

CHILD ACQUISITION OF PASSIVE SENTENCES:
BUILDING UPON ANIMACY ASSUMPTIONS FROM UG

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A thesis submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Arts in the Department of Linguistics.

Chapel Hill
2011

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ABSTRACT

HALLEY WILSON: Child Acquisition of Passive Sentences: Building upon animacy assumptions from UG
(Under the direction of Misha Becker)

Children's acquisition of passive sentences has been widely studied in an attempt to understand why children acquiring languages such as English appear to exhibit a delay in the acquisition of this structure. The present study examined semantic factors in English acquiring children's comprehension of passive sentences as a means of accounting for this delay. The results of the study indicated that animacy in the *by*-phrase may be the crucial factor required for passive comprehension. The process by which passive sentence structure is acquired is argued to be linked to inherent assumptions about animacy from UG which children may utilize to build the syntactic structures required to comprehend passives.

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CHAPTER 1

INTRODUCTION

Passive sentence acquisition in English has been widely studied and is of particular interest because children exhibit varying patterns in their understanding of the meaning of these constructions. A solid theory regarding how the passive sentence structure is acquired and the reason behind the apparent delay in acquisition for some languages but not others has yet to be established. The data from previous studies shows a broad range of comprehension patterns from overall delay (Slobin 1966) to early comprehension of specific passive types (Maratsos et al 1985, Crain et al 1987, Fox and Grodzinsky 1998).

Passive sentences appear on the surface to be inverted active sentences combined with morphological markers that trigger the passive interpretation. The syntactic subject in the passive sentence is actually the logical object and the logical subject is the noun phrase (NP) that appears after the verb in the *by*-phrase. The structure of the passive is not merely an inversion of the active, however. The passive sentence structure is derived from the active structure via a series of movements. In English the morphological markers that appear on the verb in a passive are phonetically identical to the past participle and as such it is more difficult to identify an English verb as being in passive form than it is in languages where the morphological markers for the passive are clear such as Portuguese or Sesotho. Children have to identify that a sentence is passive based on these subtle markers and then interpret it using a different hierarchical structure than they would for an active sentence. Determining

that a sentence is passive and then interpreting it using a different hierarchical structure may be the cause of difficulty with passives for English acquiring children. In section II I discuss the syntactic structure of the passive and how it relates to the active structure.

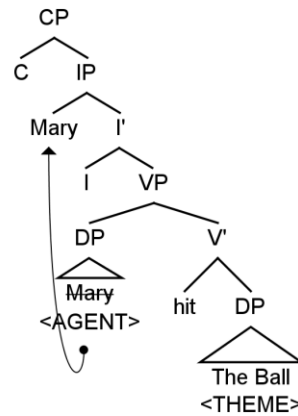
Theories of how children interpret passives are varied in how they account for the child data. Slobin (1966) and Maratsos et al (1985) claim that children understand (at least some) passives as actives. Borer and Wexler (1992) linked comprehension difficulties to A-chains. Fox and Grodzinsky's (1998) theory was that children have trouble with certain passives based on the difficulty of reassigning the theta role of the logical subject to the *by*-phrase, and Hyams (2006) approached the comprehension pattern of passives with a combination of semantic theta role assignments and A-chains. Taking these theories into account, the aim of this study was to determine whether particular semantic properties imposed by a verb on its arguments. The expected outcome was that children would acquire passives beginning with the most extreme violation of Hyams et al (2006) canonical alignment hypothesis and would slowly build up the ability to comprehend all passives. The order of acquisition based on the theta role of the NP in the *by*-phrase was expected to be agent>experiencer>theme. However, the data from the experiment did not support this hypothesis. Instead, the data is accounted for by a theory of animacy assumptions inherent in UG coupled with a stepwise process of building up passive comprehension based on the animacy of the NP in the *by*-phrase.

CHAPTER 2

PASSIVE STRUCTURE

The passive structure has a history of different analyses that have attempted to explain how the passive form of a sentence is related to the active form. Most of these accounts posit differences either in structure or in how theta roles and case are assigned between the active and the passive. Early work from Chomsky (1965) proposed an analysis of the passive where a general rule reordered the noun phrases and inserted an auxiliary. This was proposed as an improvement to the specific rule that generated the passive which was described in Chomsky (1957). In this model the passive is derived from the active but it requires a specific rule that only applies to verbs that can be passivized in order to do it. A later model given by Chomsky (1981) posits a difference regarding case and theta role assignments between the D-structure of the active and the D-structure for the passive which motivates the transformation to a passive S-structure. A simplified version of the active sentence structure is given in figure 1 below.

Figure 1: Chomsky Style Active



The subject (external argument) is generated in *SpecVP* where it is assigned the agent theta role. The object is generated in *CompV* where it is assigned the theme theta role. The logical subject moves to *SpecIP*, the sentential subject position. In the passive the logical object is generated in the same location as it is in the active but there is no logical subject (there is no NP in the *SpecVP* position). Instead, the NP that would be the subject in the active is generated lower in the tree, originating at the end of the sentence in the linear order of the D-structure. There is a parameter in which the *-en* suffix absorbs the external theta role (in the case of the above sentence, the agent theta role) and the accusative case forcing the object to move to subject position to get a case assignment (Jaeggli 1986, Baker, Johnson and Roberts 1989). This difference in these assignments is what allows the logical object to move up into the sentential subject position, resulting in passive word order.

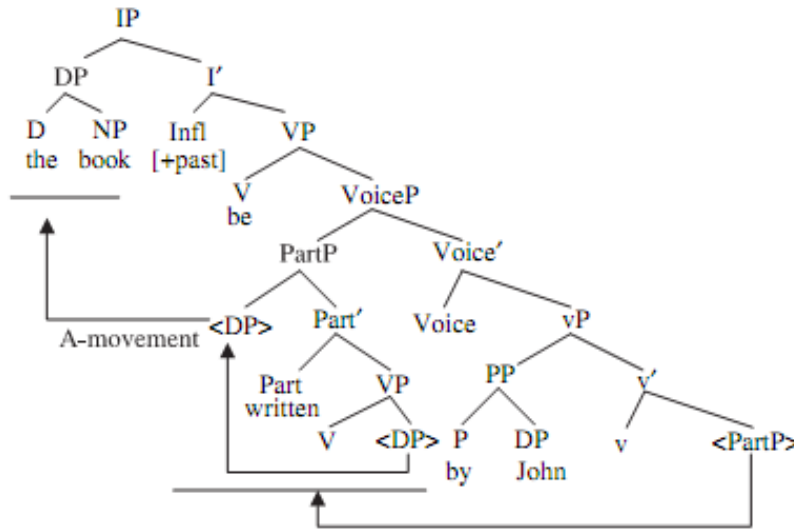
The main problem with this type of model is that the structure violates the Universal Theta Alignment Hypothesis or UTAH (Baker, 1988) which states that identical theta roles are represented with identical structural relationships (Collins 2005). If the external theta role

is not being assigned then UTAH is violated because the structural position, *SpecVP*, which would have been the site of the external argument, is not assigned the external argument theta role but is still in the structural position where that theta role should be assigned. This system also has the burden of requiring a specific passive parameter dictating the transformations that result in the passive word order in S-structure (Collins 2005). Additionally even if the arguments begin in the same structural positions in the active as the passive before transformation occurs, there is no explanation as to why *by* is suddenly placed in front of the argument in *SpecVP* in the passive.

Later, minimalist analyses of the passive such as the one proposed by Boeckx (1998) reanalyze the passive structure so that it is consistent with minimalist principles but still claims that the –en affix on the verb in the passive is the catalyst for the procedures that result in the passive. This analysis leaves something to be desired because it still posits differences in the D-structure between active and passive and, as Collins (2005) shows, the –en affix consists only of un-interpretable features rather than serving the purpose of absorbing anything that motivates movement.

Both of the above described methods require extra rules and passive specific transformations which is burdensome and, as I will explain, unnecessary if we adopt Collins' (2005) structure. Collins (2005) proposes an explanation of the passive that solves the previous structures' issues. Collins' structure posits an identical underlying structure for both passive and active sentences. His structure is shown in figure 2.

Figure 2: Collins Passive



From Collins (2005)

In this structure the entire *PartP* starts out as the complement of *v*. The head of the *VP* within *PartP* moves up to the head *Part* via head movement and the complement of this *VP*, which is the direct object, moves up to the specifier of *PartP* and the entire *PartP* moves up to the specifier of *VoiceP*. Once all of these movements take place, the direct object which was once unable to move up to the subject position due to its original location deep in the structure can now move up to the specifier of the *IP*. This is Collins' (2005) explanation of how the passive structure is derived from the same D-structure as the active, keeping with a strong UTAH hypothesis. Identical theta roles are always generated in the same place and it is feature checking that causes these movements to take place.

The motivation behind the movement in Collins' (2005) passive structure is based upon un-interpretable features on the *-en* affix. Collins (2005) provides two lines of evidence for how this works. The first is that it doesn't have an interpretable feature because the *-en* suffix attaches to the verb in both the past participle and the passive and there is no semantic reason for its presence. It cannot be a past tense marker because passives don't have to be

past tense. For example, you can form a passive like *The ball is seen by Mary* which does not have a past tense interpretation. The second is that the *-en* affix cannot serve the function of absorbing the external argument theta role given that the external argument is definitely assigned to the NP argument in *SpecVP* in the past participle because there is no other way for that argument to receive the external argument theta role in the past participle. Because there is no difference between the passive and past participle verb and passives are not necessarily past tense, *-en* still must have un-interpretable features that need to be checked. Collins' (2005) argument is that either the auxiliary *have* or the *VoiceP* can check these features and only they can do so. As such, the *-en* suffix can be licensed only by the presence of that auxiliary (in the past participle) or the movement of *PartP* to *SpecVoiceP* (in the passive) (Collins, 2005).

