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Verb-based versus class-based accounts of actionality effects in children's comprehension of passives*

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Abstract

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Several studies have shown that children perform worse on tests of passive comprehension when the verb is non-actional than when it is actional. Most existing accounts focus on the semantic characteristics of the class of non-action verbs in explaining this difference. An alternative is a "verb-based" account in which passives are initially learned verb by verb, and children hear fewer non-actional passives in their language input. An analysis of the passives heard by Adam, Eve and Sarah (Brown, 1973) found more actional than non-actional passives, consistent with the verb-based account. In a second study, children tested for passive comprehension were re-tested a week later. The verb-based account predicts that children should show a consistent pattern of responses for individual verbs on test and re-test. Such consistency was found, with some inconsistency due to improvement over the re-test. Further analyses showed no effects of affectedness in explaining children's problems with passives. Finally, we discuss whether a mixed model containing both verb-based and class-based mechanisms is required to explain the actionality effects.

Introduction

It is often found that children learning language do not formulate general hypotheses about the rules of the language. Rather, learning occurs quite gradually in many cases, and, in its final adult form, the language exhibits

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numerous idiosyncratic exceptions. With this in mind, the present paper examines the acquisition of the passive – a rule so simple in its operation, yet profound in its effect of reversing the assignments of semantic roles to grammatical functions. Interest in how children acquire the passive was stimulated when Maratsos, Kuczaj, Fox, and Chalkley (1979) found that children were much less likely to comprehend passives of non-action verbs such as *like* than of action verbs such as *hit* (see also de Villiers, Phinney, & Avery, 1982; Maratsos, Fox, Becker, & Chalkley, 1985; Sudhalter & Braine, 1985; Pinker, Lebeaux, & Frost, 1987).

Since the original report, there have been many attempts to explain the discrepancy in children's performance. In the present paper we will classify the accounts into two basic types: class-based and verb-based. Class-based accounts focus on the semantic properties of non-action verbs as a class. These properties may also include the types of arguments (e.g., agent, patient, experiencer) that are typically associated with the different semantic classes of verbs. Verb-based accounts, on the other hand, propose that children are restricted in their knowledge of passives by the input. The verbs that they hear in the passive voice are more often actional than non-actional and acquisition is based primarily on item-by-item learning. Thus, it is not the semantic nature of the verb classes that constrains acquisition, but the input.

In explaining their original findings, Maratsos et al. (1985) proposed that children's passives are restricted to verbs that are high in "semantic transitivity" (Hopper & Thompson, 1980). This concept denotes a cluster of properties relating to the animacy, definiteness, intentionality and affectedness of the verb's arguments. Maratsos et al. (1985) suggested that children may falsely hypothesize that the English passive is constrained by semantic transitivity in the same way that rules in other languages appear to be so constrained (Hopper & Thompson, 1980). Hence, children believe that passives are restricted to verbs like *hit*, which are highly transitive in this sense.

Sudhalter and Braine (1985) found evidence that acquisition of passives is not all-or-none for particular subclasses of verbs (e.g., action, mental, perceptual). They reasoned that if children learned the passive for subclasses of verbs, then for any particular subclass a child should either know all of the passives or not. This, in turn, should produce a tendency toward a bimodal distribution. In fact, Sudhalter and Braine (1985) found that children's responses to a passive comprehension task did not differ from the binomial distribution expected from an evenly varying set of responses.

Sudhalter and Braine used this evidence to favor an alternative, "cue-based" approach in which different elements within the sentence (e.g., *Be* + *ed*) provide cues associated with various functions such as reversing the argument roles. The preposition *by* in the passive construction was said to cue

the child to expect an agent argument. Since the object of the *by* phrase in non-actional passives is not an agent, the competition between cues would create a higher probability for errors with non-action verbs, but the error function would be continuous rather than discrete. While this account differs considerably from other class-based accounts, it does make reference to the semantic classes of non-action verbs via their semantic arguments (e.g., experiencer vs. agents) and is consequently classified as class-based in the present scheme.

Pinker et al. (1987) have suggested that children's problems with non-actional passives may be part of a constraint on language learning. Children's passive acquisition must not generalize to verbs such as *fit* that cannot be passivized in constructions such as **John was fit by the suit*. Using learnability arguments, Pinker et al. point out that there would be no retreat from such overgeneralization in the absence of negative evidence. Since children do not regularly produce such erroneous passives, they could not receive negative feedback. Hence, they could not learn that such passives are ungrammatical. Pinker et al. suggest that the Maratsos effect may be a manifestation of a cautious approach to passive generalization that limits early generalization to verbs with agent-patient argument structures (i.e., action verbs). However, they also caution that the Maratsos effect pertains to comprehension, not to grammaticality. They note that comprehension tests are "virtually certain not to provide evidence on the grammaticality of the sentences for the [child] (so long as they are comprehensible)" (Pinker et al., p. 235). Thus, the primary tasks employed in their report were production studies of novel verbs having various combinations of associated argument roles. Presumably, if children felt that a verb was unpassivizable then they would be less willing to use it in the passive form.

In Pinter et al.'s studies, one of the strongest findings was that children were much more willing to passivize verbs that had been modeled in the passive form ("unproductive passives") than those that had been modeled in the active form and required a generalization ("productive passives"). While this result may not be surprising, it does indicate a stronger role for lexical learning than for productive generalization in the passivization of new verbs. Pinker et al. (1987) (following Pinker, 1984) proposed that much of the Maratsos effect may be explainable by verb-based mechanisms, although they appear to favor a mixture of verb-based and class-based accounts.

How would a verb-based mechanism work? In an informal analysis of passives in children's language input, Jill de Villiers (personal communication) found that the children did not hear many non-actional passives. This was also noted by Maratsos et al. (1985), again informally. If children initially acquire passives primarily for those action verbs that have been heard in the

passive form, then they should be better on actional passives when it comes to comprehension tasks (cf. Pinker, 1984).

The verb-based account presupposes that the passive is acquired and represented on individual verbs within the lexicon. This is compatible with current theories of grammar that require separate lexical representations for active and passive forms of verbs (e.g., Bresnan, 1982; Gazdar, Klein, Pullum, & Sag, 1985), and contrasts with earlier approaches where passives were derived from deep structure actives (e.g., Chomsky, 1965). The notion that children initially acquire rules over individual lexical items, either before or while they are formulating more generalized rules, has frequently been postulated in language acquisition research (e.g., Brown, 1973; Bowerman, 1982; Kuczaj, 1978; Kuczaj & Brannick, 1979; Kuczaj & Maratsos, 1983; Maratsos, 1979; Pinker, 1984). Lexically based learning has been useful in explaining why children show only limited generalization of rules in the early stages of acquisition. For example, subject-auxiliary inversion, progressive inflection, Wh-question formation, and causative constructions all appear to show such a pattern of development.

