Consistent and cumulative effects of syntactic experience in children's sentence production: Evidence for error-based implicit learning

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Abstract

Error-based implicit learning models (e.g., Chang, Dell, & Bock, 2006) propose that a single learning mechanism underlies immediate and long-term effects of experience on children's syntax. We test two key predictions of these models: That individual experiences of infrequent structures should yield both immediate and long-term facilitation, and that such learning should be consistent in individual speakers across time. Children (and adults) described transitive events in two picture-matching games, held a week apart. In both sessions, the experimenter's immediately preceding syntax (active vs. passive) dynamically influenced children's (and adults') syntactic choices in an individually consistent manner. Moreover, children showed long-term facilitation, through an increased likelihood to produce passives in Session 2, with speakers who were most likely to immediately repeat passives in Session 1 being most likely to produce passives in Session 2. Our results are consistent with an error-based syntactic learning mechanism that operates across the lifespan.

Keywords: structural priming; implicit learning; language development; error-based learning

Children's syntax is affected by their syntactic experiences, over a range of timescales. For example, children's acquisition of syntactic structures is affected by the structures' frequency not only within the language as a whole (e.g., Brandt, Diessel, & Tomasello, 2008; Kidd, Lieven, & Tomasello, 2010), but also within their individual caregivers' speech weeks or months earlier (Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Naigles & Hoff-Ginsberg, 1998). Equally, children are more likely to use a syntactic structure if they have had multiple experiences of that structure within the last month (Savage, Lieven, Theakston, & Tomasello, 2006) or the current conversation (Huttenlocher, Vasilyeva, & Shimpi, 2004), or even an individual experience of it in the previous utterance (Messenger, Branigan, McLean, & Sorace, 2012; Rowland, Chang, Ambridge, Pine, & Lieven, 2012). In this paper we investigate the proposal that these apparently disparate effects may reflect a common syntactic learning mechanism.

Although immediate effects of individual syntactic experiences can be explained in terms of transient fluctuations in the accessibility of syntactic structures (e.g., Pickering & Branigan, 1998), such an explanation is not compatible with long-lasting and cumulative effects of experience, which instead appear to implicate long-term changes to the syntactic system (e.g., Chang, Dell, & Bock, 2006; Reitter, Keller, & Moore, 2011). Chang et al. (2006) proposed that both immediate and long-term effects arise from a single error-based implicit learning mechanism.

In their Dual Path model, proposed to account for both children's acquisition of syntax and the tendency for (child and adult) speakers to repeat syntax across utterances (*syntactic priming*; Bock, 1986), the processor comprehends sentences by predicting the next word. It uses the difference (*error*) between the predicted and actual next word to adjust weights associated with syntactic knowledge in the underlying system, improving subsequent prediction accuracy. Less frequent (hence more unexpected) structures yield greater error than more frequent structures; they therefore cause a greater adjustment to the system. Weight adjustments persist until another related sentence is processed that gives rise to new adjustments. Each additional experience of a structure iteratively yields further adjustments, until ultimately the model's predictions accurately reflect the statistics of the input. Thus each experience of a structure immediately raises the likelihood of that structure's subsequent use, and the effects of multiple experiences accumulate over time.

The precise weight adjustments (hence, extent to which individual experiences affect subsequent behaviour) are determined by an individually-determined learning rate parameter. Chang et al. (2006) proposed this parameter to capture individual differences in susceptibility to syntactic experience, and suggested that it might involve factors such as motivation and attention (as well as initial strength of structural representations); subsequent research suggests that other relevant factors might include potentially more stable characteristics such as statistical learning ability and non-verbal IQ (Kidd, 2012a, 2012b). The learning rate decreases with age (necessary to avoid early acquired knowledge being overwritten by recent experiences; McClelland, McNaughton, & O'Reilly, 1995); see Peter et al. (2015) for discussion. In this model, the extent to which an individual experience of a structure affects a speaker's subsequent behaviour is therefore a function of both his/her previous experience of that structure and his/her learning rate.