In order to keep with a strong theory of UTAH (Baker, 1988), Collins (2005) maintains an identical structure between active and passive in D-structure and uses movement motivated by the above mentioned feature checking where *PartP* moves to *SpecVoiceP* (a process of phrase movement) to derive the passive S-structure. This movement serves the purpose of moving the object DP to a position where it can be moved up to the *SpecIP* position (known as smuggling) as well as taking care of checking the un-interpretable features. As a result, the passive word order is achieved. This word order change doesn't occur in the case of the past participle because the *-en* features are checked by the auxiliary *have*. If *have* is present, *PartP* has nothing pulling it up to the *SpecVoiceP* position (Collins, 2005).

The structure that Collins (2005) proposes provides a clean method of deriving the correct passive word order from the same initial structure as the active with identical truth

values. It removes the problem of unmotivated passive specific transformations, the violation of UTAH, and the issue of what function *-en* serves if not to absorb the external argument theta role. For these reasons I am adopting this structure for use in this paper.

CHAPTER 3

PREVIOUS RESEARCH ON THE ACQUISITION OF THE PASSIVE

Passive sentences have been the subject of much research in both adult and child language due to the complexity of the syntactic structure and the apparent delayed acquisition of them for English acquiring children. In this section I discuss empirical data regarding the pattern of comprehension and production of passives from previous studies. For example, research by Slobin (1966) and Borer and Wexler (1992) showed that children under 5 struggled with comprehension of passive sentences, Crain et al (1987) claimed that young English acquiring children don't actually have difficulty with them at all and other researchers such as Maratsos et al (1985) and Fox and Grodzinsky (1998) found that children exhibit a pattern of comprehending actional passives but not non-actional ones. I also present several explanations for these comprehension patterns ranging from claims of structural difficulties, namely that children have difficulty with passives because of the number of transformations (Slobin 1966) or that the structure of the passive is difficult for children because they cannot handle non-trivial A-chains (Borer Wexler 1992) to semantic restrictions on what preschool aged children can form a passive with (Hyams et al 2006, Rubin 2009, Kirby 2009).

According to Slobin (1966) passive sentences involve complex transformations that children have difficulty with. Chomsky (1957) claims that the more transformations that occur in a given sentence, the harder that sentence is to comprehend, and this has been

supported by evidence from Mehler (1963, 1964). In order to test the complexity of passives in relation to other sentence types, Slobin's study tested adults and children from ages 6 to 12 with a variety of sentence types labeled kernel (plain active sentences,) negative (negative active sentences,) passive (passive sentence structure,) and passive negative (negative passive sentence structure) on how long it took them to decide whether a sentence was true or false based on a picture of a situation. Examples of the sentence types are given in (1)-(4) below.

- (1) Kernel – The girl is watering the flowers.
- (2) Negative – The girl is not watering the flowers.
- (3) Passive – The flowers are being watered by the girl.
- (4) Negative Passive – The flowers are not being watered by the girl.

Slobin (1966) analyzed subjects' response time, taking into account only the correct responses, and concluded that the order of difficulty for the sentences that were tested is kernel (plain active)>passive>negative kernel (negative active)>negative passive. He found that the difference in response times between the different sentence types generally showed this pattern across all ages but it was only statistically significant for children under 10 years old. Adults and children 10 years old and above exhibited the same pattern of response times but the differences were not statistically significant. Based on the measurement of response time for comprehension of the sentence, kernel sentences are the easiest and passive negatives are the most difficult but affirmative passives take only slightly longer to comprehend and make a decision on than kernel sentences.

Slobin's (1966) study also showed that true sentences were easier than untrue sentences, non-reversible sentences were easier than reversible ones and semantically felicitous sentences were easier than infelicitous ones. When sentences were presented with non-reversible noun phrases (where if the role of the NPs is reversed, the sentence becomes semantically anomalous) instead of reversible ones (where if the role of the NPs is reversed,

the sentence remains semantically plausible) the time difference between active and passive comprehension evened out. The reversible sentences seemed to add an additional layer of complexity and removing that component decreased response times of passives so that they were even with actives, especially with the young (8 years and under) age groups. Additionally, semantic anomaly caused an increase in response time. Semantically anomalous non-reversible sentences were more difficult than normal or non-anomalous non-reversible sentences indicating that the semantic anomaly variable had more effect on comprehension than the passive structure variable. One possible reason for this time delay, however, could be the difficulty in determining whether the anomalous sentence was true based on the story as response times don't differentiate between time used for evaluation of truth and time used for syntactic analysis. These factors are peripheral to the relation between Slobin's (1966) study and the present one but they are important to take note of for the design of the present study and will be discussed in the experimental methods section.

Slobin's (1966) study, in sum, indicates that the complexity of a sentence in terms of grammatical transformations, reversibility and negation are strong determiners of comprehension. The fact that negation was actually the most difficult indicates that the number of transformations involved in deriving the passive sentence structure is not the main determiner of difficulty as Slobin (1966) claimed because negative kernel sentences actually involve fewer transformations than passives. Given that active and passive comprehension time was so close with non-reversible stimuli, it appears that the structural differences between the two actually posed no problem for children when they did understand them. Their complexity may be due to semantic difficulties with the structure rather than a process of movement but because the study only included correct answers in the calculations, there is

no way to tell whether the children comprehended and performed equally well overall, equally well on certain types or just equally well on the ones they correctly responded to (Slobin 1966).

Maratsos et al (1985) examined children's comprehension of actional passives versus mental verb passives. Children performed better on actional passives than on mental verb passives showing that children analyze certain passive types one way and others in a different way. This comprehension incongruence means that there is something specific about mental verb passive sentences that make them more difficult for children than actional passives. An example of an actional passive is a sentence like *Grover is held by Ernie* (Maratsos et al 1985) and an example of a mental verb passive is a sentence like *Batman is liked by Superman* (Maratsos et al 1985). Their experiments showed significantly better comprehension of actional passives and they proposed that English speaking children are able to comprehend actional passives better than mental verb passives because they are analyzing actional passives as adjectival rather than verbal passives. Due to the ambiguous morphology of English and the fact that they describe a resultant state, actional passives such as those used in Maratsos et al's (1985) study can be interpreted in English as adjectival passives.

Adjectival passives are different from verbal passives because adjectival passives have verbs that can be interpreted as adjectives. For example the verb in the verbal passive *The paper was torn by the boy* can be put into a sentence frame as an adjective like *The _____ paper is on the table*. Action verbs, the verbs in passives that can be interpreted as adjectival passives, all fit into this frame but mental verbs do not. The verbs in mental verb

passives like *hear*, *see*, *want* and *love* do not fit naturally into this frame whereas *scare*, *hurt*, *drop*, and *lost* which are all action verbs do.

Borer and Wexler (1987, 1992) also claimed that children struggle with passive sentence constructions due to the structural complexity as Maratsos et al (1985) concluded, but their reason is that children cannot handle non-trivial A-chains resulting from NP movements in passives (Borer Wexler 1992). An A-chain is a connection formed when an NP argument moves to a position away from where it is assigned its theta role by the verb (Becker and Kirby to appear). A non-trivial A-chain is one where the NP moves over the verb to land in a specifier position of a phrase higher up in the structure. These differ from trivial A-chains wherein the argument that moves does not move over the verb. An example of a trivial A-chain is the movement of the external argument from within the VP to the specifier of the IP so that it is in subject position as shown in figure 3. Object to subject movement, like what occurs in passives, forms a non-trivial A-chain because the object has to move over the verb in order to land in the subject position, given in figure 4. Note that in the simplified structure in figure 4 below, where in the non-trivial A-chain forms a passive, the correct passive word order is not achieved. Because this is unimportant for the purpose of exemplifying the types of A-chains, I will not attempt to reconcile this issue.

Figure 3: Trivial A-chain

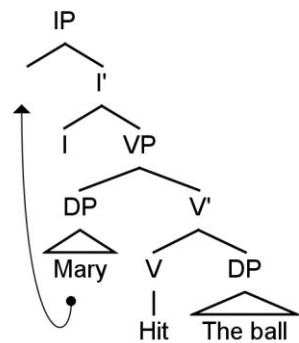
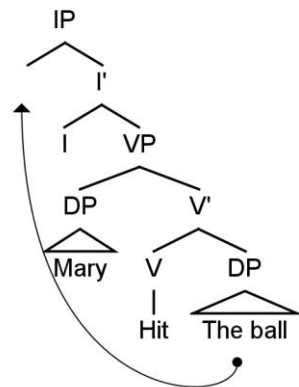


Figure 4: Non-trivial A-chain



Verbal passives supposedly involve a much greater cognitive load than actives because all verbal passives involve non-trivial A-chains in the structure that Borer and Wexler (1992) used as well as the one Collins (2005) proposed. This makes them difficult for children. If the difficulty children have with passives is related to non-trivial A-chains as Borer and Wexler (1992) claimed, children should have difficulty with all verbal passives regardless of which structure is correct. Adjectival passives, by contrast, do not involve non-

trivial A-chains like verbal passives do and this, according to Borer and Wexler (1992), explains why children are able to comprehend them. The structure of the adjectival passive (figure 5) compared with the corresponding verbal passive (figure 6) in terms of Collins' (2005) structure is shown below.

