Age, ability, and awareness in implicit and explicit second language learning

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Introduction The idea that children learn languages implicitly, whereas adults must consciously use explicit strategies to learn a second language (L2), is common in second language acquisition (Ellis, 2005; DeKeyser & Larson-Hall, 2005). Implicit vs. explicit learning processes have been used to explain greater variation in outcomes for adult L2 learners than for child L2 learners. Existing literature claims that adults can successfully learn an L2 only if they have high verbal ability, but children learn languages successfully regardless of ability (DeKeyser, 2000; Harley & Hart, 1997). Additionally, for adults, noticing linguistic structure is crucial to L2 learning success (Schmidt, 1990), but children have been said to either never notice structure (DeKeyser, 2000) or to constantly notice structure (Schmidt, 1990).

If verbal ability and awareness of grammatical structures are predictive of L2 attainment for adults but not for children, a fundamental difference between child and adult language learning is supported (Fundamental Difference Hypothesis, Bley-Vroman, 1990; 2009; DeKeyser & Larson-Hall, 2005). Most studies on this topic, though, either test only adults (rather than testing both adults and children; e.g. DeKeyser, 2000), or have confounds in instruction between age groups (i.e. a change from implicit instruction for younger learners to explicit instruction for older learners; Harley & Hart, 1997).

Methods The present study controls for these factors by assigning children ($N = 40$, age 5-7) and adults ($N = 40$, age 18+) to implicit or explicit training conditions for instruction in an artificial mini-language. The artificial mini-language paradigm ensures that no out-of-experiment exposure to the language is possible and that participants can reach high proficiency in a short time. Artificial mini-languages have also been used with adult participants to test language learning under implicit and explicit conditions (DeKeyser, 1995; Morgan-Short, Steinhauer, Sanz, & Ullman, 2012).

This study examines the relationships between age, ability, awareness, and language performance. Verbal ability in the first language (English) is measured using the Peabody Picture Vocabulary Test (PPVT, Dunn & Dunn, 2007), which is designed for use with all ages. Awareness of grammatical structure during a debriefing protocol is coded as "No Report," "Noticing," or "Understanding," following Rosa and O'Neill (1999). Performance is measured through two oral production tests and an aural grammaticality judgment task. The specific research questions are as follows:

For children and for adults,
  RQ1. Does training condition affect awareness?
  RQ2. Does training condition affect performance?
  RQ3. Does ability predict awareness?
  RQ4. Does ability predict performance?
  RQ5. Is awareness related to performance?

Existing literature predicts that for adults, all these questions will be answered "yes," but for children, all will be answered "no."

Participants were pseudo-randomly assigned to the implicit or explicit training condition such that the groups were balanced for age, gender, PPVT score, years of prior language instruction (participants with more than two years of prior language instruction were excluded), highest degree or parents' degree completed, and grade in school for children, or year of graduation from the last degree program for adults.

The training paradigm and the language used, Sillyspeak, were adapted from Hudson Kam and Newport (2009). This mini-language has 12 nouns, 2 articles, and 4 verbs (2 transitive, and 2 intransitive), creating 99 semantically possible sentences. The grammatical rules are VSO word order (with articles following nouns), and gender marking on articles. Each noun class in the present study had two human, two animal, and two inanimate referents.

Participants completed the PPVT and learned the vocabulary on the first day of the study. For the next five days, they met in groups of 2-3 to practice the vocabulary list, a set of 12 intransitive sentences, and a set of 12 transitive sentences. The sentences were acted out by the experimenter and participants using toys, and the participants were asked to repeat the sentences. The explicit group was also taught the grammar rules of the language, using cue cards, each day. On the seventh day of the study, participants completed the two oral production tests (during the first, they simply produced novel sentences; during the second, they were also asked to pay attention to word order and articles), an aural grammaticality judgment task, and a debriefing protocol. The variable "total score" in the analyses below combines word order and article correctness scores on the two production tests and the grammaticality judgment task.