The Dual Path model is consistent with evidence that children's syntactic production is affected over a range of timeframes by multiple experiences of a syntactic structure (Huttenlocher et al., 2004, 2010; Kidd, 2012b; Vasilyeva & Waterfall, 2012), as well as evidence for immediate and cumulative effects of individual experiences within an experiment (Branigan & McLean, 2016; Garraffa, Coco, & Branigan, 2015; Messenger, Branigan, & McLean, 2011; Messenger et al., 2012; Peter et al., 2015; Rowland et al., 2012).

It is also consistent with evidence for individual differences in immediate effects of individual experiences (Kidd, 2012a, 2012b).

But the Dual Path model makes a further powerful claim that has yet to be directly tested: that there should be a systematic relationship between a child's immediate response to an individual experience, and the larger pattern of their behaviour across time. Here, we test two specific aspects of this claim. First, if a single error-based learning mechanism underlies immediate and long-term effects of syntactic experience, then the effect of an individual experience of an infrequent structure should be detectable both in the child's immediate behaviour, and in their behaviour at a later point in time. Concretely, exposure to an individual instance of an infrequent structure should yield both an increased immediate tendency to use that structure (*immediate priming*), and an increase in its overall likelihood of use beyond the current context based on long-term cumulative and persistent effects of multiple experiences (*cumulative learning*). This tendency should hold even when the child is exposed equally to the more frequent alternative structure within the same session.

Second, children's immediate susceptibility to be affected by individual experiences should be stable across time (*individual consistency*): An individual child's likelihood of immediate priming at one timepoint should correlate positively with their likelihood of immediate priming at a different timepoint. Equally, children who show a stronger influence of an individual experience should also show a higher likelihood of using a structure following multiple experiences. These predictions arise from two aspects of the model. They follow from the assumption that the learning mechanism is governed by an individually-determined learning rate, so that children differ in the extent to which they adjust the weights associated with syntactic knowledge on the basis of individual experiences. They also follow from the assumption that the extent to which children are affected by individual experiences is modulated by their existing knowledge, so that children with less experience of a structure should be consistently more strongly influenced when exposed to that structure than children with more experience of a structure, because their relative lack of experience would yield a higher prediction error and a correspondingly greater weight adjustment.

We tested these hypotheses in an experiment in which three- and four-year-old children (and control adults) described transitive events in two sessions, a week apart. In each session, the experimenter and participant took turns describing picture cards as part of a competitive picture-matching game (Branigan, McLean, & Jones, 2005). We manipulated the structure (active vs. passive) of the experimenter's *prime* descriptions in a within-participants manipulation, and measured the structure of the participant's *target* descriptions.

In each session, we examined whether children showed immediate priming, producing more passives immediately following a passive than an active prime. More critically, we tested whether children showed cumulative learning, displaying an increased likelihood of producing passives in Session 2 after experiencing passives (as well as actives) in Session 1. Furthermore, we investigated whether children showed individual consistency of experience across time, such that children who showed a higher likelihood of immediate priming in Session 1 also showed a higher likelihood of immediate priming in Session 2, and whether children who showed a higher likelihood of priming in Session 1 also showed higher overall production of passives in Session 2.

Chang et al.'s (2006) model assumes the same learning mechanisms apply to children's syntactic acquisition and adult processing, but that adults have a lower learning rate. We would also expect adults' prediction error to be lower than children (because of their greater experience of the language). We therefore expected that adults would show immediate priming effects that would be consistent across time within individuals; however, they might show weaker overall effects of experience than children, so that they might be less susceptible to immediate priming within a session, and to cumulative learning across sessions.

Experiment

2. Method

2.1. Participants

Twenty-two children (3;4–4;10 years; mean 4;2; no reported developmental or language delays) participated in two sessions 5-9 (mean 7) days apart. Two further children who did not complete both sessions were excluded. Twenty-four University of Edinburgh students participated voluntarily in two sessions 7-9 (mean 7.3) days apart. Participants/caregivers provided informed consent.