There are two separate issues in considering the role of lexical learning of passives. The first issue is whether the passive is initially acquired on individual verbs. The second is whether that acquisition pattern explains the actionality effects. For example, Maratsos has argued that children initially acquire many rules on an item-by-item basis (e.g., Maratsos, 1979). However, in explaining the actionality effects in passive comprehension, Maratsos et al. (1985) specifically rejected the possibility of a verb-based account. Their rejection was based on an informally reported analysis that indicated no evidence of verb-based learning. Children were tested on passive comprehension with each verb three times, for a total of 75 trials. For individual verbs, children's answers appeared to be normally distributed over the three responses. Presumably, Maratsos et al. (1985) predicted a bimodal distribution if some children knew the passive for that verb, and others did not.

Very few researchers have actually proposed a verb-based account of the Maratsos effect. Since the effect seems so clearly to be semantically motivated, it is natural to look for semantic (class-based) explanations. As noted, Pinker (1984) and Pinker et al. (1987) support a mixed model of verb-based and class-based accounts, but no one has previously advocated a purely verb-based account for the effect. In the present paper we will see how far one can go within a purely verb-based account. Since we believe that this is a lot further than one might initially expect, it is worthwhile considering the possibility that a verb-based account is sufficient to explain the Maratsos effect by itself. However, we do not intend to hold rigidly to such a position.

The first problem for a verb-based account is to explain how children

generalize passives to verbs that are unattested in the input. Pinker et al. (1987) cite many cases where children produce passives on verbs that they could not have heard in the passive form, which must therefore be the result of a generalization (e.g., "I don't like being falled down on" – Wasow, 1981). Verb-based accounts do not rule out generalization of passives. They only seek to explain actionality differences in terms of differential input and representation. Why, then, does generalization not spread throughout the system and allow children to correctly comprehend passives of non-action verbs?

Bowerman (1987) has pointed out that we must distinguish between learning that is said to occur "on-line" versus "off-line". In on-line learning, generalizations are made as they are used. In off-line learning, they are made as the system reorganizes itself, somewhat independent of actual usage. If generalization of the passive occurred on a case-by-case basis, children would generalize the passive to individual verbs when the need arises (i.e., on-line), rather than having generalizations infiltrate the whole system in one fell swoop (i.e., off-line). This is similar to notions like "analogy" suggested by MacWhinney (1978), and at-the-moment-of-speaking transfers of syntactic privileges suggested by Maratsos (1979).

Though passive comprehension is possible through a generalization mechanism, one would expect this method to be less effective than simply consulting an established passive lexical entry containing the necessary information regarding argument roles. Established passive lexical entries, derived from the input, would be more common for action verbs than for non-action verbs. Hence, actional passives should be better comprehended than non-actionals. In fact, if generalization is simpler when there is a semantically related verb established, then the actionality effects would be enhanced because there would be more stored actional passives that could serve as models for generalization to semantically similar verbs.

Outline of the present studies

Currently, the verb-based account of the Maratsos effect relies heavily on unsystematic reports of differential passive input for action and non-action verbs. If one is to take such a proposal at all seriously, it is necessary to provide more substantial evidence that children's language input lacks non-actional passives. This is examined in the first study of the present paper.

It will be recalled that Maratsos et al. (1985) failed to find a bimodal distribution for performance on individual verbs in their task, and thus rejected a verb-based account of the actionality effects. However, the requirement of a bimodal distribution may be too strong to allow us to evaluate the

proposals since experimental "noise" may prevent such a result. In addition, the data were reported only informally and cannot be fully evaluated. The second study of the present paper employs a more straightforward method by looking for consistency over test and re-test for individual verbs in children's comprehension of passives. A verb-based account predicts that if children comprehend a passivized verb on one test, they will also comprehend that passive on a re-test. A class-based account makes no such prediction.

Study 1

Method

In this analysis we searched the language input to Adam, Eve, and Sarah (Brown, 1973) using the CHILDES computerized transcripts (MacWhinney & Snow, 1985). The aim of the study was to determine the proportion of actional and non-actional passives that children hear from adults. Adam's data extended from ages 2;3 to 4;11 and contained 26,178 input utterances. Eve's data were from 1;6 to 2;3 with 15,650 input utterances. Sarah's data were from 2;3 to 5;1 with 44,827 input utterances. Thus, there was a total of 86,655 utterances used in the analysis. Most of these were spoken by the child's mother or the researchers collecting the data. The KWAL (key word and line) program from CHILDES was used to extract passives in the children's input. This program searches files for particular strings and returns the utterance in which they occurred. We searched all utterances spoken by people other than the child for the strings: *be*, *being*, *been*, **'re*, **'m*, **'s*, *is*, *was*, *were*, *are*, *am*, **ed*, **en*, **wn*, **rn*, *got*, *get*, *gets* ('*' indicates wildcard string-initial sequence). Notice here that the data included both *be*-passives and *get*-passives, plus one example of "it needs fixed".

Passive types

Passives were divided into the two main types: *verbal* and *adjectival*, with an additional class of *adjunct* passives. The major distinction between verbal and adjectival passives has been investigated extensively in the linguistics literature (Wasow, 1977; Levin & Rapaport, 1986). However, these studies do not provide useful tests for determining whether the kinds of passives found in the present data were verbal or adjectival. Thus, we needed to develop some other methods for differentiating the two passive types.

Verbal passives bear the closest relation to their active counterparts and are classically what one thinks of as "real" passives. Consequently, they should be more significant in considering issues of generalization between

active and passive forms of verbs. All full passives were uncontroversially classified as verbal. In the case of short passives (i.e., those lacking a *by* phrase), *process* or *dynamic* interpretations were classified as verbal, and *states* were classified as adjectival. In this case, the process/state distinction is not used to classify verb types (which would be more or less coextensive with the actional/non-actional distinction), but to classify the situation denoted by the construction. For example, being seen by someone is considered a process even though *see* is non-actional. Being in a condition of "washedness" is a state, even though *wash* is actional. In other words this use of the process/state distinction cross-cuts the actional/non-actional distinction.

A further cue distinguishing verbal versus adjectival passives is suggested by Roeper (1987), who points out that true verbal passives have an implicit logical subject (e.g., agent). For example, the verbal (process) reading of *broken* can support a purpose clause as in *the toy was broken to prove a point* (the implicit agent is subject of *prove*). However, this is not possible with an adjectival (state) reading: **the toy is broken to prove a point* (where the sentence refers to the toy being in a state of brokenness).