Figure 5: Adjectival Passive

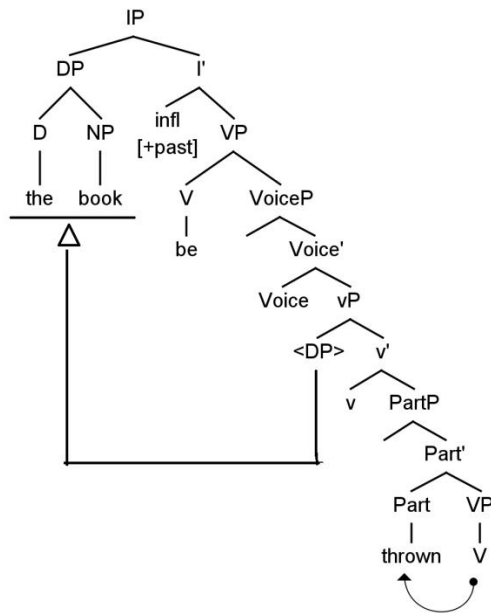
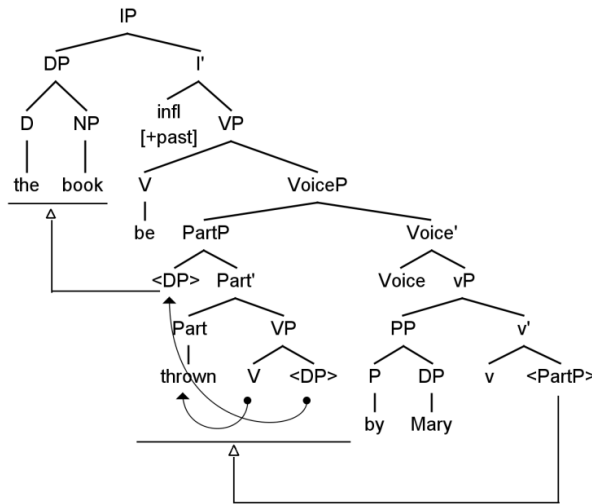


Figure 6: Verbal Passive



Looking at the trees we can see that the difference between adjectival and verbal passive structure is where the NP arguments originate. The sentential subject in the surface structure in the adjectival passive (11) starts out as the external argument when it is first generated in the same way the subject of an active starts out, creating only a trivial A-chain when it moves to *SpecIP*. By contrast, the sentential subject of the passive starts out in the object position on the other side of the verb, creating a non-trivial A-chain when it moves over the verb in order to eventually end up in the *SpecIP* position. If children are interpreting actional passives as adjectival passives then the distribution of competence with actional passives versus non-actional passives exemplified by Maratsos et al (1985) is explained. Children who can understand actional passives but not non-actional passives must be analyzing the actional passive using the adjectival structure, not the verbal structure.

Further research by Crain et al (1987) showed that children are actually able to not only comprehend but also produce some full passives given the right situation. However, once again, the passives used in the study were actional passives. Crain et al's (1987) experiments tested thirty-five preschool children in one elicited production task and three comprehension tasks on their ability to produce and comprehend full verbal passives. Children in Crain et al's (1987) study followed the same pattern as the children in Maratsos et al's (1985) study. Using several different experimental designs, Crain et al (1987) were able to elicit full passives from children as young as 3;4, significantly earlier than the age in which passive acquisition has been previously reported.

The first experiment was the production experiment. It involved acting out a scene and having the child ask another experimenter a question. The request for the child to ask the experimenter about what happened was formed so as to create a felicitous situation for the

use of a passive. Twenty-nine of the thirty-five children they tested produced full verbal passives in this experiment, the youngest of which was 3;4, (Crain et al 1987). The second two experiments were comprehension tasks. One was an act out task and the other was a picture verification task. The act out task resulted in much poorer results than the picture verification task, a 70% correct versus a 90% correct rate respectively. Crain et al (1987) ran an additional true-false judgment task with 10 children with a 77% correct rate on the untrue sentences and a 90% correct rate on the true sentences. On the surface it seems that, because children could both produce and comprehend passives, the complexity of the structure may not be the source of difficulty. However, in the truth value judgment task all the verbs used were action verbs and in the elicited production task the depictions were all of action verbs resulting in actional passives, providing further support for Maratsos et al's (1985) claim.

Fox and Grodzinsky (1998) found an interesting pattern that is similar to the ones from Maratsos et al (1985), but they focused on the semantic variable of theta roles in the *by*-phrase of passives sentences in passive acquisition rather than generalizing with actional versus non-actional verbs as previous researchers did (Maratsos et al 1985, Borer and Wexler 1992). They found that children were very good at interpreting passives that had no *by*-phrase or an agent *by*-phrase but had more difficulty when the verb assigned any other theta role to the *by*-phrase such as experiencer or theme/instrument. Example sentences of the three types of passives they used are exemplified in (5)-(7) (Fox and Grodzinsky 1998).

(5) No *by*-phrase: The bear is seen.

(6) Agent *by*-phrase: The rock star is being chased by the koala bear.

(7) Non-Agent *by*-phrase: The boy is seen by the horse.

Their claim is that children have difficulty with theta-transmission: that is, children cannot transfer a theta role from the verbal arguments to the *by*-phrase. Thus, children are

able to interpret passives without a *by*-phrase because it is not necessary to transfer a theta role, and they are able to interpret agent *by*-phrases because *by* assigns its complement an agent theta role by default so no theta transmission is necessary (Fox and Grodzinsky 1998).

Fox and Grodzinsky's (1998) conclusion that children had difficulty with theta transmission is based on children's performance in experiments which evaluated their interpretations of passives with and without *by*-phrases and their interpretations of passives with different theta roles in the *by*-phrase. They tested thirteen children on comprehension of passives, manipulating the theta role assignments by varying the verb type. Each child was presented with a scene acted out by an experimenter and then a puppet made a statement about the scene that was either true or false. Children judged whether the puppet was right or wrong. The majority of the children they tested (8 out of 13) performed poorly on passives that had an experiencer in the *by*-phrase (non-actional verb passives) but performed very well on passives that had an agent in the *by*-phrase (actional verb passives) and short passives (ones that didn't include the *by*-phrase at all). Because the children did fine on the passives in the experiments except for the non-actional passives, Fox and Grodzinsky (1998) concluded that theta-transmission was the culprit behind children's poor performance on full passive sentences (passives that contained a *by*-phrase).

There are two problems with Fox and Grodzinsky's (1998) analysis involving theta transmission. The first has to do with where the theta role assignment comes from. Looking back at Collins' (2005) paper there is clear evidence that the *by*-phrase cannot actually assign a theta role to begin with. Not only does the theta role of the complement of *by* vary depending on the verb, which is one reason Collins (2005) cited for it being a semantically null element, but there is no reason for *by* to be a theta assigner in some cases but not others.

Second, Theta transmission is dependent on the external theta role by the –en affix on the verb rather than being assigned to the logical subject and then transferred over to the *by*-phrase. However, because the –en affix is used in the past participle as well as the passive it cannot absorb the theta role or it would cause problems for the past participle (Collins 2005).

While the syntactic problems inherent in the theta transmission theory rule it out as an option, crosslinguistic empirical evidence provided by Rubin (2009) rules out the theory that structural complexity causes the greater difficulty in non-actional passives. Rubin (2009) found that children acquiring Portuguese exhibited the same pattern of understanding passives as English acquiring children. Young children acquiring both English and Portuguese tend to interpret long passive sentences as actives, understanding the subject of the passive as the acting nominal and the object in the *by*-phrase as the thing being acted upon. The relevant difference between Portuguese and English here is the morphology on the verb in the passive. Portuguese has clear morphology on the verb that differentiates between verbal passives and adjectival passives while English has the same morphology on the verb for both (Rubin 2009). If Portuguese acquiring children perform similarly to English acquiring children on verbal passives (performing significantly better on short verbal passives than long verbal passives), comprehension differences between actional and non-actional passives must have something to do with a different aspect of the non-actional verbal passive making passives difficult for children in English. Theta assignment, rather than ambiguous morphology, is a likely factor based on the Portuguese acquiring children's patterns because Portuguese acquiring children wouldn't be likely to analyze the verbal structures as adjectival ones and yet they still exhibit the same pattern as English acquiring children.

Rubin tested 3 and 4 year olds comprehension on action verbs in the experiment using an act-out task for long passives (passives that include the *by*-phrase) and a picture matching task for short passives (passives that do not include the *by*-phrase.) Short passives are relevant here because English acquiring children are more likely to be able to interpret short passives as adjectival passives because they lack a *by*-phrase but in Portuguese the verb morphology disallows this reading. Children were at ceiling for comprehension of active sentences, as was expected. In general, the children were above chance for short passives but only at chance for long passives, similar to previously found patterns for English acquiring children. This pattern was explained in English by the A-chain deficit hypothesis (Borer and Wexler 1992) because it is only possible to analyze short passives as adjectival passives because long passives have a *by*-phrase, and *by*-phrases are not present in adjectival passives. As a whole, the acquisition for both long and short passives was shown by the children in Rubin's (2009) study to be delayed in much the same pattern as English acquiring children with short passives and action verb long passives being easier than non-actional verb passives.

Individual results show that instead of long passives being at chance for all children, almost half (48%) of the children performed below chance on them interpreting 81% of all long passives as active sentences. There is no explanation for so many of the Portuguese acquiring children to perform better on the short passives than long passives since the short passives cannot be interpreted as adjectival passives in Portuguese as it is in English. Being that half of the Portuguese children had a more difficult time with long passives, interpreting the long passives but not the short passives as actives even though the unambiguous

morphology would not lead them to syntactically analyze them differently, the A-chain hypothesis is ruled out.

In Rubin's (2009) experiment very few of the children had below chance results on the short passives. Only one child out of those that were tested performed better on long passives than on short passives but this may be attributed to an individual bias for the act out task over the picture matching task for this child as it was only one subject. According to Rubin (2009), the passive shows overall delay but the variation in individual results indicates that the delay may not be universal. Rubin (2009) suggests that there may be a stage where the active interpretation is the default for passives but this doesn't explain why an active interpretation is common for long passives but not short passives. The active interpretation attributed to long passives may actually indicate a comprehension strategy which I will return to in discussing interpretations for apparent patterns in the data for this experiment.

Sesotho provides supplemental evidence to Rubin's (2009) study for the idea that structural factors do not contribute to comprehension difficulties for passives as passives in Sesotho are never ambiguous. The lack of ambiguity is due to verb morphology even if they do not have a *by*-phrase, much like passives in Portuguese, (Demuth et al 2010). Demuth et al (2010) tested children from age 2;11 to 3;5 on passive comprehension in a picture identification task and passive production in a picture description task. They found that children were significantly above chance in comprehension of both actional and non-actional passives and could produce both types without a problem as well (Demuth et al 2010). This disproves earlier conclusions from Borer and Wexler (1992) and Slobin (1966) who claimed that children do not have the grammatical structures to handle the movement in non-adjectival passives because the same grammatical structures exist in Sesotho as in English.