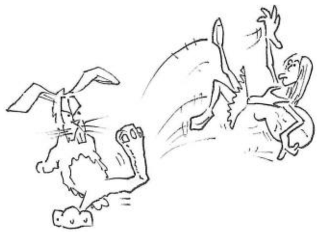
2.2. Materials

We created 32 experimental items, each comprising a prime picture/description, and a target picture.

The items depicted transitive events corresponding to eight verbs (*bite*, *chase*, *kick*, *kiss*, *lift*, *pat*, *pull*, *push*), each used in four primes and four targets (see Appendix). Each prime description had an active and passive version (Figure 1). In order to increase the overall likelihood of passive descriptions, all agents were animals (14 animal characters) and all patients were humans (14 human characters; Branigan, Tanaka, & Pickering, 2008). Prime-target pairs had no open-class lexical overlap. The items were distributed across two sets, each containing 16 prime-target pairs; set order was counterbalanced across participants, such that half of the participants were exposed to Set A in Session 1 and Set B in Session 2, and half were exposed to Set B in Session 1 and Set A in Session 2.

There were two lists per set; across lists each target occurred once in each priming condition, and within lists eight targets occurred in each priming condition.[1] Each set also contained 16 ditransitive filler items, and eight intransitive ‘snap’ items (where the experimenter and participant had identical pictures). Each participant experienced an individually randomized order of experimental items (hence, a randomized order of active and passive primes), with the constraint that ‘snap’ items were distributed approximately evenly in each list to maintain children’s interest and engagement.

Figure 1: *Example experimental item*



Active prime: *The dog is biting the robber*

Passive prime: *The robber is being bitten by the dog*

Target: rabbit kicking fairy

2.3. Procedure

The procedure was identical for each session. The experimenter placed a set of pre-ordered pictures face-down in front of each player (experimenter and participant). She told the participant they would take turns describing the pictures and looking for ‘Snap’ items. The experimenter began each game by turning the top card and describing it (following a script; prime). The participant then took his/her top card and described it (target). The players alternated until all cards had been described. If the same picture appeared on both players’ cards, the first to shout, “Snap” won the cards in play. Adult participants were tested using the same procedure. The session was audio-recorded; participants’ responses were transcribed and scored.

2.4. Scoring

We eliminated 19 experimental trials (children: 17 (5%); adults: 2 (0.3%)) because of recording problems, prime production errors, or no target response. We coded the first target description produced on each trial as *Active*: a *complete* sentence appropriately describing the target event, containing an Agent subject, verb, and Patient object, and expressible in the alternative (i.e., passive) form; *Passive*: a *complete* sentence appropriately describing the target event, containing a Patient subject, auxiliary, main verb, *by*, and an Agent object, and expressible in the alternative (i.e., active) form; or *Other* (including reversed and/or incomplete utterances) (Table 1).

3. Results

We analysed Active/Passive response frequencies, excluding Others (Table 2). We explored the effects of Prime (active vs. passive), Session (1 vs. 2), and Group (children vs. adults) on all participants' combined likelihood of producing Passive responses, and within children and adults separately. In all analyses, responses were fit using mixed logit models (Jaeger, 2008) predicting the logit-transformed likelihood of a Passive response; fixed factors were sum-coded. We fitted maximal models, including random slopes for main effects/interactions, and simplifying models by removing higher order terms until convergence (Barr, Levy, Scheepers, & Tily, 2013). Subsequent correlational analyses explored individual differences in passive production across sessions.

Table 1. *Frequency of Active, Passive and Other responses by condition*

Group	Prime	Session 1 Responses			Session 2 Responses		
		Active	Passive	Other	Active	Passive	Other
Children	Active	117	10	44	121	19	30
	Passive	92	31	47	85	54	37
Adults	Active	161	5	27	174	3	13
	Passive	151	20	19	163	19	11