Thus, if the context suggested an implicit logical subject, the passive was judged to be verbal. While such judgements are somewhat based on context, the tense and aspect of the verb also provide a clue. Verbal passives are most often used in the past tense. A passive in the simple present form (e.g., *the toy is broken*) normally describes a state rather than a process. Present tense processes normally require the progressive form (*the toy is being broken*), and these were quite rare in the transcripts ($n = 7$).

These cues, taken together, provided quite good indicators of the verbal versus adjectival status of passives. Given the nature of the task, we cannot always be certain that a speaker necessarily intended a process or state denotation. However, a small amount of error would not be damaging to the overall conclusions, which focus on actionality rather than passive type.

The third category of passives was *adjuncts*. These were cases where the passivized verb served as an adjunct to its subject, which was usually the object of *get* or *need*. Such passives could be either adjectival (e.g., "You got your back sunburned") or verbal (e.g., "You need your diaper changed"), where the former indicates a state, and the latter a process with an implicit agent. The adjunct passive was normally associated with some kind of causative interpretation. There was also a final category of "pseudo passives" where the form of the construction had all of the elements of a passive (*be*, V + *ed*), but the interpretation was too idiosyncratic to be classified as a true passive (e.g., *It's called/named X*, *You're supposed to X*). Sometimes, the verb was intransitive (e.g., *It's gone*, *It's stuck*); sometimes the surface subject was also a possible logical subject (e.g., *I'm finished*, *I'm tired*). These

"pseudo passives" were excluded from the analysis. Finally, immediate repetitions of passives were only counted as a single token.

Results and discussion

All but four of the passives in the input were short (i.e., lacking a *by*-phrase). The scarcity of full passives (also noted by Maratsos et al., 1985) suggests that the acquisition mechanism cannot rely on children hearing many full passives as their model for passive acquisition. This makes Sudhalter and Braine's (1985) proposal highly implausible, because they suggest that children's problems with non-actional passives result from a cue conflict when the preposition *by* has an experiencer argument instead of an agent.

To investigate the distribution of passive types, verbal, adjectival and adjunct passives in the input were categorized as either actional or non-actional. The results are summarized in Table 1; the verbs are listed in Appendix A. All passive types showed a dominance of actional over non-actional passives. However, the dominance was much greater for the verbal passives (93% actional) than for the adjectivals (59% actional). The adjuncts were distributed like the verbal passives (92% actional).

On the one hand, it could be argued that the verbal passive, which most clearly lacks non-actionals, is the most significant for acquisition. For example, in tests of passive comprehension, there has always been a focus on verbal rather than adjectival passives. On the other hand, it could also be

Table 1. *Proportion of passive types in the combined input for Adam, Eve and Sarah (frequencies in parentheses)*

	Actional	Non-actional
Verbal		
Types	.93 (52)	.07 (4)
Tokens	.92 (84)	.08 (7)
Adjectival		
Types	.59 (47)	.41 (32)
Tokens	.57 (113)	.43 (84)
Adjunct		
Types	.92 (22)	.08 (2)
Tokens	.92 (23)	.08 (2)
Total		
Types	.76 (121)	.24 (38)
Tokens	.70 (220)	.30 (93)

argued that the adjectival passive has the same morphology as the verbal passive and also assigns the thematic role of the logical object (e.g., theme) to its subject. Hence, the adjectival passive might also be important in the acquisition process. One should probably consider both passives as a source of children's knowledge, with some extra weighting given to the verbal passives. It should also be noted that the adjectival passives were more frequent (197 tokens) than verbal passives (91 tokens), although neither represented a large proportion of the children's total input (cf. Brown, 1973). Passives in general represented only 36/1000 of all input utterances.

Why were there relatively more non-action verbs found in adjectival rather than verbal passives? One reason is that the verbal/adjectival distinction for passive types was not totally independent of the action/non-action distinction for verb types. This is illustrated with verbs like *hurt*. In the verbal passive there is an implicit agent, and hence there is a causative reading (i.e., X causes Y to be hurt), which implies some action. However, in the adjectival passive, no agent is implied and the reading indicates a purely affective state (i.e., Y is hurt), which is non-actional. A number of adjectival passives fell into this category (e.g., *frightened*, *hurt*, *scared*, *started*).

Interestingly, most of the adjunct passives were adjectival in nature (i.e., state rather than process), yet they showed the same strong actional over non-actional preference as the verbal passives (albeit with limited data). This is explainable by the fact that the construction in which the adjunct passive is embedded is itself causative (e.g., *I got the back finished*), and hence entails an actional reading.

A second reason why actionality is correlated with the verbal versus adjectival distinction relates to the question that is begged by the whole analysis. Why do adults avoid non-actional passives in the first place? One of the main functions of the passive in English is to pragmatically focus the logical object of the verb by placing it in subject position. Van Oosten (1986) also points out that short passives are used as a device for obviating mention of vague, unspecified agents (e.g., "someone" did X). In either case, the passive requires the speaker to predicate something of the logical object. For the most part, the logical objects of non-action verbs don't have much happening to them. If John SEES Bill, it is only John who is doing or experiencing something. There would be little reason to focus on Bill unless he was maybe trying to hide from John. On the other hand, if John HITS Bill, then there is something happening to Bill, and one might want to focus on that by making Bill the surface subject in a passive.

In the case of the adjectival passive, there is only one argument and no implicit logical subject. Therefore, the issue of competing focus does not arise. The adjectival passive emerges simply as a description of a state of

affairs predicated of its surface subject. The question of "how much is happening" to the subject is not relevant, and one would predict that actional and non-actional adjectival passives would be quite evenly distributed, as they appear to be in the present data.

Summary

The present analysis reveals that non-actional passives in children's input are indeed rare, but only in the case of the verbal passives (and adjuncts). The fact that there were many non-actional passives for adjectival passives may or may not be a problem – perhaps depending on one's theory of the relation between adjectival and verbal passives. Maratsos et al. (1985) noted that, in their passive input data, they found no instances of verbs like *see*, *hear*, *remember*, or *know* – the non-action verbs typically found in passive experiments. In the present data, we also found that the passives classified as "non-actional" were mostly not those that are tested for in passive acquisition studies (see Appendix A). Unlike Maratsos et al., we did find *known* and *loved* in Sarah's corpus (both used in Maratsos et al.'s studies).

