

# Acquisition of Verb Agreement When First- Language Exposure is Delayed

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## 1. Introduction

A sensitive period for language acquisition was first presented by Penfield and Roberts (1959), and discussed extensively by Lenneberg (1967). The hypothesis that there is an optimal window of opportunity during which a first language is acquired can not be experimentally tested, for ethical reasons. However, the sensitive period hypothesis has found support through two separate avenues of research. These two avenues, discussed in more detail in the following section, are 1) case studies of language acquisition by social isolates, such as Victor, Massieu, Anna, Isabelle, and Genie, and 2) the study of Deaf adults who were exposed to American Sign Language (ASL) at various ages.

Both of these avenues of research provide potential descriptions of the effects of a sensitive period for language acquisition, but both avenues of research also have limitations. These limitations render the conclusion that a sensitive period exists, controversial at best. The previously studied social isolates have the confounds of physical abuse, including beatings directly to the head (Curtiss, 1977, among others), and a focus on other aspects of development, for example social skills (Lane, 1976, Mason, 1942).

The studies of Deaf adults who were exposed to ASL after early childhood, while valuable in showing the language attainment achieved with 15+ years of experience with the language, have the limitation of not being able to show the developmental path of the language acquisition process. Further the background data on each participant necessarily uses retrospective reporting, which is not always reliable. It was possible for Deaf adults to have variation in timing of exposure to an accessible language because until recently, it was common for most deaf children with hearing parents, to be trained first with an oral method. This method values the learning of spoken language, and strongly discourages the use of a signed language. For many deaf people, it was only after failing with the oral training were they exposed to a signed language, hence providing

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the variation in timing of accessible linguistic input. This experience with some training in a spoken language provides another potential confound.

In a new study, presented here, some of these confounds and limitations are eliminated, providing a clearer picture of sensitive period effects on first language acquisition. Although common twenty to forty years ago, it is now rare to find children who are diagnosed with deafness, but who are not provided with extensive early linguistic intervention (GRI, 2000). However, this is the case with two unrelated children, MEI and CAL, who were not exposed to their first language until approximately the age of 6 years. MEI was misdiagnosed as low-functioning mentally retarded, but instead is severely to profoundly deaf, with normal to above normal intelligence. CAL, while diagnosed correctly with severe to profound deafness by 18 months, was not exposed to a first language until approximately the age of 6 years, due to the family's personal problems at home. Neither MEI, nor CAL was physically abused. They were fed, clothed, and loved. However, there were minimal linguistic attempts to communicate with MEI and CAL by any of the people in their lives. MEI and CAL live in very rural parts of the United States, and were most often sent outside to play by themselves.

At approximately the age of 6 years, MEI and CAL became immersed in American Sign Language at a residential school for deaf children. I have filmed their language development, approximately once per week, for 3 1/2 years, and have analyzed the data. Some of the results from the examination of the acquisition of the ASL verb agreement system will be presented here.

## 2. Background

Studies of social and language isolates have provided details of varying levels of success in acquiring a first language. Lane (1976) provides details of two cases with two different outcomes; the cases of Victor and Massieu. Victor, the Wild Boy of Aveyron, was found wandering out of the woods alone, and without speaking or signing a language. His age was estimated as being between 10 and 13 years. Despite years of intensive training in spoken language, and other skills, Victor never acquired language. At best he learned a minimal gesture system. The second case discussed by Lane (1976) is that of Massieu. Massieu was a deaf child with hearing parents, and 5 deaf siblings. The family gestured together, clearly using what today is called a homesign system (Fant, 1972, Goldin-Meadow and Mylander, 1984, and Tervoort, 1961). After the age of 13 years, Massieu received intensive French language training for approximately 3 1/2 years. After that period of time, he is reported to have learned to read and write well, and use language effectively. However he did not master the use of language completely. While the details of the language problems are not clear, it seems that among other areas, Massieu had a problem with French word order, and possibly verb agreement in French (Lane, 1976, p. 91).

These areas of language found to be potentially affected by a sensitive period for first language acquisition for Massieu, were also found to be problematic for Genie, Anna, and Isabelle too. All of these cases are of children who were deprived of early language exposure.