3.1 Combined analyses

There was a significant effect of Prime (see Table 1): Participants produced more passives after passive (10.1%) than active primes (3%); Group: Children produced more passives (21.5%) than adults (6.7%); and a Session by Group interaction: Children's production of passives increased in session 2 (26.2%) compared to session 1 (11.6%), but adults' did not (Session 1: 7.4%; Session 2: 6.1%). No other effects approached significance. To confirm that our data supported the null hypothesis of no difference between groups in the priming effect, we turned to the Bayes Factor, which quantifies the likelihood of observing the data if there were no difference between the child and adult groups, compared to if there were a difference between the groups (Masson, 2011; Wagenmakers, 2007). We constructed the null model, a GLMM with only the main effects of Prime and Group, i.e. without the interaction between them (which assumes that the two groups prime to the same extent), and the alternative model, a GLMM with the main effects of Group and Prime, and the interaction between them (which assumes that the child and adult groups may prime to different extents); Session was included as a covariate in both models. We then used the two models' Bayesian

Information Criterion (BIC) values to estimate the Bayes Factor as $e^{(BIC\_alternative - BIC\_null)/2}$. The null model (i.e., without the Prime by Group interaction) fit the data better by a Bayes Factor of 6.35 (posterior probability in favour of the null model = .864), providing positive evidence (Raftery, 1995) against the hypothesis that children showed a different tendency to prime compared to adults.

3.2 Children's responses

There was a significant effect of Prime (Cohen's d = -0.82): Children produced more passives after passive (16.1%) than active primes (5.4%); and Session: Children produced more passives in Session 2 (26.2%) compared to Session 1 (11.6%); but no Prime by Session interaction: Immediate priming did not increase significantly from Session 1 (17.3%) to 2 (25.3%).

There was a significant positive correlation (one-tailed) between immediate priming effects in Sessions 1 and 2 ($r(20)$= .54, p= .005): Children who showed a greater likelihood of passive priming in Session 1 also did so in Session 2 (Figure 3a); and between immediate priming effects in Session 1 and rate of passive production in Session 2 ($r(20)$= .66, p< .001): Children who showed a greater likelihood of immediate priming in Session 1 showed a higher overall rate of passive production in Session 2 (Figure 3b).

3.3 Adults' responses

There was a significant effect of Prime (Cohen's d = -0.71): Adults produced more passives after passive (5.6%) than active primes (1.1%). There was no effect of Session: Adults did not produce more passives in Session 1 (7.4%) than Session 2 (6.1%); nor a Prime by Session interaction: Immediate priming did not change from Session 1 (8.7%) to 2 (8.7%).

There was a significant positive correlation (one-tailed) between immediate priming effects in Sessions 1 and 2 ($r(22)= .45$, $p= .014$; Figure 4a); and a marginal correlation between immediate priming in Session 1 and passive production in Session 2 ($r(22)= .34$, $p= .055$; Figure 4b).

Figure 2: Proportion of passive responses (of total active + passive responses) by priming condition, group and session.