On a verb-based account, this is actually about the number of "hits" one would like to find. The proportion of non-actional passives to actional passives is less significant than the frequencies of individual non-action verbs used in the passive voice. In a typical study, children might be tested on 6–8 non-actional passives, of which they may know between 2 and 4. Since the present data underestimate the children's input by a factor of about 100–200, the likelihood that 2–4 relevant non-actional passive verb types occurred in any one child's input is quite good.[1] Note that one cannot simply use the underestimation factor as a multiplier for projecting expected frequencies to the whole corpus (i.e., expecting 200–400 non-actional passive types in the full corpus). Rather, because there is a very strong bias against using these particular verbs in the passive voice, their occurrence should be considered a "rare event". What the current data establish is that passivization of these verbs is not a non-occurring event, and that given a sufficiently large sample a few of them will probably occur a few times in a child's input. If one adds to this the probability that some limited generalization might also occur, then the nature of the input appears to be compatible with the results one finds in the experimental studies.

While the data from this analysis indicate a plausible basis for a verb-based

[1]The 100–200 underestimation factor is calculated on speech samples taken for about 1 hour, every 2 weeks in the early samples, and about once a month in the later samples. If a normal day contains about 7 hours of speech, then multiplying this by 14 days gives us an underestimation factor of 98. Multiplying by 30 days gives us 210.

account, they are also compatible with a class-based account. That is, one could simply postulate that children's inductions are generalized to the classes of verbs they hear passivized – perhaps along the lines of semantic transitivity suggested by Maratsos et al. (1985). Therefore we still need further evidence that actually differentiates between a verb-based and a class-based account. This is provided in the following study.

Study 2

In the second study, we tested children's comprehension for actional and non-actional passives. A week later, we re-tested them on the same set of verbs. A purely class-based account predicts only that children will have general problems with non-actional passives as a class. Therefore, errors on non-actional passives should represent somewhat random responses. In contrast, a verb-based account focuses on children's knowledge of passives for individual verbs. Hence, a passivized verb that a child knows on the first test should also be known on the re-test, and there should be high consistency in a test–retest comparison of individual verbs for individual children.

In this test, we were also interested in whether the Maratsos effect occurs for short passives, which have never been tested in relation to the actional/non-actional distinction. This is particularly relevant in evaluating Sudhalter and Braine's (1985) proposal, which hinges on a conflict of cues within the *by*-phrase. Since the short passive has no *by*-phrase, there should be no conflict, and hence no difference between actional and non-actional short passives. If there are actionality effects in the short passive, then Sudhalter and Braine's hypothesis is untenable. In addition, since most of the input data in Study 1 consisted of short passives, one might speculate that actionality effects are limited to full passives, which children are less familiar with. Again, if the effect remains, this alternative interpretation can be ruled out.

Method

Subjects

Thirty-three preschoolers were originally tested; three were dropped from the analysis due to response bias (see Results section). The remaining 30 subjects were divided into two groups of 15 by age. The younger group ranged from 3;0 to 4;2 (M = 3;6). The older group ranged from 4;2 to 5;6 (M = 4;6). All were native speakers of English from mixed SES families.

Materials and design

The set of verbs used in this study included nine action verbs (*drop*, *eat*, *carry*, *kiss*, *hold*, *wash*, *shake*, *hug*, *kick*) and nine non-action verbs (*watch*, *forget*, *hear*, *know*, *remember*, *believe*, *like*, *see*, *hate*). The full passives are listed in Appendix B. Within each subset of nine verbs, three were tested in the full passive, three in the short passive and three in the active form. Thus, each child received a total of 18 verbs with six in each construction type. In addition, each child was re-tested in exactly the same condition about one week after the initial test. There were three pre-determined random orders of presentation, ensuring that each verb appeared in each of the three construction types across subjects.

In developing the procedure, we wanted to eliminate many of the problems associated with testing non-action verbs in the passive. Comprehension tasks usually require the child to act out a sentence with toys or else to identify an appropriate picture depicting the sentence. However, acting out non-actional states can present obvious problems, as can attempting to depict such states pictorially (see de Villiers et al., 1982; Maratsos et al., 1985). In Maratsos et al.'s (1979) original procedure, children were told a sentence such as "Mickey was known by Goofy" and were then asked "Who did it?" Clearly, such a question is odd for a non-actional verb. Later studies have asked "Who knew the other one?" (Maratsos et al., 1985; Sudhalter & Braine, 1985). However, such a construction requires comprehension of a complex reciprocal construction. Such complexity is a serious consideration if it can be shown that non-actional verbs are already harder to process. Lempert and Kinsbourne (1981) have demonstrated that children have worse memory for the arguments of non-action verbs than for those of action verbs, even when the voice is active. All existing procedures for testing passive comprehension require the child to remember the arguments of the verbs prior to responding. Therefore, we developed a procedure that did not make demands on memory, was not "odd", and did not involve complex constructions.

This procedure involved showing children a picture of a boy called John engaged in some activity and telling them a short story describing the events in the picture. One example involved John eating peas, which he hated. The story included an active sentence describing John's relation to the objects in question (e.g., "John hated the peas"). We then asked two questions, one to be affirmed and the other denied. These questions were either active, short passive or full passive, as in the following:

ACTIVE:

a. Did John hate the peas?
b. Did the peas hate John?

SHORT/FULL PASSIVE:

a. Were the peas hated (by John)?
b. Was John hated[2] (by the peas)?

Each child received the *a.* question first followed by the *b.* question (or vice versa) for each verb tested. Notice that these sentences are non-reversible. That is, there is only one plausible "hater" (John) and only one plausible "hatee" (the peas). Investigators of passive acquisition generally use reversible passives in which both noun phrases could fulfill the given semantic roles (e.g., *John was kicked by Bill*). The reason is that children can presumably use non-linguistic knowledge to determine the most plausible interpretation of a non-reversible passive (Bever, 1970). However, in this test it was not possible for the child to use this strategy since the test requires knowledge of how to assign the correct argument roles in the question structures. The advantage of this procedure is that it does not require the child to hold in memory "who did what to whom" which, given Lempert and Kinsbourne's (1981) observations, could interact with the verb type and spuriously produce a difference between action and non-action verbs.

Training

Since children were to receive two questions, it was important to ensure that they knew that one of the questions should be answered "yes" and the other "no" and that they paid attention to the differences between the two questions. Children were given explicit instructions and training to ensure the efficacy of the procedure. In the training, they were shown pictures of one object on top of another and were asked, for example, "Is the present on the chair?" and "Is the chair on the present?" If children failed to differentiate their answers, they were reminded that one question should be answered YES and the other NO. If a child answered three consecutive pairs of questions correctly, he or she was moved immediately on to the main test items; 24 children met this criterion. The remaining nine children went on to take the full test, but their data were only retained if they showed differentiation of Yes/No answers on 80% of the main items. Three children failed to meet this criterion and their data were eliminated from the analysis.