Sesotho acquiring children do not exhibit the difficulties that English and Portuguese acquiring children have which is unexplained because of the identical structures.

English acquiring children should have the ability to handle the complex grammatical structure of passives before the age of three just like Sesotho acquiring children because the Sesotho passive is structurally the same as the English passive. The infrequent occurrence of passives in the input and the ambiguous morphology of English may be contributing to the comprehension difficulties with English acquiring children (Demuth et al 2010). Portuguese has clear morphological markers like Sesotho, so Portuguese acquiring children should not show the same delay as English acquiring children. However, Rubin (2009) showed that many Portuguese acquiring children still have difficulty with non-actional passives just like English acquiring children. It may be that passive delay in English (and Portuguese) is related to a combination of low exposure as well as something semantic. Sesotho acquiring children may just have enough exposure from adults that the semantic factors are neutralized earlier.

Hyams et al (2006) propose that rather than structural difficulties exclusively accounting for the delay, assumptions regarding the placement of semantic roles in sentences (inherent in UG) prevent early comprehension of passives. The Canonical Alignment Hypothesis (CAH) seeks to explain the semantic difficulty that may cause the above mentioned delays in English (and in Portuguese) (Hyams 2006). CAH leads to a claim that children have difficulties with non-trivial A-chains that result in a violation of thematic and grammatical hierarchies. Speakers prefer to have the external argument of the verb occur in the sentential subject position. The most canonical alignment of theta roles in a sentence is with an active, because an active places the external argument in subject position, with an

agent as the external argument (Lempert 1984) (for example, *The girl threw the ball*).

Because of this, passive sentences, having a non-agent subject, are more difficult for children as they violate the canonical theta alignment of sentences that children come to the learning experience with as a default setting. The next most canonical subject theta role for an active sentence is experiencer subject followed by a theme subject according to the Thematic Hierarchy (Jackendoff 1972). In order to comprehend a passive sentence, children must first allow the violation of canonical alignment.

The data from Portuguese and Sesotho is accounted for with this theory about the process of language acquisition. Any assumption from UG must be modified if it doesn't fit with the specifics of the language that a child is acquiring and the more examples of the target that they have, the more opportunities they have to amend the assumption. Children who have little exposure to passives as with English acquiring children and Portuguese acquiring children will take a relatively long time to allow these violations while children with a lot of exposure as with Sesotho acquiring children will take less time because they have more exposure. Their input is felicitous for acquiring the passive quickly based on the idea that they have more opportunities to begin developing the allowance of these alignment violations.

Fox and Grodzinsky's (1998) results for English and Rubin's (2009) results for Portuguese can additionally be interpreted in terms of Hyams et al's (2006) CAH as indicating a canonical alignment not just for sentences as a whole but for individual structure types. Many sentence types involve a different alignment of theta roles than the canonical one, including the passive, so English speakers have to allow violations of the canonical alignment. The alignment that Hyams et al (2006) give is the one that children should have as

a default setting from UG. Children have to allow violation of the canonical alignment of agent as subject for passive interpretation to be possible. However, once the child allows the violation and figures out that passives are different from actives, the child then understands the passive essentially as an inverted active sentence so an agent in the *by*-phrase is easiest to comprehend because it is clear that the argument in the *by*-phrase is the actor. An agent *by*-phrase is thus the canonical alignment of a passive with any other theta role being acceptable in the subject position. The child then has to allow passives of each verb type that is allowed by English. This would then allow them to interpret an experiencer or instrument in the *by*-phrase. In this way, the results from Fox and Grodzinsky (1998) are explainable as the result of slowly allowing the violation of canonical alignments in stages.

CAH (Hyams et al 2006) is not only consistent with the previous research in passives but also with data from Kirby (2009) who examined children's acquisition of raising to object and object control verbs. In Kirby's (2009) dissertation she included tested of children's ability to comprehend full verbal passives as well as passives embedded under raising to object and object control verbs. For example:

- (8) Raising to object passive – “He needed Tigger to be called by Elmo”
- (9) Object control passive – “She told the policeman to be sniffed by the dog”

Kirby (2009) tested 4 and 5 year old children using truth value judgment tasks where children made judgments on whether a sentence about a story was true or false. She found that 4 year olds were not above chance on this task but five year olds were. When she tested 4 and 5 year olds with passives embedded under raising to object (8) and object control (9) verbs both 4 and 5 year olds exhibited an interesting pattern. Logically, passives should be just as difficult if not more difficult for children when embedded in these structures as they are embedded other, matrix clauses. However, 4 year olds actually performed better on the

passives embedded under raising to object verbs and worse on object control verbs while 5 year olds performed just as well on passives embedded under raising to object verbs as they did on matrix passives and worse on passives embedded under object control. Looking in more detail at the data, children performed above chance on the experiments with embedded passives only when there was a theta role assignment violation. Essentially, if the embedded passive did not conform to the canonical alignment of theta roles for a sentence, children were above chance for comprehension of them. This supports the idea that theta role assignment plays an important role in children's interpretation of passives. Kirby (2009) concludes that it is the lack of canonicity that causes children's confusion with certain kinds of constructions, including passives.

Kirby (2009) refers to processes guided by UG called semantic scaffolding in which children create stepping stones in acquiring language where one structure builds on another as an explanation for the pattern she found in her experiments. This also allows us to make a prediction regarding the acquisition pattern of passives using previous empirical facts about children and passive constructions. The scaffolding process allows semantic and syntactic bootstrapping to build upon previous structures and eventually result in an adult grammar. The child starts out with canonical assumptions inherent in UG and builds upon them in small, graduated steps in order to acquire all of the less-canonical forms that their language allows.

Using this scaffolding approach, children's varying patterns of passive comprehension are easily accounted for as being at different points in the scaffolding process. The less canonical a passive structure is, the later it will be learned because the groundwork has to be built before the less canonical structures can extrapolate from it. The

more canonical a passive construction is, the sooner it will be learned and the earlier children will show competence with it.

Further evidence for preferences in where the theta roles in a sentence should show up in the surface structure is shown by Ferreira's (1994) study which tested adults on what verb types they were most likely to form a passive with. The adults were presented with 2 nouns and a verb and asked to form a sentence using them. Adults were more likely to form a passive sentence with a verb that assigned a theme to its subject and experiencer to its object in the active (yielding a theme *by*-phrase; these verbs are referred to henceforth as theme-experiencer) than they were to form a passive with a verb that assigned an experiencer to its subject and theme to its object in the active (yielding an experiencer *by*-phrase; these verbs are referred to henceforth as experiencer-theme) or a verb that assigned an agent to its subject and a theme to its object in the active (yielding an agent *by*-phrase; these verbs are referred to henceforth as agent-theme.) The three types are exemplified in (10)-(12) below.

- (10) Theme-Experiencer
Active: The chair hurt Alan.
Passive: Alan was hurt by the chair.
- (11) Experiencer-Theme
Active: Diego loved the book.
Passive: The book was loved by Diego.
- (12) Agent-Theme
Active: Alice cut the scissors.
Passive: The scissors were cut by Alice.

The results of Ferreira's (1994) experiments with adults indicate that English speakers have a bias regarding what elements should appear first in a clause, consistent with Hyams et al's (2006) CAH. Themes are the less preferred subject so in order to place the experiencer in the subject position adults form a passive. For example, when presented with the two nouns,

thunder and *children*, and the verb, *terrified*, as in (13), adults were likely to form a sentence like the passive in (14).

- (13) Thunder children || terrified
(14) The children were terrified by the thunder.

Applying Kirby's (2009) semantic scaffolding approach and building upon sentence canonicity from Hyams (2006), the first passive type to be learned should be with an agent *by*-phrase because it is the clearest trigger of passive structure due to the extreme violation of the canonical alignment of a sentence. After that, the experiencer *by*-phrase should be acquired because it is the next clearest violation of the canonical alignment. It is less clear than the agent *by*-phrase because it is less canonical to have an experiencer subject in the active than an agent. The next to be acquired should be the instrumental because the instrumental subject is even less canonical. This order of acquisition seems counter to Ferreira's (1994) data from adults because adults showed a preference for creating passives with theme *by*-phrases. However, just because adults have a bias for producing a passive which is consistent with the canonical alignment of theta roles in a sentence does not indicate that these are the easiest to acquire. Theme *by*-phrase passives are more likely to be difficult for children because they do not violate the canonical alignment of theta roles for active sentences. Because they follow the canonical alignment of theta roles there are less cues present to trigger children to interpret them differently from actives.

This leads to an order of acquisition that implies if children understand passives with an experiencer *by*-phrase then they should understand those with an agent *by*-phrase, and if they understand passives with a theme *by*-phrase they should understand all passives. The expected order of acquisition of passives is, thus, from earliest to latest:

- (15) Agent-Theme
Experiencer-Theme
Theme-Experiencer

CHAPTER 4

EXPERIMENTAL SUBJECTS

Three groups of children aged 3, 4 and 5 years old were tested. There were 9 total participants in the 3 year old group (Group 1), 9 total participants in the 4 year old group (Group 2) and 6 total participants in the 5 year old group (Group 3). The children were recruited from preschools, via university mass emails and through established personal contacts. All children were from the Raleigh-Durham-Chapel Hill area and from upper-middle class economic backgrounds.

Child participants were included based on their age, native language and dialect. Only normally developing monolingual Standard English acquiring children, as indicated by parental report, were included in the study. After the study was completed children were excluded from the final data analysis if they showed a yes or no bias or provided greater than 25% incorrect responses on the control stimuli. Three of the children in the 3 year old group, three of the children in the 4 year old group and two of the children in the 5 year old group had to be excluded from the data analysis due to these factors. As a result there were six participants in the 3 year old group, six participants in the 4 year old group and four participants in the 5 year old group in the final analysis.

An additional 10 monolingual English speaking adults from UNC Chapel Hill were tested to provide a baseline of target answers to compare the child data to. All of the

volunteers who fit the criteria, determined via self-report by the subjects, were included in the adult data.