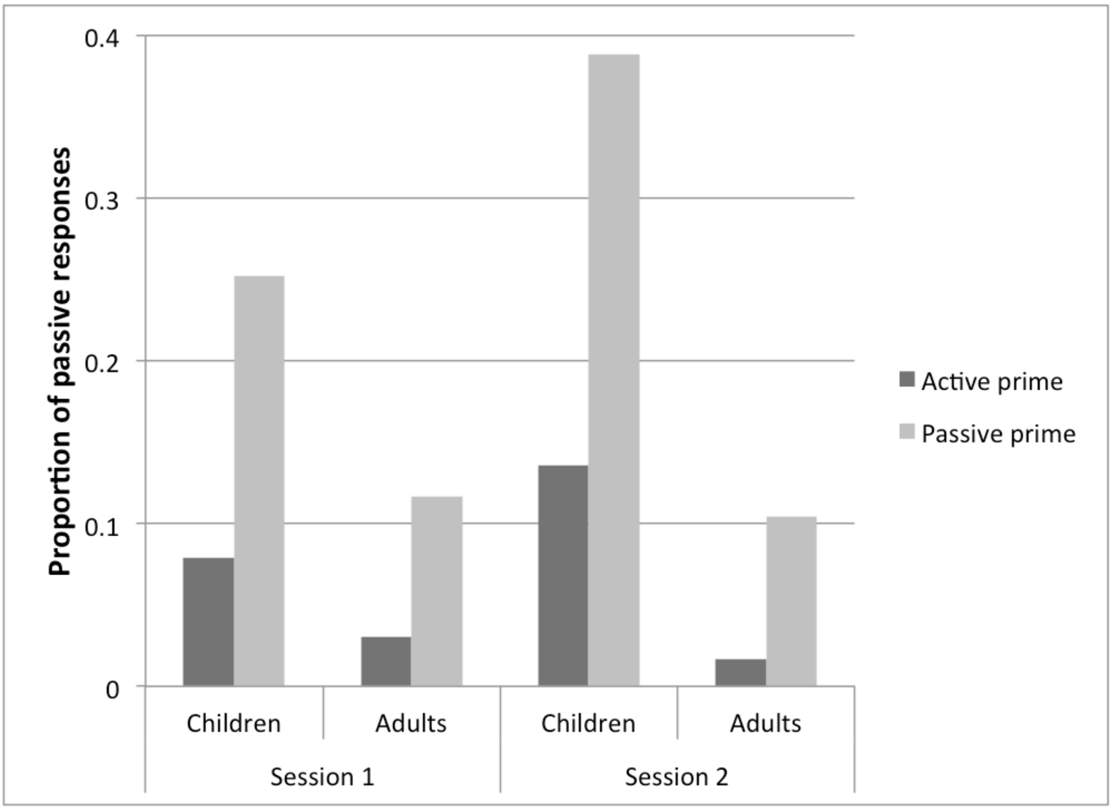


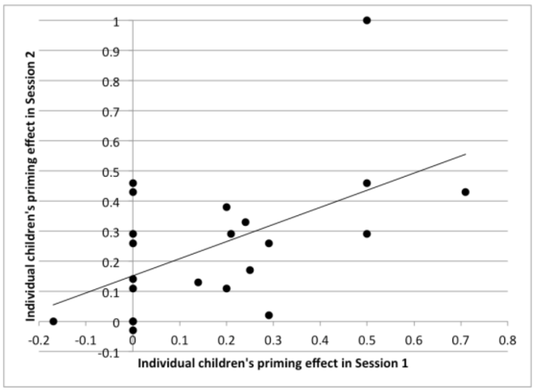
Table 2. *Model coefficients and probabilities for maximally converging models.*

Fixed effects	*Coefficient*	*Std. Error*	*Wald Z*	*p (coefficient ≠0)*
3.1 Combined analyses[A]				
Intercept	3.09	0.32	9.60	
Prime	-2.04	0.41	-4.93	< .001
Session	-0.20	0.41	-0.48	= .63
Group	2.17	0.69	3.16	= .002
Prime x Session	-0.25	0.60	-0.42	= .67
Prime x Group	-1.06	0.73	-1.44	= .15
Session x Group	1.71	0.71	2.41	= .016
Prime x Session x Group	-0.16	1.10	-0.14	= .89
3.2 Children's responses[B]				
Intercept	-2.03	0.39	-5.16	
Prime	1.54	0.43	3.60	< .001
Session	1.18	0.52	2.29	= .022
Prime x Session	0.05	0.70	0.08	= .94
3.3 Adults' responses[C]				
Intercept	-4.38	0.76	-5.75	
Prime	2.98	1.36	2.18	= .029
Session	-0.64	0.88	-0.72	= .47
Prime x Session	-0.32	1.17	-0.27	= .79

[A] The maximal model to converge included random slopes for Prime, Session and Group for both participants and items.

[B,C] The maximal model to converge included random slopes for Prime and Session for both participants and items.

Figure 3: Correlations between children's priming effects in Session 1 and: (a) individual priming effects in Session 2; (b) rate of passive production in Session 2.

a. 