[2]It might be argued that "Was John hated?" could be interpreted as a general statement about John's popularity. However, since children performed somewhat better on the short passive than the unambiguous full passive, we find it unlikely that children made this interpretation.

Results and discussion

The 30 children retained in the analysis failed to differentiate Yes/No responses for an average of 3/18 responses on the main test (SD 2.94), and such cases were scored as errors. Despite quite radical differences between the present procedure and other methods, the results were very comparable to previous findings (e.g., Maratsos et al., 1985). Non-actional passives were again more poorly comprehended than actional passives, as shown in Table 2. Active questions, overall, were superior to passive questions, *Min F'*(1,35) = 8.56, $p = .006$. The superiority of actional over non-actional passives was found for both the full passive, *Min F'*(1,39) = 13.31, $p = .001$, and the short passive, *Min F'*(1,45) = 9.53, $p = .003$. While performance was somewhat better for the short passives than for full passives, the difference was not significant, $t(29) = .29$, $p = .77$. Since children showed an actionality effect for short passives, this means that the explanation for the effect does not lie within the *by*-phrase, as suggested by Sudhalter and Braine (1985).

Table 2. *Mean proportion correct for Actionality × Voice*

	Active	Full passive	Short passive	All passives
Actional	.85	.63	.71	.67
Non-actional	.82	.35*	.43*	.39*
Total	.84	.49	.57	.53

*$p < .005$.

With respect to age trends, we found that the older children performed worse overall on passives than the younger children (see Table 3), but the difference was not significant, $t(28) = 1.34$, $p = .2$. While such a decline in performance does seem to replicate the anomalous trend previously noted by Bever (1970), de Villiers and de Villiers (1973) and Maratsos (1974), an attempt to replicate the decline using the present method with larger numbers of subjects was not successful, and it would appear that such apparent regressions might be a statistical rather than a developmental anomaly (Gordon, 1989).[3]

[3] Dips in passive acquisition have been found at every age between 2;4 to 5;6. The more places that a dip can occur, the more likely it is that there will be a Type I error. Since the studies reported either no statistics or non-parametric comparisons of adjacent age groups, there is no assurance that the dips are anything more than variance – especially when the age groups are often only 3 months apart and hence relatively similar in competence.

Table 3. *Mean proportion correct for Age Group × Voice × Actionality*

	Active		Full passive		Short passive		All passives	
	A	NA	A	NA	A	NA	A	NA
Younger (3;0–4;2)	.82	.78	.69	.41	.77	.48	.73	.45
Older (4;2–5;6)	.89	.87	.58	.29	.64	.39	.61	.34
Total	.85	.82	.63	.35	.71	.43	.67	.39

Note: A = actional, NA = non-actional. No age differences significant at $p < .05$.

The major question of the present study was whether children were consistent between test and re-test on individual verbs. The data for test and re-test are shown in Tables 4 and 5 for action and non-action verbs respectively. To test for consistency, we compared the number of verbs that were consistent against chance. In other words, if the child was either correct or incorrect on both test and re-test for a particular verb, this was scored as consistent for that verb. The number of verbs scoring consistently out of a total of 6 was compared against a chance total of 3 (i.e., 50%). High degrees of consistency were found for both the actional passives, M consistent = 4.57/6, $t(29) = 8$, $p < .001$, and the non-actional passives, M consistent = 3.97/6, $t(29) = 5.49$, $p < .001$.

Table 4. *Response patterns over test and re-test: action verbs*

	Re-test	
Test	Correct	Error
Correct	.65	.07
Error	.13	.15

Table 5. *Response patterns over test and re-test: non-action verbs*

	Re-test	
Test	Correct	Error
Correct	.28	.07
Error	.24	.41

While the significance of the consistency tests was high, in some ways it represents an underestimation of the degree to which the lexical model is supported. This is because many children showed improvement from test to re-test. This can be seen in the bottom left cells of Tables 4 and 5 where 24% of the non-actionals and 13% of the actionals showed improvement, *Min F'* (1,42) = 9.3, $p = .004$. Since improvement implies being inconsistent from test to re-test, there is a corresponding underestimation of the degree of consistency (although it remains highly significant). Notice that when children were correct on the first test on a particular verb, they did not tend to then be wrong on the re-test since only 7% of the verbs fell into this pattern (upper right cells of Tables 4 and 5). Thus, we can conclude that the main source of inconsistency was not randomness, but improvement.

This improvement is interesting since it occurred in the absence of feedback. It suggests that some generalization might have occurred during the task itself, although simple practice effects cannot be ruled out. Similar improvement without feedback was noticed by Cromer (1987) in his studies of *easy* versus *eager* type adjectives. In these studies, children often choose the incorrect animal as the subject of the complement clause (the biter) in sentences such as *The dog is easy/eager to bite.*

In studying this phenomenon, Cromer (1983) also used a consistency analysis to examine the possibility of lexically based learning. In contrast to the present study, his analysis failed to find evidence of consistency, and thus argued against a lexical mechanism for adjective learning. Of course, we cannot assume that adjectives will necessarily be learned in the same way as passives. But one is tempted to ask why there should be such differences, whether they reflect different learning strategies, and why children should adopt different strategies for different constructions.

Cromer's estimate of consistency may have been deflated by random responding by those of his subjects who did not know the correct answer. Each of Cromer's questions had two possible responses, one correct and one incorrect. This means that there was only a 50% chance of being scored as making an error on that adjective if responses were random. Over multiple re-tests, the chances of a child being scored as consistently wrong on a particular adjective goes down exponentially with each re-test (1/2, 1/4, 1/8 ... and so on). Since Cromer tested for consistency over 8 tests in a year, there would only be a 2^{-8} probability that any particular adjective would be scored as consistently wrong across the test series, given that the child did not know that adjective's argument structure.[4] Notice that such response patterns tell

[4]Although Cromer did attempt to control for improvement by eliminating children that showed such improvement, his criteria were quite strict, and he may not have eliminated this source of variance.

us nothing about whether acquisition is, or is not, item-by-item. The only consistency that is crucial to establish item-by-item learning is that once an item has been acquired, the child must stick with the correct response. If the item is unknown, then the child could either be consistently wrong or random. Unfortunately, inconsistency due to randomness was interpreted as counter-evidence to an item-based acquisition mechanism.