CHAPTER 5

EXPERIMENTAL STIMULI

The study consisted of a truth value sentence judgment task. The manipulated variable in the passive sentences was the thematic assignment of the NPs dictated by the verb. Three verb types were used. They were categorized by the semantic roles assigned by the verb to its arguments in the active voice.

- (16) *Agent-Theme*: The verb assigns an agent theta role to the external argument and a theme theta role to its complement in the active. (e.g. *John dropped the paint*)
- (17) *Experiencer-Theme*: The verb assigns an experiencer theta role to the external argument and a theme theta role to its complement in the active. (e.g. *Oscar saw the security camera*)
- (18) *Theme-Experiencer*: The verb assigns a Theme (or more accurately, instrumental) theta role to the external argument and an experiencer theta role to its complement in the active. (e.g. *The chair hurt John*)

The theta roles for each verb were determined based on the following attributes of the NPs in the sentences. The assignment of agent was applied to NPs that were animate and could be volitional actors in the sentence. The assignment of experiencer was applied to NPs that were animate and could therefore have feelings but not act causally. The assignment of theme was applied to inanimate NPs that could not be construed as completing the action of their own volition. For example, a paper ball could not intentionally throw itself at something because it is inanimate so it was considered a theme in these sentences. The animacy and volitional participation attributes were based on real world knowledge of objects and individuals.

Every attempt was made to reduce the possibility the children would confuse the NP that was doing the action with the NP that was the receiver of the action. Passives with one animate and one inanimate NP were used to remove any extra layer of difficulty imposed by having multiple possible doers of the action or by having similar NPs which could easily be confused. Using mixed animacy NPs made it clearer which NP fit each theta role assignment because the properties of each theta role is better matched with one type of NP or another. For example, agents are generally animate and themes are generally inanimate. Example sentences for each verb type used are shown below. For a full list of the sentences used in the study please see the appendix.

- (19) *Agent-Theme*: The paint was dropped by John.
- (20) *Experiencer-Theme*: The security camera was seen by Oscar.
- (21) *Theme-Experiencer*: John was hurt by the chair.

There were 4 verbs of each theta role assignment type used in the experiment, chosen based on their frequency in the English language, and each verb was presented only once for a total of 12 test sentences. The verbs' frequencies were determined by searching in the LDC American English Spoken Lexicon CELEX2 database which contains over 50,000 of the most common words in the English language (Baayen 1996, accessed November 2010). The frequency number is the number of tokens for each verb in its passive form in the database. All verbs within the categories were not equal in frequency but the verbs within each category were chosen to provide the highest frequency for each verb type as possible. The verbs are shown in figure 7 arranged by category with their individual frequencies in the database to the right.

Figure 7: Verb Frequencies

Verb Type	Verb	Frequency	Category Average
Agent-Theme	Scratched	60,505	260,308
	Dropped	177,749	
	Cut	385,022	
	Lost	417,956	
Experiencer-Theme	Loved	41,569	195,708
	Heard	147,352	
	Wanted	295,956	
	Seen	297,956	
Theme-Experiencer	Scared	19,993	80,290
	Calmed	22,392	
	Hurt	122,383	
	Bored	156,395	

The passive sentences were ordered pseudo-randomly to avoid clustering any one sentence type together or at the beginning or end of the experimental stimuli. Two active sentences were used for training purposes and placed at the beginning of the list. Six more active sentences were inserted throughout the stimulus list as controls for a total of 20 sentences. There were fewer filler items than test items because pilot studies showed attention problems with the age groups being tested. To avoid the problem of children getting tired of the task before all test items could be given, a smaller number of control items were included.

Each sentence was preceded by a story that the stimulus sentence was based on. Half of all the stimuli sentences had target true responses and the other half had target false, evenly distributed throughout the verb types and frequencies so that the children could not pick up on patterns of true or false for any verb or sentence type. The false passive sentences were semantically anomalous, meaning they were unlikely based on real world knowledge. Even though Slobin's (1966) study indicated that semantically anomalous sentences were harder than non-anomalous ones, anomalous sentences were used to ensure that children

wouldn't judge the sentence as true or false based exclusively on whether the NPs in the sentences were correct in conjunction with the verb. If they had been non-anomalous children could have determined the truth value based entirely on whether the correct NPs for the action were present and could entirely ignore the structural relations for false targets. For children to actually evaluate if a stimulus sentence was true or false they would need to understand the sentence as a passive and interpret the theta roles correctly. An example of a story and semantically anomalous, target false stimulus sentence following it is shown in (22) below.

- (22) Mary was putting on a puppet show for Ben and Alice. At the end of the show Mary's puppet threw a paper ball! The paper ball hit Ben and it scratched Ben.
The paper ball was scratched by Ben.

The puppet's response in (31) is anomalous because it is unusual for someone to scratch a ball. Not only is this not what happened in the story but there is no reason for someone to scratch a paper ball. The children's individual responses were all checked to ensure that the false, semantically anomalous sentences did not skew the data. Children did not exhibit a preference for either target false or target true stimuli.

CHAPTER 6

EXPERIMENTAL METHOD

The experiment was a truth value judgment task similar to one utilized by Fox and Grodzinsky (1998) in which children were successful in comprehending passives. Children were told that they were going to help a puppet learn to speak English. They were told that the experimenter was going to read some stories to them and the puppet. Then the puppet would be asked to say something about what happened. The children were asked to tell the puppet if the puppet's answer was right or wrong. They were instructed to give the puppet a reward food (strawberry) if he got it right and to give the puppet a punishment food (cucumber) if he got it wrong. Children were instructed to pay attention so they'd be able to tell if the puppet got it right or wrong. The puppet gave the same reaction for both the reward and the punishment foods to avoid biases based on which food children liked feeding to the puppet more. If they said the puppet's sentence was wrong, they were asked to tell the puppet which thing was acted upon in an active frame such as "Who did the ball scratch?" or "What was Francine afraid of?" to check for understanding of the passage. The task was video recorded for review post interview.

The following is a sample script (with a control item) from the experiment.

- (23) EXPERIMENTER: Boots and Dora were sitting at a picnic table to eat lunch together. They invited Diego to sit next to them. As he sat down Diego spilled his orange juice all over the table.
 EXPERIMENTER: Alright, tell me something that happened in this story, Rex.
 PUPPET: Diego spilled his milk on the table.

EXPERIMENTER: So was that right or wrong?

CHILD: Wrong

The 10 adult participants were given a paper version with the same stories and test sentences that the children were read. Adults were asked to read each story and mark whether the sentence that followed it was true or false based on the story.

CHAPTER 7

RESULTS

Three of the children in the 3 year old group had to be excluded from the data analysis due to yes or no biases or inattention based on their performance on the active control sentences. Three of the 4 year olds had to be excluded and two of the 5 year olds. This left six children in the 3 year old group, six children in the 4 year old group and only 4 children in the 5 year old group with usable data. The results are shown in the tables below organized by age group. Asterisks indicate incorrect responses.

Table 1: Group One – 3 year olds

Sentence Type	Verb	Target	BS 3;0	NW 3;2	SL 3;3	DM 3;5	MW 3;6	JD 3;8	% Correct
Agent-Theme	Scratched	F	F	T*	T*	T*	F	T*	47.8%
	Dropped	T	T	F*	F*	T	F*	T	
	Cut	F	T*	F	F	T*	F	F	
	Lost	T	T	F*	F*	T	F*	F*	
Experiencer-Theme	Loved	T	T	T	F*	T	F*	F*	65.2%
	Heard	F	F	F	F	T*	T*	T*	
	Wanted	T	T	F*	T	T	T	T	
	Seen	F	T*	F	F	T*	F	F	
Theme-Experiencer	Scared	T	F*	F*	F*	T	F*	F*	52.2%
	Calmed	F	F	T*	T*	T*	F	T*	
	Hurt	T	T	F*	T	T	T	T	
	Bored	F	F	T*	F	T*	T*	T*	

Table 2: Group Two – 4 year olds

Sentence Type	Verb	Target	LS 4;1	AM 4;4	MT 4;6	JG 4;6	CR 4;8	MW 4;11	% Correct
Agent-Theme	Scratched	F	T*	T*	T*	T*	F	F	56.5%
	Dropped	T	T	T	T	T	T	F*	
	Cut	F	T*	T*	F	T*	F	F	
	Lost	T	T	T	F*	T	F*	F*	
Experiencer-Theme	Loved	T	T	T	T	T	T	T	56.5%
	Heard	F	T*	T*	T*	T*	T*	T*	
	Wanted	T	T	T	F*	T	T	T	
	Seen	F	T*	F	T*	T*	T*	F	
Theme-Experiencer	Scared	T	T	T	T	T	T	T	78.3%
	Calmed	F	T*	T*	F	T*	F	F	
	Hurt	T	T	T	T	T	T	T	
	Bored	F	T*	T*	F	T*	F	F	

Table 3: Group Three – 5 year olds

Sentence Type	Verb	Target	JD 5;2	DA 5;5	VM 5;8	HH 5;10	% Correct
Agent-Theme	Scratched	F	T*	F	T*	F	68.7%
	Dropped	T	T	T	T	T	
	Cut	F	F	F	T*	F	
	Lost	T	F*	T	T	F*	
Experiencer-Theme	Loved	T	T	T	T	T	75%
	Heard	F	F	T*	F	F	
	Wanted	T	T	T	T	F*	
	Seen	F	F	T*	T*	F	
Theme-Experiencer	Scared	T	F*	T	T	T	68.7%
	Calmed	F	F	F	F	F	
	Hurt	T	F*	F*	T	F*	
	Bored	F	T*	F	F	F	

CHAPTER 8

DISCUSSION

The results were not statistically different from chance for any verb type. While only the 5 year olds results were significantly above chance ($F=21.09$, $P<.05$) 4 year olds performed better than 3 year olds overall and 5 year olds performed better than 4 year olds overall. This result is to be expected as 5 year olds would have had the most language exposure and 3 year olds the least. None of the age groups displayed an ability to comprehend agent-theme passives better than any other passive type, nor did the entire group when all ages were combined. This is contrary to the pattern that was hypothesized based on empirical evidence in previous research and the CAH. In fact, the 4 year old group seemed to show the opposite of the expected passive type bias, performing best on the theme-experiencer passives (made stranger still by the fact that the verbs in the theme-experiencer passives in this study had the lowest frequency). This pattern fits with Ferreira's (1994) findings which I will return to shortly. The surface analysis appears to support the claim that passives are actually universally delayed, at least in English, rather than delayed by type. Because none of the individual verb types showed significantly greater comprehension than any other, the data appears to suggest that children struggle with all non-reversible passives regardless of the theta roles that are assigned by the verb and that they slowly increase in comprehension ability as they get older. However, looking at each child's responses separately, it is clear that there's a great deal of individual variation ranging from completely

random to individual sentence type preference to near perfect comprehension. I propose that the reason no clear trends can be determined from this data is that individual variation is so wide for passive acquisition rate due to individual development that no particular age group can accurately represent any single point in the passive acquisition process. Passive acquisition cannot be tracked by age in such a small sample because it's a process that each child begins and completes on his or her own schedule. Instead of looking at the groups as a whole it is more useful to look at the results individual children display over the entire age range to find patterns in sentence type comprehension.