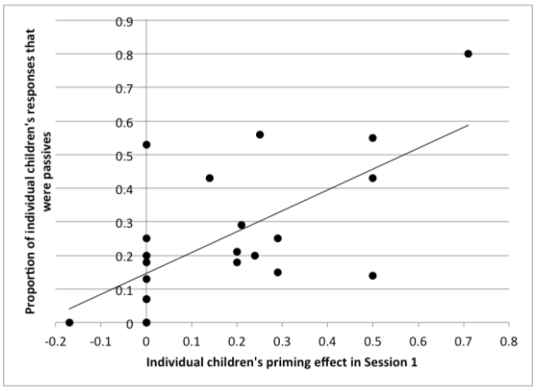
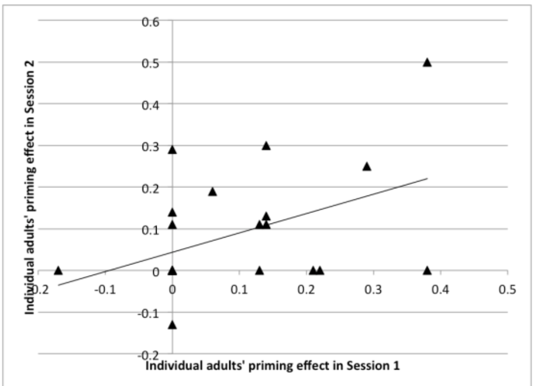
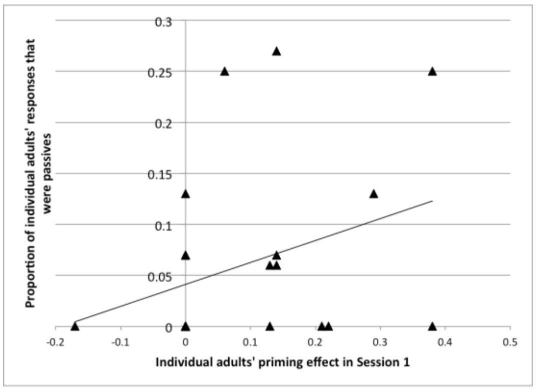
b. 

Figure 4: Correlations between adults' priming effects in Session 1 and: (a) individual priming effects in Session 2; (b) rate of passive production in Session 2.

a. 

b. 

General Discussion

Implicit learning models of syntactic processing such as Chang et al.'s (2006) Dual Path model propose that a single error-based learning mechanism with an individually-specified learning rate underlies both immediate and long-term effects of syntactic experience, and hence predicts that children should show cumulative and consistent effects of syntactic experience across time.

Our experiment showed that three- to four-year-old children’s syntactic choices were dynamically affected by individual syntactic experiences: When exposed to both active and passive structures within a session, children were more likely to use a passive immediately after hearing the experimenter use a passive. Critically, individual experiences of an infrequent structure also contributed to cumulative learning that persisted over seven days: Children had a higher overall rate of passive production in Session 2 than in Session 1. Moreover, we demonstrated consistent individual differences in susceptibility to syntactic experience: Children who showed strong immediate effects of individual experiences of the passive structure in Session 1 also showed strong immediate effects a week later, and additionally showed a higher overall rate of passive production in Session 2. Adults also showed immediate effects of individual experiences that were consistent across time within speakers; however, they did not show a higher overall rate of passive production in Session 2 than in Session 1. Overall, children produced more passives than adults.

Our results support an error-based implicit learning mechanism for syntax in several important respects. The demonstration of immediate facilitation for a passive structure following an individual experience is consistent with previous research (e.g., Messenger et al., 2012; Rowland et al., 2012), and follows straightforwardly from the assumption that each experience yields weight changes in the underlying syntactic system. The novel demonstration that children’s overall rate of passive production increased (and their overall rate of active production correspondingly decreased) following exposure to multiple passive primes a week earlier is consistent with the assumption that the system continuously refines its predictions via weight changes in response to each new experience, which accumulate and persist over time. Previous research has yielded mixed evidence concerning such long-term cumulative effects (e.g., Kidd, 2012b, found no evidence that exposure to passives increased production of passives a week later in four- to six-year-olds, whereas Savage et al., 2006, found that such exposure yielded increased production of passives a month later in four-year-olds, under at least some circumstances). It is not clear what factors might underlie these inconsistent findings. However, our results provide evidence that long-term cumulative learning effects can occur in three- to four-year-olds in the context of a task that children find engaging and that encourages them to attend closely to the input.