The likelihood that there would be some random responding is quite high in Cromer's case because he specifically selected children who were in a stage in which they did not show a consistent bias for incorrect answers. This would decrease the likelihood of having children who produced consistent error responses (i.e., a "bias"), and it would select for children who would be disposed to respond randomly.

The present task differs crucially in many respects from that of Cromer. First, we did not select for children who would respond randomly. In fact, acquisition studies suggest that children who do not know passives probably treat them as actives (e.g., Bever, 1970), thus predicting consistently incorrect response patterns. Finally, if a child did respond completely randomly in our test (ignoring instructions to differentiate the two Yes/No answers), this would not be so damaging to estimates of consistency. This is because, on each test and re-test, there were four possible outcomes to the two questions (yes–yes, yes–no, no–yes, no–no). The probability of getting a spuriously "correct" answer with random responses is only 25% instead of 50%. When we examine test–retest consistency, there is only a 3/16 chance of a verb being scored as inconsistent if responses were totally random in this manner.[5]

Of course, we did try to get children to differentiate their Yes/No answers on each item, which would bring the initial chance probability of spurious "correct" answers up to 50%. But if children did not heed our instructions, randomness is not very harmful to our estimates of consistency. More importantly, since we only looked at consistency over 2 tests rather than 8 trials, randomness cannot devastate our consistency estimates in the exponential manner as they could for Cromer. In summary, the differences between the present results and those of Cromer may be more apparent than real. A true comparison would have to be made over comparable methodologies.

More central to our present concerns is the fact that Maratsos et al. (1985) failed to find evidence for item-based acquisition in passive comprehension.

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[5]There are 4 × 4 possible combinations of response patterns over test and re-test. If, say, YES–NO is the correct response, then this will be found in 4 of the 16 combinations. One of these will be the correct, consistent pattern (i.e., YES–NO + YES–NO). The other three will be inconsistent, hence the 3/16 spurious inconsistent scores. The remaining 12 combinations will both contain incorrect responses on test and re-test, and will be scored as consistently incorrect.

In their task, they tested each verb three times in a single session. They failed to find evidence of a bimodal distribution, which they predicted for an item-based learning strategy (i.e., passives should either be known or not known for individual verbs). One possible explanation for the different results lies in the picture-matching task, which they noted was not good for testing non-actional states. This alone might create noisy data, thus increasing randomness and inconsistent responding. In addition, Maratsos et al. (1985) had 75 items per child. They noted that the order in which the non-actionals and actionals were presented had a strong influence on children's level of correct responding, which ranged between 37% and 63% depending on the order of presentation. That is, if children were tested on, say, actional passives first, this affected the way they responded to non-actional passives later (perhaps through generalization). Clearly, such within-task effects might preclude a meaningful assessment of within-verb consistency. In our present study, the number of items was only 18, and the re-test, being a week later, might be less affected by testing factors and more accurately reflect the true degree of consistency. However, we were also not immune to generalization effects creating inconsistency. We found clear evidence of improvement over the re-test. However, we were less affected by such generalization because we did not require a bimodal distribution as evidence of item-based learning.

Semantic transitivity and affectedness

In rejecting the verb-based account, Maratsos et al. (1985) developed a class-based account focusing on the notion of semantic transitivity. They suggested that children notice that the passives in their input are "limited" (i.e., they do not include non-action verbs such as *like*), and they attempt to seek an "active generalization about the nature of the data to find such limitations" (p. 189). For this they turn to the concepts of intentionality, affectedness and so on, which define the notion of "high transitivity" in Hopper and Thompson (1980).

Unfortunately, this proposal confounds the distinction between grammaticality and comprehension, noted previously. What children are trying to do in the comprehension task is presumably to get the right interpretation of the passive sentence. It would indeed be bizarre if they were trying to figure out which passives they should get wrong because the verb does not meet the conditions of semantic transitivity. In fact this is a distinction that many researchers have failed to consider in attempting to link the Maratsos effect to more general linguistic principles or related constraints in the adult grammar.

While it is important to bear this distinction in mind, one cannot necessarily

rule out a role for notions like semantic transitivity in explaining the Maratsos effect. In the present experiment, the situations described in the different items were relatively homogeneous on dimensions such as animacy, intentionality, and definiteness. The one area where they did differ was in "affectedness". Thus, a relevant test of this particular class-based account would be to examine whether there are independent effects due to this aspect of verb semantics.[6]

Affectedness has also been invoked by Lebeaux (unpublished 1985; cited in Roeper, 1987) and Pinker et al. (1987), who point to a number of linguistic analyses that argue that various rules are subject to an affectedness constraint (e.g., Fiengo, 1981). Lebeaux has argued that children might initially make a distinction between affected and unaffected objects, where only the former can move into subject position as in the passive transformation (see Roeper, 1987 for a fuller account).

In their strongest form, these proposals could be construed as arguing that it is affectedness (or semantic transitivity) rather than actionality *per se* that explains children's uneven performance on passives. If true, then one should find that differences accounted for by affectedness should be greater than, and to some extent orthogonal to, those accounted for by actionality. However, since non-actional verbs invariably have low-affected logical object arguments, there will always be a confound between actionality and affectedness if one simply contrasts action and non-action verbs.

A way to unconfound these two factors is to consider affectedness within a single class of verbs. While non-action verbs are uniformly low in affectedness of the logical object, action verbs are by no means uniformly high. For example, holding something does not affect it to the same extent as eating it. If it is true that affectedness is significant in constraining passive interpretation, then children should perform better on a verb like *eat* than one like *hold*. We tested this prediction by obtaining adult ratings of affectedness for the verbs used in the present study. We then examined whether these ratings correlated with performance by the children on the different action verbs in the passive.

The nine actional and nine non-actional verbs used in the present study were rated by six naive adult raters for the degree to which the logical object of the verb is affected by the event described by the verb. Raters were given an example that if you kill someone, they are highly affected, whereas if you look at someone or something they are not affected. Using these examples

[6]Tsunoda (1985) has argued that the generalizations regarding agency and volitionality do not hold consistently, and affectedness is the only crucial criterion for semantic transitivity.

as anchor points, raters were asked to rate the 18 verbs on a 7-point scale (1 = low, 7 = high). Questions were presented in the form: "How affected is something that is X-ed?" – where X was the appropriate verb. Since we were primarily interested in action verbs, these were presented first, followed by the non-action verbs. As expected, non-action verbs received uniformly low ratings on affectedness (mean = 1.1) and hence were not useful for a correlational analysis.