In the 3 year old group one child, BS, only missed 1 item in each category (75% correct). This child showed remarkable performance on the passives and seems, at only 3;1 to have already acquired the ability to comprehend passive structure in an adult-like way. Another child in the 3 year old group, DM clearly understood that passives were different from actives but was not able to interpret them and as such responded with a true value for each passive test stimulus. This looks completely random statistically and indicates a lack of understanding of how the passive works. JD answered incorrectly for 7 out of 12 stimuli with no preference for either true or false target answers indicating that there were no biases and the responses were truly random. SL and MW each answered incorrectly for 6 out of 12 stimuli and while their answers were not quite as evenly distributed between categories as JD's incorrect answers, they were relatively evenly distributed and they had no clear biases for true or false targets again indicating random responses. Both random responses and a yes bias for passives shows that the children are identifying them as different from active sentences but that they are unable to analyze them syntactically.

Only one child in the 3 year old group had a clear pattern of comprehension for passives. This child, NW, had a correct response ranking of Experiencer-Theme>Agent-Theme>Theme-Experiencer where experiencer-theme verbs were most comprehended and theme-experiencer verbs the least. NW answered incorrectly for all of the theme-experiencer verbs, interpreting them all as actives, correctly responded to all but one experiencer-theme verb and was at roughly 25% correct on agent-theme verbs.

In the 4 year old group there were 2 children, LS and JG, who answered true for every test stimulus. Another 4 year old, AM, showed the same yes-bias pattern as LS and JG except that they answered one of the false experiencer-theme verb passives correctly as false. Since this was only a single anomaly, it could easily have been a sudden lapse of attention causing a random response. As such, I have grouped AM with the other two 4 year olds who understood that the passive was not an active but didn't know how to interpret it. The other three 4 year olds, MT, CR and MW, all performed much better with theme-experiencer verb passives than the other two passives. Their rankings are Theme-Experiencer>Agent-Theme>Experiencer-Theme for MT, Theme-Experiencer>Agent-Theme>Experiencer-Theme for CR and Theme-Experiencer>Experiencer-Theme>Agent-Theme for MW. These last three in the 4 year old group seem to have a clear proficiency with passives using theme-experiencer verbs but not with other verbs.

The 5 year olds as a whole did much better than the other two groups, as expected. One 5 year old, HH, only responded incorrectly to three out of twelve sentences, one in each group, indicating near mastery of passives. JD had the ranking Experiencer-Theme>Agent-Theme>Theme-Experiencer. VM had the ranking of Theme-Experiencer>Experiencer-Theme>Agent-Theme. One child, DA, exhibited a ranking of Agent-Theme>Theme-

Experiencer> Experiencer-Theme, having answered true for all of the experiencer-theme sentences. There were no two identical patterns in this group. I will return to this issue shortly.

There are 5 rankings exhibited in this data. The rankings, along with the number of children who fall into them from each age group, are shown in the table below.

Table 4: Theta Role Preference Distribution

Ranking	Age Group			Total
	3's	4's	5's	
Agent-Theme>Experiencer-Theme>Theme-Experiencer				
Agent-Theme>Theme-Experiencer>Experiencer-Theme			1	1
Experiencer-Theme>Agent-Theme>Theme-Experiencer	1		1	2
Experiencer-Theme>Theme-Experiencer>Agent-Theme				
Theme-Experiencer>Experiencer-Theme>Agent-Theme		1	1	2
Theme-Experiencer >Agent-Theme>Experiencer-Theme		2		2

No patterns emerge in this data related to theta roles so this property may not be the variable of concern in passive acquisition, indicating that the proposed hypothesis is incorrect. Another way to look at the data is in terms of the animacy of the NP's.

Research by Lempert (1978, 1989) suggests that animacy has a strong effect on child language acquisition. Lempert (1978) proposed that children use a probable event strategy based on animacy to interpret sentences when the sentence allows for it and use structural relations when this strategy is unavailable. Lempert's (1978) experiment tested children in their ability to comprehend passives with an act out task. The experimenter instructed children to show the meaning of sentences with various toys. The passive sentences had either mixed animacy NPs, dual inanimate NPs or dual animate NPs. Lempert (1978) found that while 3 and 4 year olds performed fine with passive sentences where both NPs were either animate or inanimate (sentences such as *The girl pushed the boy* and *The truck hit the van*), both age groups assigned the inanimate NP the role of instrumental regardless of

whether it was in subject or object position in the passive. Only the 5 year olds did not do this. The data indicated that only 5 year olds were using syntactic knowledge to analyze mixed animacy passives and younger children were using animacy assumptions. The way in which they used these assumptions was actually the reverse of the expected pattern, however. An order of mention strategy only prevailed for two of the children. Instead, most of the younger children seemed to be assuming that the passive structure served the purpose of encoding inanimate causation or unknown causation as Horgan (1976) proposed. The data from the individual breakdown of child comprehension patterns in this study seems to reflect this as well.

Lempert (1989) tested children on passive production after training with either animate or inanimate *by*-phrase passives (animate passives having an agent theta-role and inanimate passives an instrumental one) to determine whether animacy plays a role in the acquisition of passives. The proposal was that the prototypical subject is composed of properties like animate and cause. As such, passives with animate subjects should be easier than inanimate subjects because subject prefers the properties of an animate patient over an inanimate patient and the subject constraints on passives should take precedence for comprehension. In order to allow other passives they have to allow access to other types of subjects, such as inanimate subjects, so it should take longer for passives with inanimate patients to be learned because inanimate patient passives have inanimate subjects. The experiment trained children on the passive structure with either animate patient and animate agent or inanimate patient and animate agent. Lempert (1989) found that children who received training with animate patient and animate agent *by*-phrase passives were significantly more likely to produce passives in general when tested in an elicited production

task later. The results do not seem to favor the idea that subject animacy preference aids in passive acquisition. The pattern could instead be due to the effect of animacy strategies as proposed in Lempert (1978). Children who were trained with dual animacy may have been attending to the structural relations whereas children who were trained with mixed animacy (having an inanimate patient subject in the passive) may not have bothered to attend to the structure. Regardless of the reason for the difference in training effectiveness, Lempert (1989) shows that animacy clearly has some effect on acquisition of passives. And, as the study shows, children's patterns of comprehension of passives are much more likely to be based upon animacy than theta roles. Evaluating the results from the present study in terms of whether the causer of the action is animate or inanimate is prudent based on Lempert's (1978) findings.

The expected interpretation pattern for children in this experiment for animacy factors is that children who are just acquiring the passive structure should perform best on inanimate causation passives just like those in Lempert's (1978) study.

Condensing the rankings chart and limiting it to animacy in the *by*-phrase instead of theta-roles we have two different patterns of comprehension. All but one of the children who were included in the above table fit into one of two patterns where either animate or inanimate *by*-phrase passives were better comprehended. The child who does not fit into these two ranking patterns exhibits a 75% correct rate for both animate and inanimate *by*-phrase passives once the groups are condensed based on animacy. Because this child's comprehension percentage rate overall is high, this child was grouped with the children who exhibited overall proficiency with the passive structure and having no clear bias towards

understanding a particular type. The children's responses are graphed in figure 8 and the distribution of rankings is given in table 5.

Figure 8: Individual Comprehension Rate by Animacy of the *By*-phrase

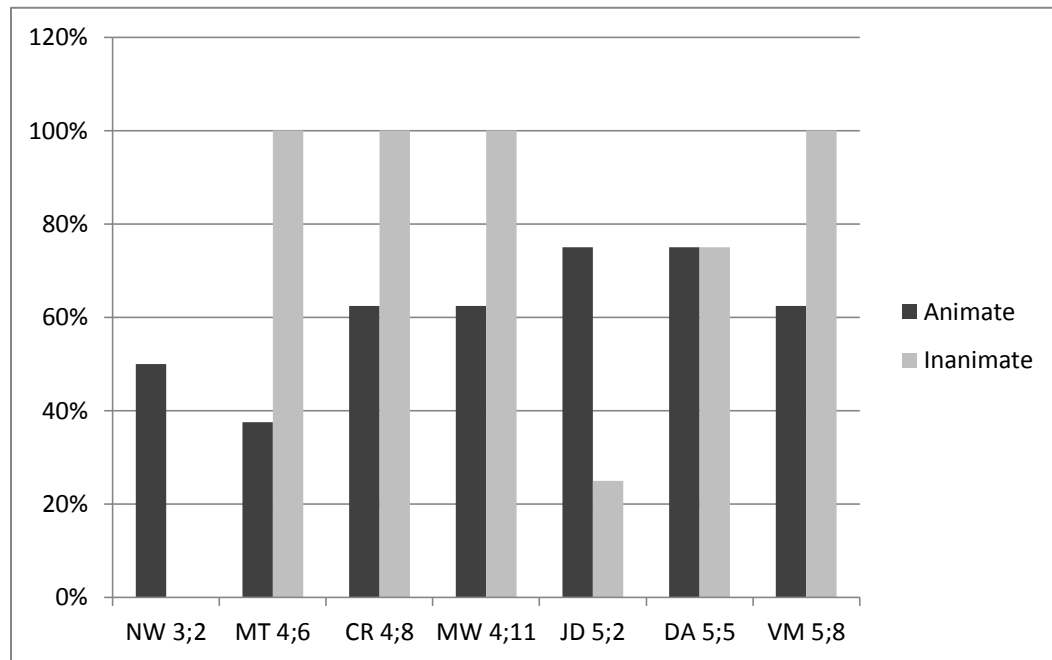


Table 5: Comprehension Ranking by Animacy of the *By*-phrase

Ranking	Age Group			Total
	3's	4's	5's	
Inanimate=Animate			1	1
Animate>Inanimate	1		1	2
Inanimate>Animate		3	1	4