More importantly, the fact that such learning occurred when children had equal exposure to actives and passives (unlike in previous research; e.g., Savage et al., 2006) follows from the assumption that learning is based on prediction error, and thus that each experience of an infrequent (hence, unexpected) structure yields a strong adjustment to the syntactic system, whereas each experience of a highly frequent structure has little effect.[2] It also rules out an explanation based on children associating the experimental context with the production of passive rather than active structures (see Kidd, 2012b, for discussion).

The finding that children showed a consistent susceptibility to immediate effects of individual experiences across time is compatible with an individually specified learning rate that determines the extent to which weights are adjusted by experience. That is, some children appear to be more susceptible than others to effects of syntactic experience. Our experiment is not informative about the factors determining individual children's learning rate, but other studies suggest that relevant factors may include non-verbal IQ and statistical learning ability (Kidd, 2012a, 2012b). The finding that individual children's susceptibility to immediate passive priming at one timepoint correlated with their overall likelihood of passive production at a later timepoint following multiple experiences also follows from the assumption of a single implicit learning mechanism with an individually determined learning rate.

Both findings are also compatible with an error-based learning mechanism, by which less frequently experienced (hence less expected) structures yield larger adjustments to the syntactic system. Children who have previously encountered fewer passives therefore experience a larger prediction error when processing a passive sentence than children who have encountered more passives, and are correspondingly more strongly affected by it. These children would therefore display a consistently stronger immediate priming effect, and a higher likelihood of passive production following multiple experiences.[3] On the basis of the current experiment, we cannot distinguish the contributions of individual learning rates, versus individual variations in prior experience of the passive, to the effects that we found.

Our main interest was in children's production. However, evidence from the adult controls is also informative, although in some respects less clearly compatible with an error-based account. Like children, adults also showed effects of immediate experience, which were moreover stable at an individual level across time, consistent with an error-based learning mechanism. The marginal correlation between individual adults' propensity to immediate passive priming in Session 1 and overall likelihood of passive production in Session 2 is also compatible with this account. However, we expected that adults would be less affected by experiences of passives than children, because of their greater language experience (which should yield a lower prediction error) and their lower learning rate. As such, we expected adults to demonstrate weaker immediate priming and a weaker cumulative effect across sessions than children.

We found evidence for the latter: As a group, adults did not show an increased overall likelihood of passive production in Session 2 than Session 1, unlike children, suggesting that the cumulative effects of experiencing eight passives in Session 1 did not facilitate the passive structure (see also footnote 3). However, we found no evidence for the former: There was no significant difference in adults' and children's tendency to produce a passive immediately after hearing a passive. This pattern is not predicted by an error-based learning account, though we note that it is consistent with previous findings (Branigan & McLean, 2016; Messenger, Branigan, & McLean, 2011; Messenger et al., 2012; Peter et al., 2015; Rowland et al., 2012). We suggest that this pattern may reflect children's difficulty in successfully producing well-formed passives, even when facilitated through previous use. This interpretation is supported by the fact that in both sessions, some children did not successfully produce any well-formed passives (Session 1: eight children; Session 2: three children).[4]

In conclusion, our results support the proposal that children's syntactic development is supported by an implicit learning mechanism that continuously adjusts the syntactic system to reflect the statistics of the input: Each experience plays a part in shaping a child's syntactic behaviour – although some children are more strongly influenced than others.

Notes

[1] Owing to a randomization error, one set contained 7 items (active or passive) in one condition and 9 in the other.

[2] Error-based learning also predicts that with increasing experience of a structure, each new instance yields increasingly weaker adjustments (see Jaeger & Snider, 2013). We found no evidence for such *adapted surprisal* within our experiment (which would have manifested as reduced immediate priming in Session 2), but note that previous studies finding such effects used larger numbers of items and/or skewed presentation.

[3] Note that we cannot control for variations in participants' exposure to passives in the intervening week between Sessions 1 and 2. We assume that children who had relatively less experience of passives prior to Session 1 also had relatively less experience of passives in the intervening week. It also seems likely that adults were exposed to more passives than children during the intervening week.

