
OLG		2			SOP	5	2	2	

figures represent plural *-i* and *-e* forms supplied in c. 20 total contexts for each child  
figures in brackets represent dubious forms

NOUN + ADJECTIVE		NOUN + ADJECTIVE	
AMY	4/11	ADR	4+1/12
CAR	3/12	ALE	2+1/9
CHR	0/10	ALL	3+1/9
COU	0/11	CHR	10/14
JOR	8+1/11	KAT	4+2/11
JOS	14/16	LAU	4+1/9
KIE	9+1/15	MAT	3+2/9
NIK	5/8	SAR	3/7
OLG	0/13	SOP	3/8

figures after the slash represent numbers of contexts  
simple figures before the slash represent *-i* agreement  
figures preceded by + represent *-e* agreement

#### 4. Conclusion

This is a first study worldwide of grammatical development in L2 with a child with HFASD-N. Our results show that a child with HFASD-N can learn an L2 beyond the acquisition of unanalysed single words and formulas. In a 12 week period, as his Italian L2 utterances become longer, Chris developed from producing mostly invariant single words to being able first to mark number in Ns, and then to form agreement between head Ns and their modifiers within NPs. This development

follows the same route as that of typically developing children reported in Di Biase (2002), and at a comparable pace, indeed perhaps a faster one.

In § 1.4 we mentioned two possible sources of early language delay in ASD. The first hypothesis claims that social and communication deficits can lead to a lower amount of linguistic input, and hence a slower pace of acquisition; the second that an underlying language processing deficit/difficulty leads to difficulties in acquiring L2 grammar. The evidence gathered in this study clearly indicates that Chris does not display underlying linguistic deficits; rather, with instruction that is structured appropriately to address his social/communication difficulties, he was able to acquire Italian inflectional morphology in NPs by the normal route and at a comparable (or faster) speed to normal children. He even demonstrates the ability to mark plural with both the default plural *-i* suffix and the more marked non-default plural *-e* suffix. This discrimination was acquired earlier than expected and may reflect the *detail-focused* processing style of children with ASD (Happé & Frith 2006) and/or ability to *hyper-systemise* (Baron-Cohen 2009) novel L2 grammar.

Recent studies have shown that bilingualism in typically developing children improves cognitive functioning, particularly executive functions such as attention shifting and inhibitory control (Bialystok & Craik 2010). Since children with ASD are posited to have deficits in executive functions (Ozonoff, Pennington & Rogers 1991), SLA may prove to be of considerable cognitive benefit for these children, rather than posing problems for them as argued by Jelinek, Toppelberg, Snow & Tager-Flusberg (1999). Future research would need to involve large group studies of children with HFASD and typically developing controls. It would also need to enlarge its scope in many directions, including investigations not only of more structures dealt with by PT, but also of earlier stages of morphophonological development, such as *phonological constancy* (Best et al. 2009), that is, the ability to recognise spoken words even in the face of phonetic variability in the words' pronunciation across a variety of speakers and regional accents. Also, a finer-grained analysis of speech production at a *phonemic level* may bring to light important differences in the way children with HFASD perceive and produce novel speech and articulatory gestures.

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