

Emergence and evolution of morphological patterns through convergence

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During a conversation, speakers tend to conform to each other's way of speaking. This convergence effect has been observed on many different linguistic levels such as syntax, naming preferences, speech rate, fundamental frequency, vowel production, and lexical choice (Garrod & Pickering, 2004; Giles & Coupland, 1991; Pickering & Garrod, 2006). However, only a few studies have yet explored convergence in morphology (Beckner et al., 2016; Rácz et al., 2018; Szmrecsanyi, 2005, 2006). The recent work of Rácz et al. (2018) shows not only that morphological convergence does occur but also that the study of this phenomenon provides insight into how new input leads individuals to adjust their morphological generalization patterns. At the same time, there is strong evidence that the productivity of morphological patterns, i.e. their propensity to be used in the creation of novel forms, is also highly dependent on how frequently they occur among existing forms (Albright & Hayes, 2003; Bybee, 2001; Pierrehumbert, 2001). The present study explores how the effects of convergence and frequency interact and addresses the question of whether the number of existing forms available to speakers may influence their propensity to converge. To do this, convergence effects were assessed for two different morphological processes in Japanese: a process of abbreviation of compound loanwords which emerged relatively recently, and which crucially therefore has a limited number of existing forms, and a well-established verbal inflection process with a large number of existing forms.

Our experiments adapt the ESP-paradigm to the study of the morphological processes mentioned above (Rácz et al., 2018; Von Ahn & Dabbish, 2004). In two separate experiments, participants played a three-phase online game during which they were asked to create novel forms involving a specific morphological process. In the first phase, they played alone and picked the most natural novel forms according to their own preferences in a forced-choice paradigm between a regular pattern and at least one irregular pattern. In the second phase, they were connected to another (simulated) player and told that the goal was for both players to give the same answers. They were presented with the other player's answer at the end of each trial. In the third phase, the participants played alone again. The simulated player in Phase 2 was programmed to follow one of three possible behaviors based on the answers of the participant in Phase 1: using the regular pattern more often than the participant ("over-regularizer" condition); using it less often than the participant ("under-regularizer" condition); or using all patterns with the same frequency distribution as the participant ("no change" condition).

The results (fig.1)¹ show that the simulated player's behavior had a significant influence on the participants' productivity patterns even when it was no longer present (i.e. in Phase 3). For both morphological processes this influence goes in the expected direction in that the over-regularizer robot lead to an increase in usage of the regular pattern, and the under-regularizer robot lead to a decrease in usage of the regular pattern. Interestingly, participants also tended to produce more regular forms as the game progresses. A generalized logistic mixed model was fit to the data, with response type (regular/irregular) as the binary dependent variable, phase and robot condition as the fixed factors, and item as a random factor. For the abbreviation of compound loanwords, model comparison revealed a significant

¹ Each experiment includes several item types based on phonological structure. The results reported in this abstract, for each morphological pattern, concern the type of items which displays a regular/irregular ratio in Phase 1 that is the closest to 50/50. The effect of convergence being more salient for those naturally more variable items.

effect of phase ($\chi^2=21.654$, $p<0.001$), robot condition ($\chi^2=9.6$, $p<0.01$) and their interaction ($\chi^2=80.929$, $p<0.001$). For the verbal inflection process, the effect of phase was only marginally significant ($\chi^2=3.5961$, $p=0.05791$), but the effect of the robot condition was significant ($\chi^2=9.5012$, $p<0.01$) and the effect of interaction as well ($\chi^2=103.78$, $p<0.001$).

These results show that overall, convergence has a comparable influence on speakers' answers in Phase 3 for both morphological processes, providing evidence that the number of existing forms does not hinder that phenomenon, at least in short term interactions. We argue that by enabling the creation of novel forms that do not follow the tendencies observed in the existing forms, convergence allows speakers to gradually modify even their strongest preferences through its cumulative effect in multiple interactions. Thus convergence plays an important part in the emergence and evolution of morphological patterns.

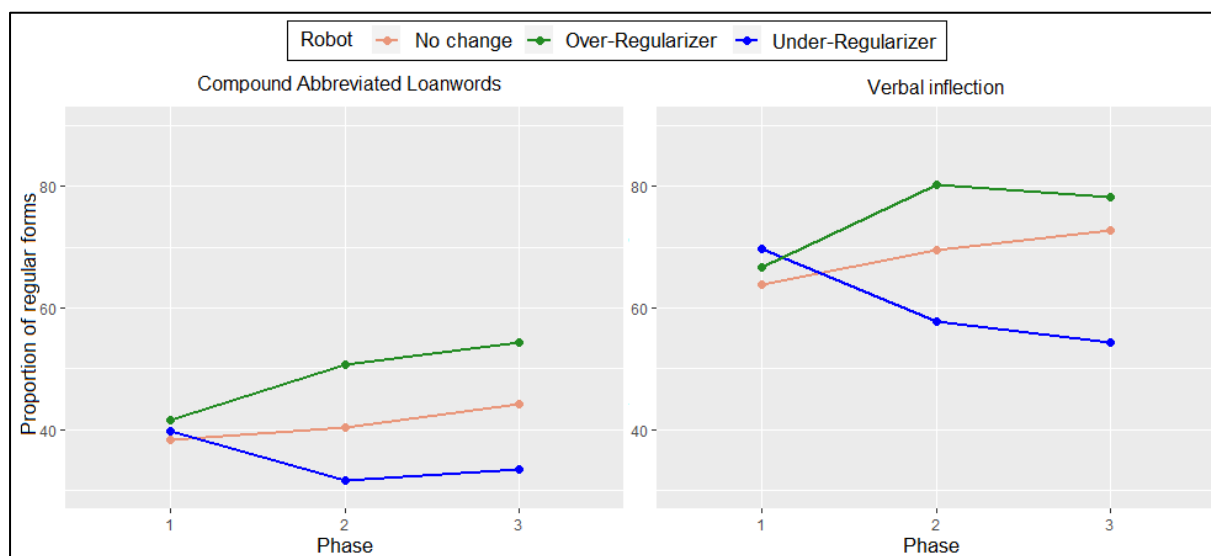


Figure 1: Proportion of use of the regular pattern by phase and by artificial partner behavior for the two morphological processes.

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