[4] 12 adults in Session 1 and 13 adults in Session 2 did not produce any passives. This pattern seems unlikely to arise from these adults having difficulty in producing passives, and is consistent with adults being less affected by experience of passives.

Acknowledgments

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Appendix:

Experimental items (*Active/Passive prime sentences (P) with target pictures (T)*) and snap items *(S).*

P01. The rabbit is biting the doctor/The doctor is being bitten by the rabbit

T01. Cat chasing queen

P02. The dog is biting the robber/The robber is being bitten by the dog

T02. Rabbit kicking fairy

P03. The cat is chasing the boy /The boy is being chased by the cat

T03. Lion lifting doctor

P04. The horse is chasing the soldier/The soldier is being chased by the horse

T04. Pig pushing fireman

P05. The sheep is kissing the queen/The queen is being kissed by the sheep

T05. Horse kicking clown

P06. The frog is kissing the doctor/The doctor is being kissed by the frog

T06. Cat chasing fairy

P07. The elephant is lifting the nurse/The nurse is being lifted by the elephant

T07. Cat patting girl

P08. The lion is lifting the witch/The witch is being lifted by the lion

T08. Frog kissing king

P09. The horse is pulling the fairy/The fairy is being pulled by the horse

T09. Frog kicking witch

P10. The tiger is pulling the soldier/The soldier is being pulled by the tiger

T10. Goat patting policeman

P11. The pig is pushing the witch/The witch is being pushed by the pig

T11. Dog patting king

P12. The dog is pushing the girl/The girl is being pushed by the dog

T12. Elephant kicking clown

P13. The elephant is kicking the king/The king is being kicked by the elephant

T13. Sheep lifting boy

P14. The cow is kicking the fireman/The fireman is being kicked by the cow

T14. Dog chasing king

P15. The bear is patting the girl/The girl is being patted by the bear

T15. Sheep kissing clown

P16. The cat is patting the witch/The witch is being patted by the cat

T16. Tiger pulling fireman

P17. The horse is biting the fireman/The fireman is being bitten by the horse

T17. Sheep kissing boy

P18. The rabbit is biting the nurse/The nurse is being bitten by the rabbit

T18. Horse pulling girl

P19. The dog is chasing the queen/The queen is being chased by the dog

T19. Horse biting witch

P20. The tiger is chasing the soldier/The soldier is being chased by the dog

T20. Rabbit patting king

P21. The horse is kissing the witch/The witch is being kissed by the horse

T21. Tiger biting fireman

P22. The frog is kissing the queen/The queen is being kissed by the frog

T22. Elephant lifting boy

P23. The tiger is lifting the robber/The robber is being lifted by the tiger

T23. Bear pulling doctor

P24. The sheep is lifting the witch/The witch is being lifted by the sheep

T24. Dog pushing fireman

P25. The bear is pulling the witch/The witch is being pulled by the bear

T25. Frog kissing fireman

P26. The lion is pulling the doctor/The doctor is being pulled by the lion

T26. Dog chasing robber

P27. The sheep is pushing the king/The king is being pushed by the sheep

T27. Rabbit biting fairy

P28. The dog is pushing the king/The king is being pushed by the dog

T28. Lion lifting nurse

P29. The cow is kicking the fairy/The fairy is being kicked by the cow

T29. Tiger pulling doctor

P30. The rabbit is kicking the clown/The clown is being kicked by the rabbit

T30. Cat pushing fireman

P31. The bear is patting the soldier/The soldier is being patted by the bear

T31. Rabbit pushing girl

P32. The giraffe is patting the postman/The postman is being patted by the giraffe

T32. Horse biting boy

S01. The boys are crying

S02. The pigs are crying

S03. The boys are running

S04. The cats are running

S05. The cats are sleeping

S06. The elephants are skipping

S07. The ballerinas are sitting

S08. The girls are dancing

S09. The girls are skipping

S10. The girls are jumping

S11. The frogs are hopping

S12. The dogs are running

S13. The burglars are hopping

S14. The sheep are hopping

S15. The boys are sleeping

S16. The queens are sleeping