Action verbs produced a good range of responses, with mean ratings for individual verbs between 1.8 and 6.3. The reliability of the ratings was extremely good when assessed by Kendall's coefficient of concordance, $W = .715$, $\chi^2(8, N = 6) = 34.37$, $p < .001$. The mean affectedness ratings for each verb, along with children's performance on passives for those verbs, are given in Table 6. There was absolutely no relationship between the two measures. In fact, the correlation was slighty negative, Spearman, $r_S = -0.18$, $p = .3$. In addition, we examined whether there was a gross difference between verbs rated higher on affectedness and those rated lower on affectedness. Taking a median split on the ratings for the nine action verbs, average performance for children on passives of the verbs within the upper and lower divisions showed no significant difference, M upper = .67, M lower = .64.

To the extent that affectedness can be considered a graded concept, the present analysis provides no evidence that it plays a role in determining children's comprehension of the passive construction. It should be pointed out here that the intuitive notion of "affectedness", while relevant to the notion of "semantic transitivity" (e.g., Maratsos et al., 1985), should be differentiated from the dichotomous notion invoked in studies of lexical semantics (e.g., Pinker et al., 1987). The notion of "affectedness", within this ap-

Table 6. *Mean "affectedness" ratings and performance on passives*

Verb	Mean affectedness	% Correct	
eat	6.33	58	
kick	5.67	74	
shake	5.33	48	Mean = 67
drop	5.17	78	
wash	4.67	77	
	Median split		
hug	3.67	61	
carry	2.33	82	Mean = 64
hold	2.0	47	
kiss	1.83	67	

proach, relates only to what is strictly entailed in the definition of the verb. For example, while a person or object is normally highly affected by being kicked, an unmovable object, such as a wall, is not. Hence, the logical object of *kick* is not considered "affected" in this stricter sense because the affectedness is not strictly entailed in the meaning of the verb.[7]

This alternative definition of affectedness is dichotomous rather than continuous, with *carry*, *eat*, *shake*, *drop*, and *wash* in the [+ affectedness] category, and *kick*, *hug*, *hold*, and *kiss* in the [− affectedness] category. The mean percent correct scores would now be 69% and 62%, respectively. Again, the differences, while in the right direction, are quite insignificant and unlikely to account for the major differences in children's performance in passive tests.

In summary, affectedness does not appear to directly constrain children's interpretation of the passive, although it may have an indirect role. For example, we have suggested that the reason that adults fail to use passives for non-action verbs is that there is usually nothing happening to the logical object of the non-action verb, and hence there is no reason to focus on that argument by passivizing the verb. The reason that action verbs are good candidates for passivization, thus providing the majority of the child's input, is that PATIENTS of action verbs are normally affected by the action and hence are things to focus on in discourse.

If we are correct in our pragmatic assumptions, then affectedness could have a very important role in accounting for children's differential performance on passives. However, that role would be quite indirect. A more direct role for affectedness might arise if children have the same kinds of pragmatic constraints on the use of passives, namely patient focus. Lempert (1984) provides evidence that children will use passives with patients that are more salient, hence focused. Also, Pinker et al.'s (1987) design establishes that children will produce passives when asked "what's happening" to (i.e., focusing on) the patient. Since children appear to be sensitive to patient focus in passives, they should use more actional passives in their own speech, and perhaps, as a consequence, go on to store those passives as lexical entries.

General discussion

The results of the present studies have shown that children hear very few of the non-actional passives that are typically tested in acquisition studies (e.g.,

[7]This distinction was pointed out to us by Steve Pinker. Another reviewer also pointed out that if *kick* subcategorizes for a preposition, as in *kick over the fence*, then there are no "unaffected" interpretations. However, this does not apply in the present case.

know, *see*, *like*). In addition, children show consistency in terms of which verbs they do and do not comprehend in the passive. This confirms the predictions of a verb-based account of the Maratsos effect. However, the current data do not rule out a mixed model in which there are also class-based effects.

What would count as evidence that a class-based account is needed in addition to a verb-based account? One possibility would be to demonstrate that children show an actionality effect when the input is held constant across verb types. There are basically two ways to do this: saturation and deprivation. In the former case, one can simply give the children input for passives with both action and non-action verbs, and see if they still perform better on actional passives. Such a procedure has been carried out by de Villiers (1984). In this study, different groups of 3- to 4-year-olds repeated active or passive forms of sentences containing action or non-action verbs. They were then asked to describe some pictures depicting both the actions and non-actional states.

De Villiers (1984) found that children primarily used the passives that they had been trained on, and did so quite prolifically. Most significantly, there were no differences between the action and non-action verbs in children's productions. De Villiers (1984) interpreted these data as contradicting previous studies showing worse performance on non-actional passives. But, on the contrary, they are exactly what one would predict on the verb-based account. These kinds of phenomena suggest that the verb-based account can be very powerful in explaining results that would otherwise seem baffling, as they appeared to be in de Villiers' (1984) report.

Pinker et al. (1987) provide data on both saturation and deprivation in their first two experiments. In these studies, children were tested on novel verbs that were actional or non-actional (perceptual or spatial). For verbs that were modeled in the passive and elicited in the passive (i.e., the "unproductive" passives), Pinker et al. (1987) found no differences between action and non-action verbs in children's willingness to passivize them. In fact, if anything, they were more willing to passivize the non-action verbs. This again shows that equalizing input by saturation appears to nullify the actionality effects. This is exactly what is predicted by a verb-based account – as Pinker et al. acknowledge.

Children were also tested on novel verbs that had been taught only in the active voice (i.e., the "productive" condition). This represents the deprivation method of controlling input. The class-based account predicts clear superiority for actional passives in this condition. Unfortunately, Pinker et al.'s data were not at all clear-cut. In one experiment, comparing action and perception verbs, the raw data showed the perception verbs more likely to

be passivized than the action verbs. While this difference was not significant, it clearly fails to indicate an advantage for action verbs. In a second experiment, comparing action and spatial verbs, the data again failed to show any clear evidence for an actional advantage in passivization of novel verbs.

While Pinker et al. (1987) point out that these data show no strong reluctance on the part of children to passivize non-action verbs (see also Pinker, 1984), they do suggest that there is a tendency in this direction. This conclusion is based on a measure they call the "relative passivizability index" (RPI), which attempts to control for "verb difficulty" (i.e., the fact that non-action verbs are initially harder for children to passivize). Thus, the RPI examines the difference between children's "productive" and "unproductive" passivizations (see above). Unfortunately, we have serious misgivings about the validity of this measure.[8] We also note that in an act-out comprehension post-test of these novel verbs the evidence was again equivocal concerning the relative advantages of action over non-action verbs. In other words, the lack of an actionality effect was not restricted to production studies, but appears to extend to comprehension studies when novel verbs with no history of differential input are used.[9]

Since the Maratsos effect has been replicated a few times now, it is interesting that the effect is so hard to obtain when there is no difference in input for actional and non-actional passives. Such facts, along with the present data, appear to conspire toward a relatively simple verb-based explanation for children's problems with non-actional passives. We are not yet ready to completely rule out any class-based constraints, but find little convincing evidence that they are necessary to explain the Maratsos effect.