While the results from these case studies are suggestive of a sensitive period for first language acquisition, there are limitations and confounds. It is not known how long Victor lived in the woods. It could have been only a few years, in which case he should have had language before the neglect. Victor's family history was never discovered. It is also possible that Victor suffered from what is today termed autism, or another similar disorder, rendering his acquisition of language difficult or impossible. The situation for Genie has similar limitations. Genie suffered severe physical abuse, including beatings to the left-side of the head. It is unclear what the role of the abuse was, physically and psychologically, on Genie's ability to acquire spoken English. The cases of Massieu and Isabelle are similar, in that of all the linguistic isolates, they acquired the most of the language they were eventually exposed to. However, both Massieu and Isabelle started with extensive gesture systems that they used with at least one other family member. Hence while they still showed problems with acquiring a natural human language, they started with the base of the gesture system, as opposed to complete isolation. Another significant limitation to all of the above cases, is the dearth of specific information regarding the acquisition of language in particular, as opposed to more general development and learning of skills.

The second avenue of research, the study of Deaf adults who were exposed to ASL at varying ages, has fewer confounds, but still has the limitation of not being able to observe and study the course of language acquisition when there is delayed input. It also has the limitation of having to rely on retrospective information for the participants' background and history. Given this, the reported findings show particular aspects of language that may be affected by a sensitive period, in that these aspects were not fully acquired, even after 15 or more years of using the language.

Emmorey, Bellugi, Friederici, and Horn (1995) conducted an experiment with adult signers who had been exposed to ASL at different ages, ranging from native to 20 years. They found, in an on-line processing task, that native signers were sensitive to errors in both verb agreement and aspect, but that early and late signers (age at initial exposure was from 4 to 20 years) were only sensitive to errors in aspect morphology. They found, in a different type of test, an off-line grammaticality test, that the three groups were equally able to detect the errors. Emmorey, et al (1995) suggest that the processing of verb agreement is affected by a sensitive period.

Newport (1984) tested 3 groups of participants: Native, Early learners (exposed to ASL from 4 –6 years old), and Late learners (exposed to ASL from 12 years old and up), on basic word order and complex morphology of ASL, using elicited production and comprehension tasks. She found that there was no effect of age of acquisition on ASL basic word order; there were consistent

effects of age of acquisition on ASL morphology; and there were differences in individual morpheme scores, error patterns, and qualitative analyses of responses for early vs. late learners.

Mayberry (1994), using Deaf adults exposed to ASL at various ages, found that when ASL is acquired later in childhood (after age 5 years) there are problems with language processing, memory, and comprehension, as opposed to difficulties with language production.

All of these background studies have in common difficulties with verb agreement, when a person is exposed to a first language after 5 years.

### **3. Present Study**

The overall project, of which the current study is one part, examines the course of language acquisition once linguistic input has begun. Most Deaf children in the United States receive some kind of linguistic input by toddlerhood. Two children reported on here, MEI and CAL, were not exposed to a first accessible language until approximately 6 years of age, but once exposed, were fully immersed in ASL (Berk, 2003, Lillo- Martin and Berk, 2003).

Recorded language development observations of MEI and CAL began in March of 1999, and continued regularly until June of 2002. The study as a whole is designed to examine the time course of morphological and syntactic development under the condition of delayed linguistic input. Here I focus on some of the errors with verb agreement found - both type and rate.

### **4. Participants and session information**

The participants in the current study include MEI and CAL, the two later-learners, and two Deaf, native signers, JIL and NAT. "MEI" was originally misdiagnosed with mental retardation, but was later correctly diagnosed with severe to profound deafness by age 5 1/2 years. Between the ages of 3 and 5 years, MEI was enrolled in a Head- Start program three times per week, for four hours per day. The program staff did not recognize the deafness. According to MEI's mother, due to the misdiagnosis, only crayons and paper were given, to MEI by the program staff to keep MEI busy. There were minimal attempts to communicate with MEI linguistically, or to involve her with the rest of the group.

At age 5;9, MEI completed an intake evaluation at a residential school for Deaf children, and the school psychologist reported that "MEI's overall performance indicates that she has some well developed nonverbal cognitive abilities". MEI was able to produce between 15 and 20 gestures, at the time of the evaluation, with very few gesture combinations. MEI was first exposed to ASL at age 6;1, upon starting school.