For each of the test stimuli there was one animate and one inanimate NP so for each sentence if the *by*-phrase was animate, the sentential subject was inanimate and vice versa. There were no instances where the two NPs had the same level of animacy. The rankings in table 5 reflect proportions of correct answers based on the animacy of the noun in the *by*-phrase. The Inanimate-Animate ranking reflects even proportions of correct answers for inanimate *by*-phrases and animate *by*-phrases respectively. Animate>Inanimate reflects a

greater proportion of correct answers for animate *by*-phrase passives than animate *by*-phrase passives. The reverse is true for Inanimate>Animate.

This data does not fit the exact patterns exhibited by the children in Lempert's (1978) study which showed that younger children assign the acting role to the inanimate NP due to the assumption that passives encode inanimate causation but it is still consistent with her findings and theories. Because this is such a small sample once the random response subjects were removed from analysis and because there is a large amount of variation within each age group (likely due to different rates of acquisition between individuals) it is necessary to look at each subject's comprehension pattern to determine trends in the data. Looking at the results by age group would not be prudent because the small sample size within each age group does not lend itself to generalization. Analyzing across age groups can give us some idea of what might be going on. Individual rankings of animacy may lend support to an animacy related passive sentence acquisition pattern rather than a theta role related one.

The ranking of Animate>Inanimate is easily explained by analysis of sentences using animacy assumptions by children who do not yet analyze mixed animacy sentences structurally. Merging an innate animacy assumption with the idea behind CAH, which claims that the most canonical alignment of theta roles for a sentence is an active structure (Hyams et al 2006), children have a system in place to start building syntactic relations between NPs and a verb in the basic active sentence. Children would need only to determine where the NP causer of the action is in relation to other sentential elements. After acquiring the basic syntactic relations for the active, children may still have the animacy assumption at their disposal to use in building the structural relations for more complex structures like the passive.

Having this assumption means that children who have not yet acquired any of the passive structure will automatically assign the agent theta role, the theta role for the causer of the action, to the animate noun in a sentence. For example, when presented with a string consisting of two NPs and a verb, such as in the passive stimulus of an agent-theme verb *The ball was scratched by Ben*, children who are still relying on the assumption that animate NPs are actors to determine the meaning of complex syntactic structures should interpret the above sentence as *Ben scratched the ball*. These children correctly say this stimulus sentence is false based on the story because in the story that preceded the stimulus sentence the ball actually scratched Ben rather than the other way around. This would look like they correctly analyzed the structure but instead they correctly responded because the structure fit with the animacy assumption. Children should respond similarly in the case of an experiencer-theme verb because the inanimate noun is the one on the receiving end of an action imposed by the animate noun. Conversely, they should incorrectly say that sentences such as *Francine was scared by the toy bee* are false because these sentences have inanimate causation which is counter to the animacy assumption.

If this is correct, it explains why short passives but not long passives have been shown to be comprehensible in past studies (Maratsos et al 1985, Fox and Grodzinsky 1998) by very young children: they were automatically applying an agent theta role to an animate NP regardless of syntactic structure. In a short passive the thing that causes the resultant state is not stated. Children who are analyzing structures based on animacy assumptions could be assuming that the causer of the action (which isn't given) is animate regardless of the animacy of the NP that is given. An expectation that children would perform well on inanimate subject short passives also follows from this. When encountering a sentence like

The table is kicked, children in this initial stage of passive comprehension should assume that the table did not cause the action because it is not animate. When encountering a sentence like *The man is kicked* they should similarly expect that the causer of the action is animate. This leads to a dual animacy situation so children would be forced to attempt to interpret the passive syntactically since they cannot use their animacy assumption strategy to interpret it. The expectation is that they would not be as good at analyzing the animate subject short passives as the inanimate ones because they have to make a decision about whether the actor is overt or not. This hypothesis cannot be confirmed from the present data and would need further investigation.

The one three year old who had neither a mastery of passives nor completely random data exhibited a pattern of Animate>Inanimate and appears to be at the stage of passive acquisition described above. One 5 year old, JD, shows this ranking as well but in reviewing the video recording it is clear that the child was not attentive to the task even though the child did not perform badly enough on the controls to be excluded from the analysis. This is an anomaly in the data and does not appear to be caused by the child being at a different stage of passive acquisition than the other children of the same general age.

Three of the 4 year olds and the remaining 5 year old exhibited the reverse ranking, performing better on inanimate than animate NP *by*-phrases (Inanimate>Animate). These children performed at 100% comprehension on the inanimate *by*-phrase and only 57% on the animate *by*-phrase on average, with no extremes of correct or incorrect responses or biases towards true or false targets. These children were apparently guessing on the animate *by*-phrase stimuli but were able to interpret the inanimate *by*-phrase stimuli. Recall that Lempert (1978) found confirmation for a proposal from Horgan (1976) that children use passive

structure to differentiate between animate causation and inanimate causation. Inanimate *by*-phrase passive comprehension like that found with the 4 and 5 year olds and like what Lempert (1978) found is the logical next step after animacy assumption based interpretation in the acquisition process. If you recall that Ferreira's (1994) study with adults showed a preference for forming a passive with verbs that assigned a theme theta role to the subject (an inanimate NP) and an experiencer theta role to the object (an animate NP) for an active sentence it makes sense that children would have more experience with inanimate causation. The theta role assignments of verbs dictated whether they preferred to use an active or a passive structure. Given that adults preferred to make passives with inanimate *by*-phrases in the experiment it is possible that they produce more of this type of passive in general so children would have the most experience from the input with passives of this type than any other. The adults in Ferreira's study were also more likely to form passives with these types of verbs with nouns of mixed animacy. Granted, the results from Ferreira's (1994) study were based on experimentation rather than analysis of adult speech, so it is not necessarily the case that children hear more of these types of passives than other types of passives but if their results are reflective of what is found in the input, this would give children a good reason to make the assumption that passives are used for inanimate causation.

Based on this hypothesis regarding the input, inanimate causation passives should be the first type of passive to be acquired completely because exposure to mostly inanimate *by*-phrase passives from adults would lead children to make the assumption that passives are for use with inanimate causers. At this stage, the animate *by*-phrase passives would be more difficult to comprehend because children are working under the assumption that the passive structure and the markers that identify it as being passive are exclusive to inanimate causers.

Children could then use the inanimate *by*-phrase passive as a kind of template to decide how to assign theta roles with other types of passives once they reset their assumptions about what passives are used for based on further experience with sentences having the passive markers but also animate NPs in the *by*-phrase. Children would need longer to comprehend animate *by*-phrase passives, which are less prevalent in the input, because they need sufficient exposure to them in order to realize that passives are possible in English for both animate and inanimate causers. The data from the four children who were better at inanimate *by*-phrase passives support this idea.

It's possible that the one 3 year old and one 5 year old who showed comprehension of both sentence types have already advanced past the point of the above described template stage to English passive proficiency. Following this same line of logic, the children who exhibited random responses for all categories would be between the stages of interpreting sentences based on real world assumptions regarding what can cause an action and forming the assumption that passives are for use with inanimate causation. At this point they realize that there is a different structure for the passive but not what it's for or how to interpret it. Those who answered true for all test stimuli are also at this stage but, rather than guessing, were biased to trust the puppet, most likely because the experimenter was the one controlling it.

It is possible to explain all of the data from this experiment in terms of animacy assumptions originating from the default setting of UG, coupled with the process by which children build upon assumptions and structures to reach an adult competence with passives. There are two assumptions from UG at play. One is the assumption that subjects are agents and animate, and the other is that causers are animate. The data indicates that children put a

greater importance upon the causation assumption. If children were putting a greater emphasis on the subject assumptions, the youngest children wouldn't perform best on animate *by*-phrase passives because those passives have an inanimate non-agent syntactic subject. As such the order of acquisition with this analysis should be as follows.

- (24) Animate Actor Assumption. (Stage 1)
- (25) Understanding that passive structure is different from active but not sure how to interpret it structurally. (Intermediate Stage)
- (26) Assumption that passive structure indicates inanimate causation in a sentence (possibly influenced by adult preference for this type of passive). (Stage 2)
- (27) Understanding that passive should be interpreted based on structural relations. (Stage 3)

Children start with the assumption that the causers of events are animate in the stage given in (24) which is characterized by good performance when the *by*-phrase contains an animate causer but poor performance when it contains an inanimate causer. In the intermediate stage, given in (25), they realize that passives are different from actives but don't understand how to interpret them. This intermediate stage is characterized by guessing on interpretation of passive sentences. Through exposure to passives in the input, which may have inanimate causer NPs in the *by*-phrase the majority of the time, children acquire the passive as a way to differentiate between animate and inanimate causation as in the stage given in (26) which is characterized by good performance on passives with inanimate causation but poor performance on passives with animate causation. It is entirely possible that at the second stage they are switching the emphasis from causer assumption to subject assumption but there is no evidence from this experiment one way or the other at this stage. They use the template from inanimate causation passives that they acquire first along with contextual information from the learning experience to release the aforementioned animacy restrictions for passive causation and accept that structural relations dictate interpretation of

passive sentences in all instances as in the stage given in (27). Children at this stage would exhibit high levels of comprehension for all types of causation.

