The effect of visual context on processing & learning L2 morphological case marking.

Under the notions of cue salience, blocking, and competition, L2 learning occurs when expectations, generated based on previous experience, are violated by new data (Arnon & Ramscar, 2012; Ellis & Sagarra, 2010). Consider participant role assignment: English uses fixed word order, but other languages such as Greek, use free word order and morphological case marking on nouns and their determiners. L1 English learners initially transfer the English pattern and often fail to become aware of and learn case morphology (Fulga & McDonough, 2016). This line of L2 research has ignored the importance of visual context, even though L1 research has shown that linguistic and pictorial cues are considered, processed and integrated in real time during language comprehension (e.g., Knoeferle et al., 2005). In fact, visual scenes provide a concrete representation against which learners can evaluate their initial (mis)interpretations of L2 sentences.

In three related studies we examine how the modality of the learning environment influences what aspects of Greek case morphology (determiners, noun endings) are attended to and learned by naïve English learners (40 per study). The studies are deployed on Ibex farms and distributed on Amazon MTurk to monolingual English speakers. Each study consists of 5 tasks; only Task 2 differs between studies, and it involves a manipulation of contextual support (images, translations, none).

In **Task 1**, participants will learn the 15 Greek words used in the experiment. In **Task 2**, they will complete self-paced reading (SPR) of 32 simple transitive sentences in Greek, presented twice. The stimuli (see Table 1) cross type of structure (SVO/OVS) and type of agent (1 noun /2 nouns as good agent), and they are distributed over two lists such that the same participant does not see both the SVO and OVS versions of a proposition. The sentences are presented underneath visual scenes (study A), English translations (study B), or without any additional information (baseline study C). The learning phase is followed by multiple outcome measures. **Task 3** integrates SPR with picture matching and confidence ratings. Participants will see two images with reversed participant roles, perform a SPR task, select the correct image and rate their confidence (1-5). The stimuli come from the counterbalanced list from Task 2, with an additional implausible agent condition in a 2x3 Latin square (48 stimuli). In **Task 4**, participants will type sentences to describe 6 images; we will code and analyze production accuracy of agent and patient determiners and noun suffixes. **Task 5** is a qualitative exit survey about what they noticed/learned to determine participant awareness of the morphosyntactic pattern.

In Task 2, we will analyze reaction times at the agent and patient determiners and nouns. By using a cumulative SPR window, we allow for re-reading and saccades to the context. If participants successfully use the visual context to re-evaluate their initial misinterpretations, we expect longer reaction times for the OVS condition and higher accuracy scores in the subsequent tasks. We also predict an interaction with presentation order; after they have identified the pattern, reaction times should be reduced. Based on results from an offline pilot, we expect learning of the determiners but not of the less salient noun suffixes (see Figures 1 and 2). Secondly, by comparing slowdown patterns between studies A and B, we can determine whether information modality plays a role, or whether *any* additional information (linguistic in L1, or visual) can enhance the salience of the morphosyntactic pattern. In Task 3, we will evaluate reading speed and accuracy of picture selection (expecting lower accuracy in OVS and implausible agent conditions if participants have not fully learned the structure). Our study is among the first to examine real time L2 processing as a function of learning environment modality and its impact on learning.

Table 1. Stimuli token set. Task 2 has a 2 X 2 design with SVO/OVS and 1 or 2 nouns as good agents and no implausible agent condition. Task 3 has a 2 X 3 design (full token set).

	One noun as good agent	**Two nouns as good agents**	**Implausible agent**
SVO	Htes / o /skilos /dagose /ton /adra /sto parko. [Adv]/the$_{[NOM]}$/dog$_{[NOM]}$/bit/ the$_{[ACC]}$/man$_{[ACC]}$/[adv].	Htes / o /giatros /ide /ton /adra /sto parko. [Adv]/the$_{[NOM]}$/doctor$_{[NOM]}$/saw/ the$_{[ACC]}$/man$_{[ACC]}$/[adv].	Htes / o /adras /dagose /ton /skilo /sto parko. [Adv]/the$_{[NOM]}$/man$_{[NOM]}$/bit/ the$_{[ACC]}$/dog$_{[ACC]}$/[adv].
OVS	Htes /ton /adra /dagose /o /skilos /sto parko. [Adv]/the$_{[ACC]}$/man$_{[ACC]}$/bit/ the$_{[NOM]}$/dog$_{[NOM]}$/[adv].	Htes /ton /adra /ide /o /giatros /sto parko. [Adv]/the$_{[ACC]}$/man$_{[ACC]}$/saw/ the$_{[NOM]}$/doctor$_{[NOM]}$/[adv].	Htes /ton /skilo /dagose /o /adras /sto parko. [Adv]/the$_{[ACC]}$/dog$_{[ACC]}$/bit/ the$_{[NOM]}$/man$_{[NOM]}$/[adv].
	Yesterday the dog bit the man at the park.	*Yesterday the doctor saw the man at the park.*	*Yesterday the man bit the dog at the park.*

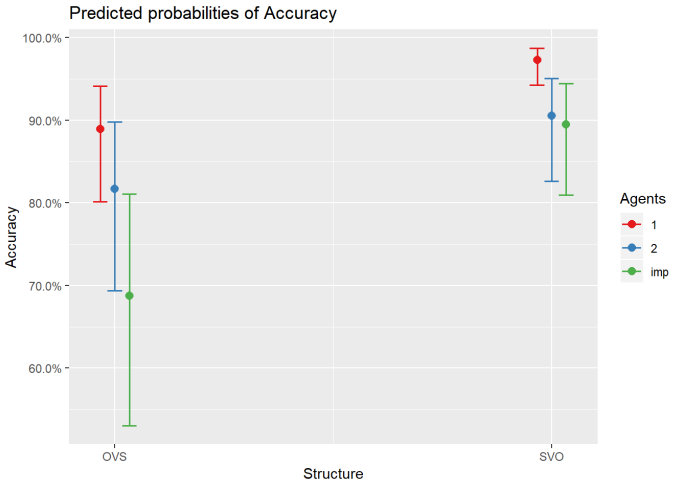

Figure 1. *Offline pilot results from Task 3 (sentence-picture matching). Pilot included only stimuli from study A (Greek sentences + images).*

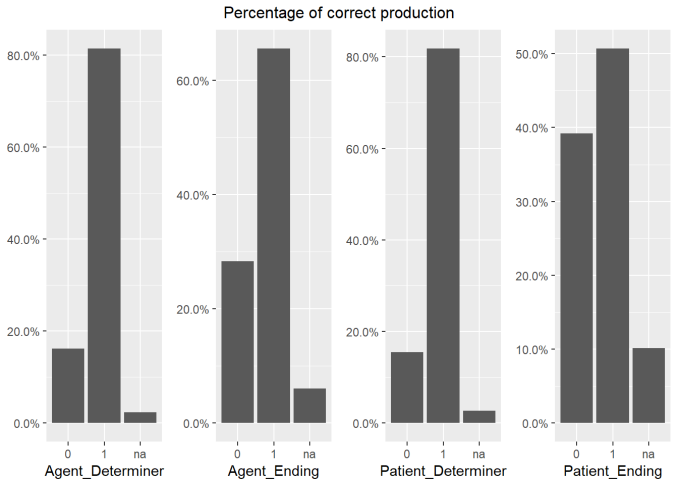

Figure 2*. Offline pilot results from Task 4 (sentence production). 1 means accurate production of the morphological marker and 0 inaccurate. Pilot included only stimuli from study A (Greek sentences + images).*

References

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