"CAL" was correctly diagnosed with a hearing loss by 18 months, and profound deafness before the age of 3 years. However, he was not exposed to an accessible first language until later, due to personal problems that his parents

were having. Between the ages of 3 and 5 years, CAL was in a county children's partial hospital program for behavioral problems. He then had a home tutor to teach him signed words. CAL's mother reports that the tutor did not know more than 20 signs.

At age 5;9, CAL completed an intake evaluation at a residential school for Deaf children, and the school psychologist noted in his chart that "CAL's performance on the K-ABC Nonverbal Scale suggests he is functioning within average range of nonverbal intelligence". The psychologist notes that CAL knew between 20 and 25 gestures, consisting mostly of communicating basic needs. CAL was then first exposed to ASL upon starting school at that time. However there were only 2 months until the end of the school year. This was followed by a 3 month summer break, during which time there was no accessible linguistic input. Language exposure began again, and consistently, the following school year.

"JIL" is a Deaf, native ASL signer, whose data are being used as a comparison for those of MEI and CAL. JIL is younger than MEI and CAL, but has had a similar number of years of exposure to language. JIL was filmed playing the same kinds of games, and in a similar situation to that of MEI and CAL. However, JIL is part of a larger developmental study of native linguistic input and early acquisition of ASL, the Cross- Linguistic Early Syntax Study (CLESS), at the University of Connecticut.

"NAT" is a Deaf, native ASL signer, whose data are also being used for comparison. NAT is an age-peer and MEI's dorm mate. She is approximately the same age as MEI and CAL, with less than a 5 month age difference. While filmed less frequently than MEI and CAL, NAT was filmed playing the same games, and in the same situation as that of the later- learners.

Sessions from all four children were selected for analysis such that there would be at least one session per month, with the long- term goal being to use all of the taped sessions. Sessions with alot of child signing were chosen over those with little signing in order to maximize the chances of capturing the child's language knowledge. The sessions, once selected, were transcribed, checked for reliability, and coded for analysis, as detailed in Tables 1 and 2.

**Table 1. Participants- delayed exposure**

Child Session	Age/Range at session	# Sessions/ age range	Exposure amount at session*
MEI 1-5	6;6 -6;8	3	7-9 months
MEI 6	6;9-6;11	1	9 1/2-11 1/2 months
MEI 12-18	7;0-7;2	4	12-14 months
MEI 24-28	7;3- 7;5	4	15-17 months
MEI 43- 51	7;6 - 7;8	2	18- 20 months
MEI 56	7;9-7;11	1	21- 23 months
MEI 59- 67	8;0- 8;2	3	24- 26 months

MEI 72	8;3- 8;5	1	27- 29 months
MEI 81	8;6 - 8;8	1	30- 32 months
MEI 97-98	9;0-9;2	2	36- 38 months
MEI 110	9;9- 9;11	1	45- 47 months
CAL 1-2	6;9- 6;11	2	10-11 months
CAL 5-8	7;0 - 7;2	2	12- 14 months
CAL 10-17	7;3- 7;5	3	15- 17 months

**Table 2. Participants- native exposure**

Child Session	Age at Session	Exposure amount at session*
JIL 17	2;0	Native (24 months)
JIL 34b	2;6	Native (30 months)
JIL 35a	2;6	Native (30 months)
JIL 41	3;0	Native (36 months)
JIL 65	3;3	Native (39 months)
JIL 75	3;6	Native (42 months)
JIL 1 (S)	4;6	Native (54 months)
NAT 1	7;11	Native (95 months)
NAT 4	8;11	Native (107 months)

\* Exposure- meaning the approximate amount of time since language immersion, not first exposure.