Children who understand agent or experiencer causation passives based on the structural relations of the passive structure rather than assumptions of animacy should have already mastered inanimate causation passives. Children who appear to understand agent or experiencer causation passive types but do not show proficiency with the latter should still be working from animacy assumptions. That some children (over age 4) still exhibit the pattern of interpreting non-reversible passives based on animacy assumptions can be accounted for by individual development rates and linguistic experience variation. This is consistent with the semantic scaffolding process as described by Kirby (2009) and explains the results of other studies which have shown apparently varying patterns children exhibit in passive comprehension.

APPENDIX A

EXPERIMENTAL STIMULI

Training Sentences

1. Pig, Whyatt, and Ariel all went to concert together. The musicians played some African drum music. Ariel danced around the room and Pig and Whyatt watched.

Pig danced to the drum music. (Active)

2. Nina was showing Rich how to tie a knot in his string. Dave told them that he could tie lots of things. To show them, Dave untied his shoes and then tied them again with a bow.

Dave tied the bow on his shoes. (Active)

Test Sentences

3. Mary was putting on a puppet show for Ben and Alice. At the end of the show Mary's puppet threw a paper ball! The paper ball hit Ben and it scratched Ben.

The paper ball was scratched by Ben. (Agent-Theme)

4. Dora was reading a book in Spanish to Boots and Diego. Boots thought it was a boring book but Diego loved the book.

The book was loved by Diego. (Experiencer-Theme)

5. Archie showed everyone his rock collection that he got last summer. He even gave Jeff and Greg some rocks to start their own collections. Jeff put their rocks in their bed rooms. Greg put his rocks on the couch in the living room.

Jeff put his rocks on the couch. (Active)

6. Francine is very afraid of Bees. Francine and Muffy were playing with blocks at Buster's house. Buster threw a toy Bee at the girls' play area. Francine screamed really loud because she thought it was a real bee!

Francine was scared by the toy bee. (Theme-Experiencer)

7. In art class, Tiffany and Katie were painting pictures. John was carrying some paint to his table and wasn't looking when he went to set it down. John dropped the paint, spilling it everywhere.

The paint was dropped by John. (Agent-Theme)

8. One afternoon Scott put a movie on the tv. Dave decided to take a nap during the movie and Scott read a book while he watched. Warehouse Mouse loved movies so he watched the movie for the entire time.

Warehouse Mouse watched the movie on the tv. (Active)

9. Big bird was making a time capsule. His friends Burt and Ernie were going to record a message on a recorder so they could listen to their message when they dug the capsule up. Ernie went first. The light turned green on the tape recorder. The green light meant that the microphone on the tape recorder could hear Ernie.

The microphone was heard by Ernie. (Experiencer-Theme)

10. Fern and Alan were playing tag with Sue Ellen. Sue Ellen was “it” and was chasing Alan. Alan tripped and hit his head on the chair. The chair hurt Alan!

Alan was hurt by the chair. (Theme-Experiencer)

11. Toni was making a fort in the play area of the classroom. Carrie and Luke wanted to help so they cleared the other toys away from the fort. Luke rolled the ball into the closet.

Luke rolled the ball to the corner. (Active)

12. Amy was cutting a heart out of paper. Jenny and Mike were talking about ponies and Amy turned her head to listen better. She accidentally dropped the scissors on her leg. The scissors cut Amy!

The scissors were cut by Amy. (Agent-Theme)

13. Dorothy the Dinosaur brought desserts to her friend's house for after dinner. She brought cake, pie, and ice cream. Wags the dog wanted to eat the cake but Henry wanted to eat the pie.

The pie was wanted by Henry. (Experiencer-Theme)

14. During story time, everyone sat around the teacher to listen. Mary and Alice sat on pillows but Ben wanted to sit in a chair so Ben brought a chair from the drawing table over to the story area and sit in it.

Ben sat on a chair in the story area. (Active)

15. People had been writing on the fence in the park so the park staff put a security camera up to keep an eye on the wall. While Cookie Monster and Elmo were playing in the park, Oscar the grouch decided to draw a picture on the fence. The security camera saw Oscar draw on the wall and he got in trouble.

The security camera was seen by Oscar. (Experiencer-Theme)

16. Arthur was putting on a play for Emily, D.W. and some toys. The stuffed animals looked very bored to Arthur. Arthur bored the stuffed animals with his play!

Arthur was bored by the stuffed animals. (Theme-Experiencer)

17. Alan, George, and Fern were painting in class. Fern painted a picture of a cat, Alan painted a picture of a fish, and George painted a picture of a dog with watercolor paints.

George painted a picture of a dog. (Active)

18. When Hannah was showing Mark and Loren her new Jewelry box, it wouldn't open. It needed a key but Hannah didn't have it. Hannah lost the key to her jewelry box.

The key was lost by Hannah. (Agent-Theme)

19. Jenna and George were playing with a baby doll. George pressed the button on the doll to make it cry and handed it to Buster. Buster rocked the doll until it stopped crying. Buster calmed the doll by rocking it.

Buster was calmed by the doll. (Theme-Experiencer)

20. At lunch time Boots and Dora were sitting at a picnic table to eat together. They invited Diego to sit next to them. As he sat down, his cup of orange juice tipped over and spilled all over the table.

Diego spilled his milk on the table. (Active)

APPENDIX B

ADULT RESPONSES

Question	Subject and Responses									
	1	2	3	4	5	6	7	8	9	10
The paper ball was scratched by Ben.	F	F	F	F	F	F	F	F	F	F
The paint was dropped by John.	T	T	T	T	T	T	T	T	T	T
The scissors were cut by Amy.	F	F	F	F	F	F	F	F	F	F
The key was lost by Hannah.	T	T	T	T	T	T	T	T	T	F*
The book was loved by Diego.	T	T	T	T	T	T	T	T	T	T
The microphone was heard by Ernie.	T*	F	F	F	F	F	T*	T*	F	F
The pie was wanted by Henry.	T	T	T	T	T	T	T	T	T	T
The security camera was seen by Oscar.	T*	F	F	F	F	F	F	F	F	F
Francine was scared by the toy bee.	T	T	T	T	T	T	T	T	T	T
Buster was calmed by the doll.	F	F	F	F	F	F	F	F	F	F
Alan was hurt by the chair.	T	T	T	T	T	T	T	T	T	T
Arthur was bored by the stuffed animal.	F	F	F	F	F	F	F	F	F	F

APPENDIX C
CHILD RESPONSES

3 year olds

Verb (Stimuli #)	Target	BS 3;0	DM 3;5	MW 3;6	NW 3;2	SL 3;3	JD 3;8	% True	% False	%Cret Total	
Scratched(3)	F	F	T*	F	T*	T*	T*	66.6%	33.3%	47.8%	A G T - T H M
Dropped(7)	T	T	T	F*	F*	F*	T	50%	50%		
Cut(12)	F	T*	T*	F	F	F	F	33.3%	66.6%		
Lost(18)	T	T	T	F*	F*	F*	F*	33.3%	66.6%		
Loved(4)	T	T	T	F*	T	F*	F*	50%	50%	65.2%	E X P - T H M
Heard(9)	F	F	T*	T*	F	F	T*	50%	50%		
Wanted(13)	T	T	T	T	F*	T	T	83.3%	16.6%		
Seen(15)	F	T*	T*	F	F	F	F	33.3%	66.6%		
Scared(6)	T	F*	T	F*	F*	F*	F*	16.6%	83.3%	52.2%	T H M - E X P
Calmed(19)	F	F	T*	F	T*	T*	T*	66.6%	33.3%		
Hurt(10)	T	T	T	T	F*	T	T	16.6%	83.3%		
Bored(16)	F	F	T*	T*	T*	F	T*	66.6%	33.3%		

4 year olds

Verb (Stimuli #)	Target	AM 4;4	CR 4;8	JG 4;6	LS 4;1	MT 4;6	MW 4;11	%True	%False	%Crct Total	
Scratched(3)	F	T*	F	T*	T*	T*	F	66.6%	33.3%	56.5%	A G T - T H M
Dropped(7)	T	T	T	T	T	T	F*	83.3%	16.6%		
Cut(12)	F	T*	F	T*	T*	F	F	50%	50%		
Lost(18)	T	T	F*	T	T	F*	F*	50%	50%		
Loved(4)	T	T	T	T	T	T	T	100%	0%	56.5%	E X P - T H M
Heard(9)	F	T*	T*	T*	T*	T*	T*	100%	0%		
Wanted(13)	T	T	T	T	T	F*	T	83.3%	16.6%		
Seen(15)	F	F	T*	T*	T*	T*	F	66.6%	33.3%		
Scared(6)	T	T	T	T	T	T	T	100%	0%	78.3%	T H M - E X P
Calmed(19)	F	T*	F	T*	T*	F	F	50%	50%		
Hurt(10)	T	T	T	T	T	T	T	100%	0%		
Bored(16)	F	T*	F	T*	T*	F	F	50%	50%		

5 year olds

Verb (Stimuli #)	Target	DA 5;5	HH 5;10	JD 5;2	VM 5;8	%True	%False	%Crct Total	
Scratched(3)	F	F	F	T*	T*	50%	50%	68.7%	A G T - T H M
Dropped(7)	T	T	T	T	T	100%	0%		
Cut(12)	F	F	F	F	T*	25%	75%		
Lost(18)	T	T	F*	F*	T	50%	50%		
Loved(4)	T	T	T	T	T	100%	0%	75%	E X P - T H M
Heard(9)	F	T*	F	F	F	25%	75%		
Wanted(13)	T	T	F*	T	T	75%	25%		
Seen(15)	F	T*	F	F	T*	50%	50%		
Scared(6)	T	T	T	F*	T	75%	25%	68.7%	T H M - E X P
Calmed(19)	F	F	F	F	F	100%	0%		
Hurt(10)	T	F*	F*	F*	T	25%	75%		
Bored(16)	F	F	F	T*	F	25%	75%		

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