Results   RQ1: Figure 1 shows that there was a significant association between age group and awareness (no report, noticing, or understanding), $\chi^2(2) = 20.005$, $p < .01$. There was an even stronger association between instruction condition and category of noticing, $\chi^2(2) = 42.899$, $p < .01$.
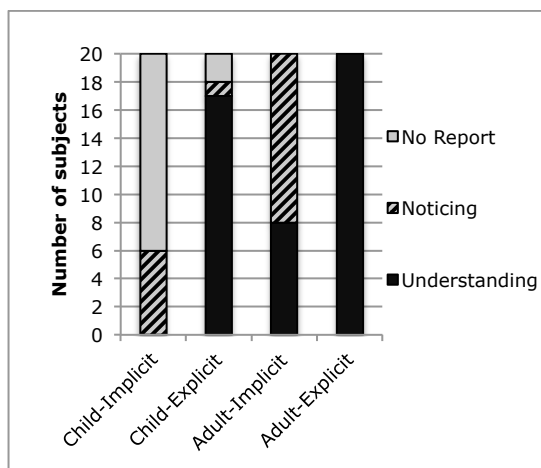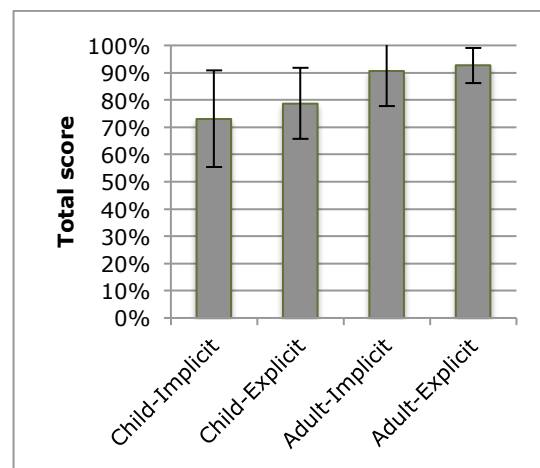

Figure 1: Awareness, by group

Figure 2: Total score, by group

RQ2: Figure 2 shows that there was a significant effect of age group on total score, $F(1, 76) = 24.417$, $p < .01$, but no significant effect of training condition on total score, $F(1, 76) = 0.443$, $p = .44$. For this reason, the two child groups and the two adult groups are collapsed in further analyses.

RQ3: PPVT score was not significantly correlated with awareness for either children, or adults, $r = .06$ and $r = .23$ respectively, $p > .05$.

RQ4: Because the PPVT is actually a measure of vocabulary and not of grammatical ability, subjects' performances on mini-language vocabulary recall and on sentence production/judgment were compared separately to their PPVT scores. For vocabulary recall, both children's and adult's PPVT scores were significantly correlated with number of vocabulary items recalled ($r = .40$ and $.48$ respectively, $p < .01$). Total score, on the other hand, was not related to children's PPVT scores, $r = .05$, $p > .05$, but it was related to adults' PPVT scores, $r = .47$, $p < .01$. So, verbal ability as measured by PPVT score predicts vocabulary performance for both children and adults, but it predicts grammatical performance only for adults.

RQ5: Awareness was significantly correlated with performance for both age groups ($r = .33$, $p < .05$ for children, and $r = .39$, $p < .05$ for adults). These results are driven by a very strong correlation ($r = .63$, $p < .001$) between awareness and performance for children and adults in the implicit training condition. In other words, children and adults who were exposed to the mini-language but never taught grammatical rules, yet noticed structures on their own, performed extremely well. Children and adults who were simply taught the grammar rules all achieved high awareness, unrelated to performance. Training condition had a significant effect on awareness for both age groups, but no significant effect on performance for either group. Table 1 summarizes results for all five research questions.

	Children	Adults
RQ1 condition > awareness	yes	yes
RQ2 condition > performance	no	no
RQ3 ability > awareness	no	no
RQ4 ability > performance	vocab yes / grammar no	vocab yes / grammar yes
RQ5 awareness ~ performance	yes	yes

Table 1: Summary of results

Discussion and Conclusion   Overall, this study shows more similarities than differences between child and adult L2 learners. For both children and adults, explicit instruction leads to high awareness, high awareness is associated with high performance, and high awareness in the absence of explicit instruction is even more predictive of high performance. The view of adults as uniquely explicit learners, though, is partially supported by the finding that verbal ability and performance are related only for adults.   This finding fits well with Ullman's (2001) declarative/procedural model. The model posits that in the first language, declarative memory is used for vocabulary and procedural memory for grammar, but that adult L2 learners may rely too heavily on declarative memory when they process L2 grammar.

Returning to the claims of the existing literature, we can revise our understanding of age and implicit/explicit language learning. Consistent with previous literature, verbal ability may be more important for adults than for children in learning L2 grammar. But contra previous literature, both adults and children are capable of both implicit and explicit learning, and noticing grammatical structure improves the performance of both adults and children.

This study shows that noticing, awareness, and explicit information may play an important role not only in adult L2 learning, but also in child L2 learning, broadening our understanding of the ways in which age affects language learning. Other work with child-adult

comparisons has shown that supposed hallmarks of *adult L2 learning* (such as transfer errors) are actually hallmarks of *L2 learning* (Schwartz, 2004). This study suggests that supposed hallmarks of *adult classroom L2 learning* (such as responding to explicit instruction and benefitting from noticing) are actually hallmarks of *classroom L2 learning*.

Future Work Future directions include using multiple regression to look at all individual subject variables simultaneously, measuring reaction time for implicit and explicit groups, and testing the learning of artificial grammatical markings with a wider age range.

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