## 5. Procedures and methods

The sessions used for this study from all four children are part of a larger developmental study of the effects of delayed linguistic input on language acquisition. A naturalistic language production methodology was employed. MEI and CAL were video- taped twice per week during the school year for 15 to 45 minute sessions. The length of the session depended on the attention span of the child on the particular day of filming. JIL was video- taped once per week interacting with either her Deaf mother, or with a hearing, fluent signing friend of the family. NAT was video- taped once every 4 months. MEI, CAL, and NAT interacted individually with a Deaf signer and a bag of toys, or an activity. The Deaf signer, SAF, is a woman who regularly works in the dorm with the children as a language and Deaf culture role- model. The sessions were filmed by a hearing, fluent signer, either in a child- familiar dorm living room area, or outside in the playground.

The sessions analyzed here were transcribed verbatim in a FileMaker Pro system which assigns each utterance to a separate record. Information about the signed utterance, non- manual markers, and contextual information are all

included in the record. All of the transcripts were either initially transcribed, or reliability checked, by a native signer.

A detailed analysis has so far been performed on approximately one session per month for the later-learners, as noted in Table 1. The transcripts were coded in conjunction with viewing the signed utterances on videotape. Utterances were coded for presence of a verb, verb type, verb agreement expressed, eye gaze, whether referents were present or non-present, whether arguments were overt or null, and presence/ type of error.

The hypotheses, in part based on the previously reported results of both other social/ linguistic isolates, and the Deaf adult late learners, are that 1) MEI and CAL will make more errors than the native signers with verb agreement, and 2) that verb agreement errors will not decrease over time.

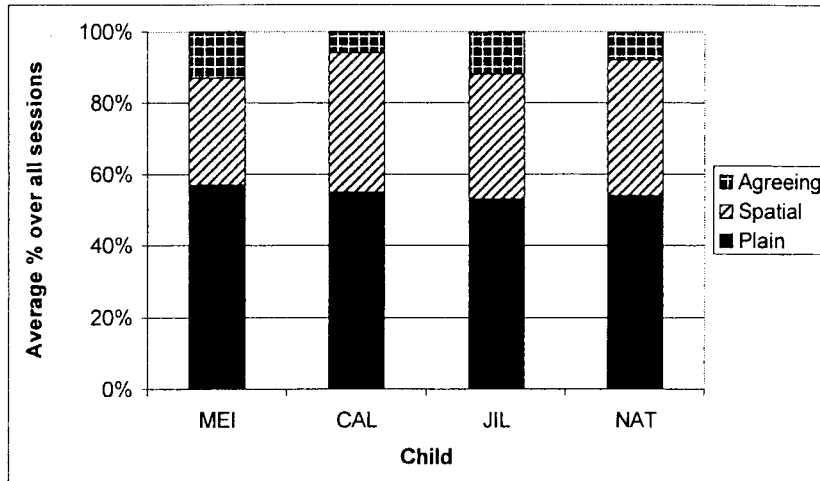
## 6. Results

Presented here are the results from the more general examination of the acquisition of the ASL verb agreement system by MEI and CAL, in comparison to that of JIL and NAT. This includes general trends of verb type use, types of verb agreement errors found, and the effect of the amount of language exposure on the rate of verb agreement errors. The data from MEI, CAL, JIL, and NAT were first examined for the rate of verb type used. The verb types were based on the following. ASL has three verb categories- plain verbs, spatial verbs, and agreeing verbs (Fischer and Gough, 1978, Padden, 1983, and others). Plain verbs, for example LIKE, do not mark agreement with a subject. Plain verbs can be signed with either/both animate and inanimate subjects and objects. They are often, but not always body- anchored signs.

Spatial verbs, for example PUT, require marking of agreement with locations. This agreement has semantic consequences. Spatial verbs are signed toward a location, either present or non-present but set-up in space.

Finally, agreeing verbs, for example, GIVE, require formal agreement marking, which is a process that is triggered by purely formal features of the subject and object. Agreeing verbs require both the subject and object to be animate (or anthropomorphized) arguments. Spatial and agreeing verbs are nearly identical in how they express agreement; that is, both use path of movement between end points set up in space, and the facing of the hand. However the features expressed by spatial agreement are semantic- they convey meaning about location, while those expressed by agreeing verbs are purely formal (Berk and Lillo-Martin, in prep).