It is certainly true that a purely verb-based mechanism cannot explain everything about passive acquisition. In particular, there is no denying that

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[8]The RPI takes the difference between the unproductive and productive conditions for each verb type and essentially examines which difference score is bigger. This is said to indicate a greater reluctance on the part of children to passivize those verbs. The validity of this measure is questionable on two counts. First, in a limiting case, children could be passivizing 100% and 95% for non-action verbs, and 2% and 1% for action verbs, yet the action verbs would be classified as more passivizable. Something like this, but less extreme, actually occurred for Experiment 1. Second, the notion of "verb difficulty" is justified in terms of non-action verbs being initially harder, but in many cases it was the action verbs that showed lower passivization. Thus, there is little reason to believe that "verb difficulty" has any real meaning in this case.

[9]There was one result that appears to provide evidence for an actional advantage in Pinker *et al.*'s experiments. This was a *post hoc* comparison of Experiments 3 and 4. Children tested on action verbs in Experiment 3 were more likely to passivize the verb than those tested on spatial verbs in Experiment 4. This difference approached significance ($p = .06$), but only for the older children (age 7–8 years). The spatial verbs had location–theme arguments denoting relations like "to have located at one's center/end". Pinker *et al.* note that it is quite difficult to find real word analogues to such verbs. Examining the data from these verbs reveals that children had problems even producing the active forms, with as little as 50% success in some cases. Such poor performance on the active voice for 5–8-years-olds suggests that there may be something "unnatural" about these verbs that could make them less than useful as an example of passivization of non-action verbs.

the actional passive is a kind of "prototype" passive, as argued by Pinker et al. (1987). An acquisition theory must explain how actional passives achieve this status. Furthermore, it seems unlikely that one can account for grammatical restrictions on passivization (e.g., **John was fit by the suit*) without some kind of class-based constraints. In fact, Pinker et al. (1987) found that children were indeed unwilling to passivize verbs that violate the thematic hierarchy constraints, proposed by Jackendoff (1972). Furthermore, those results were much more clear-cut than the results based on actionality differences described above. In conclusion, while there may be *some* class-based constraints on children's passive rules, such constraints may not be directly related to the Maratsos effect. Verb-based factors, on the other hand, appear to play a significant, if not complete, role in limiting children's comprehension of non-actional passives.

Appendix A: Passives in the input for Adam, Eve, and Sarah

(Note: A = Adam; E = Eve; S = Sarah. Numbers indicate multiple tokens)

I. Verbal passives

Actional
adjusted (S)
attached (A)
bitten (A)
broken (E,S,A4)
burned (E,A)
caught (A2)
cleaned (A)
connected (S)
cooked (A)
cuddled (S2)
cut (S)
eaten (A)
fitted (A)
fixed (E,A,S2)
folded (E)
hit (A2,S)
hugged (S,A2)
hurt (A,S)
jumped into (S)
locked (S2)
made (A7)
milked (A)
mixed (A2)
moved (S)
opened (A)
operated on (S)
painted (A)
picked up (S)
punished (S)
re-heated (S)
reversed (S)
severed (S)
sewed (S)
shipped (S)
slipped (S)
soaked (S)
sold (A)
spanked (S,A2)
stepped on (A)
stirred (A2)
stolen (S)
stuck [stick] (E)
taken out (S)
tattooed (A)
tied (A)
tied on (S)
tucked inside (A)
turned (A2)
turned out (A2)
washed (E,S2)
wiped up (E)
written on (E)

Non-actional
invited (S3)
loved (S2)
blamed (S)
marked (S)

II. Adjectival passives

Actional
battered (A)
bent over (E)
blocked (A)
broke (S3)
broken (E,A27,S12)
broken up (S)
brushed (S)
burned (A)
caught (A)
chapped (S)
chewed (S)
closed (S3)
closed up (S)
cooked (S,A2)
covered (A)
dressed (S3)
dressed up (S5)
filled (A,S)
fixed (A,S4)
folded over (E2)
folded up (S)
glued (S3)
hooked in (S)
messed up (S)
misshapen (A)
mixed up (S)
murdered (S)
organized (S)
picked up (A)
plugged in (A2)
plugged into (A2)
prepared (A2)
ripped (S2)
shaved (S)
shrunk (S2)
skinned (A)
snowed (S)
soaked (S)
squashed (A)
started (S)
stopped (A2)
tangled (A)
tangled up (S)
tied (A2)
trained (S)
turned (A)
turned on (A)
turned over (A)
warmed up (S2)
washed (A)

Non-actional
allowed (S)
balanced (A)
booked up (S2)
complicated (E)
confused (S4)
crowded (A,S)
disappointed (E,S)
excited (A2,S3)
excused (A)
exhausted (S2)
faked out (S)
flattered (S)
frightened (A3)
hurt (S)
interested (A)
known (S)
lost (A,S7)
made up (S)
married (A3,S8)
misplaced (A)
scared (A2,S7)
shaped (A7)
spoiled (S)
stored (A)
sunburned (S)
surprised (A2,S3)
thrilled (S)
worn out (S4)
worried (A)

III. Adjunct actional

attached (A)
bit (S)
broken (S)
changed (E)
dressed (S3)
embroidered (A)
fixed (S2)
fugged up (E)
ground up (A)
punched out (S)
started (A4)
straightened out (A)
taken (E,A)
undressed (S)
untied (E)
wiped (A)
written (A)

Non-actional
sunburned (S)

Appendix B

Training items

Is the cup on the tray?
Is the pen on the desk?
Is the ball on the box?
Is the apple on the plate?
Is the can on the shelf?
Is the brush on the drawer?
Is the chair on the rug?
Is the book on the table?
Is the pot on the stove?
Is the present on the chair?

Test items

Was the medal kissed by John?
Was the box shaken by John?
Were the dishes washed by John?
Was the toy held by John?
Were the carrots eaten by John?
Was the ball kicked by John?
Was the blanket hugged by John?
Was the suitcase carried by John?
Was the chair dropped by John?
Was the story known by John?
Were the peas hated by John?
Was the tent seen by John?
Was the radio heard by John?
Was the game liked by John?
Was the book remembered by John?
Was the ball forgotten by John?
Was the story believed by John?
Was the movie watched by John?

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