The purpose of the analysis of the proportion of verb types used was to see if the later-learners pattern similarly to the native signers. Figure 1 shows the proportions of verb types used by each child, from all of the language sessions combined. As seen, there is little difference across the children, but there is a difference seen for the verb types used. This pattern of more plain than spatial, and more spatial than agreeing verbs was consistent per child across time, allowing the collapsing of data across time.



**Figure 1. Proportion of Verb Types Used**

All four children, regardless of timing of language exposure used more plain verbs than spatial verbs, and more spatial verbs than agreeing verbs. This finding has recently been found in other sign languages as well (Hanel, in press). The data pattern may reflect a general pattern in the specific language, as opposed to a developmental trend.

The data were next examined for errors made with verb agreement. NAT made no errors with verb agreement in the sessions analyzed. The types of verb agreement errors found from MEI, CAL, and JIL can be grouped into four categories. The first category is errors of omission. This category consists of agreeing or spatial verbs in which the required agreement morphology is absent, but the space has been set up and/or used in discourse. The second two categories are errors of commission: agreement with the wrong argument or referent, and spatial/agreement put on something that can not have it. These last two occurred with plain, spatial, and agreeing verbs, as well as with nouns. The fourth category, a type of omission error in most cases, consists of utterances with spatial and/or agreeing verbs, whereby space was not set up and/or was not used. This category of error often occurred with another error, for example, "not using required agreement". It also occurred with examples of commission errors. Some examples of all four of these errors are provided in Table 3.

**Table 3. Examples of Agreement Errors**

Child	Verb	Utterance	Interpretation	Error type
MEI 1	Spat.	THROW.	She threw it at me.	Did not set up space, but did use it.
MEI 6	Agree	TELL BEAR.	Someone tells	Space not set



			bear or Bear tells someone	up. Subj & Obj not marked
MEI 17	Plain	YOU- WON	You won this game.	Commiss- Subj over-marked as part of verb
MEI 24	Agree	NOT-YET GIVE- GIFT NOT-YET.	I didn't give you the gift yet	Omission-agree morph not shown
MEI 51	Spat.	WALK	Frog walked to window.	Omission- Loc not marked
MEI 110	Agree	PT-CHILDREN FEED FOOD.	Children feed the hamster food.	Omission- agr not shown
CAL 1	Noun	RABBIT-HOP HOP.	The rabbit hops.	Verb morph put on N.
CAL 2	Plain	PT-SBB SMELL-HER.	SBB, you smell SAF.	Commiss.- Obj over-marked
JIL 1(S)	Agree	BEE-FLY CHASE	Bees chase the dog.	Omission- agr morph not pres

Next the data were analyzed for rate of verb agreement errors over time. Figures 2, 3, 4 show the results for JIL, MEI, and CAL respectively. The percentage of verb agreement errors with the three verb types combined, in MEI's and CAL's sessions, ranged from 2% to 11.1%. In contrast, for JIL there was a high of only 1%.

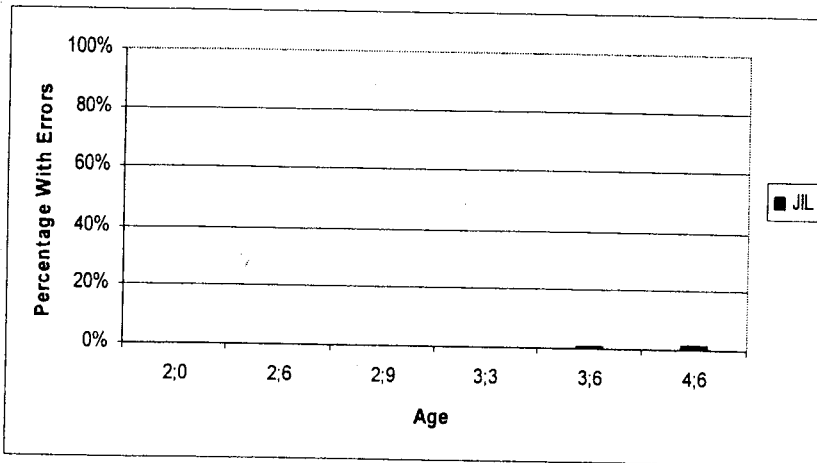


Figure 2. JIL's Total Verb Agreement Errors with All Verb Types

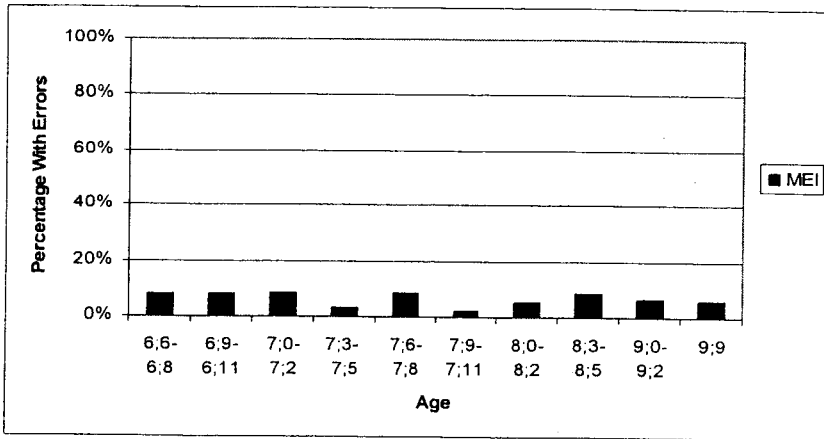


Figure 3. MEI's Total Verb Agreement Errors with All Verb Types

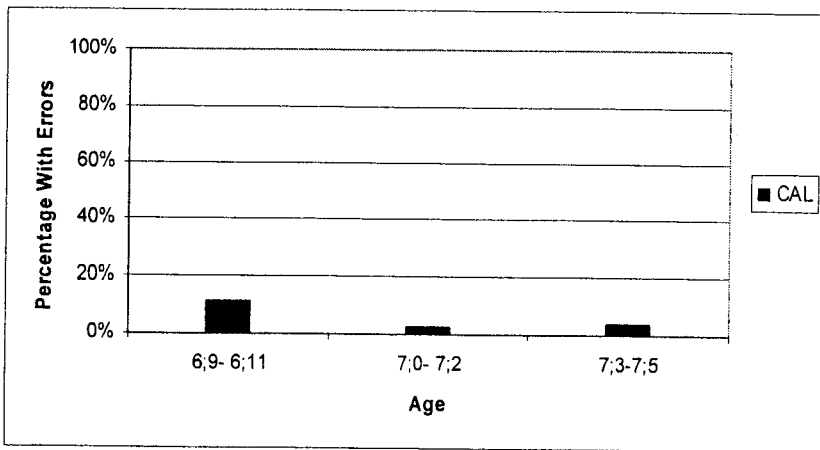


Figure 4. CAL's Total Verb Agreement Errors with All Verb Types

Figure 3 in particular shows that for MEI, the verb agreement error rate does not decrease over time. While there was some fluctuation over the time period studied, there are still many verb agreement errors. Figure 4 shows a similar pattern for CAL, even with the one year's worth of data that has been analyzed so far.

## 7. Discussion

When recording of MEI and CAL began, they had been tested as having normal to above normal intelligence and cognitive ability, and had been exposed

to a first language for approximately 6 months. In many aspects, MEI and CAL appeared to be acquiring language in a normal acquisition path, only delayed due to the late exposure (Lillo- Martin and Berk, 2003). However, a closer examination of the use of the ASL verb agreement system shows one aspect of language acquisition that is different – not delayed. The results from a 3 1/2 year study of language acquisition by MEI and CAL show that while the approximate proportions of the verb types used were similar for both the two later- learners and the two native signers, the rate of verb agreement errors was not similar.

MEI and CAL had a higher percentage of verb agreement errors than did JIL or NAT. Further, these errors remained constant in number over time for MEI and CAL. These results converge with those from the studies of Deaf adult late- learners. Verb agreement errors are found not only with late- learner Deaf adults, even after they have used the language for more than 15 years, but throughout the language development of MEI and CAL, as well.

The results suggest that there is a sensitive period for first language acquisition, and that the effects are specific to particular aspects of language. The verb agreement system, specifically the contrast between the morphology use with the different verb types, is one area that is currently being further examined for these sensitive period effects on first language acquisition under the condition of delayed input.

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