we anticipated a privileged role for this form of information structure, relative even to sequences generated from the highly structured lattice graphs. In an initial between-subjects experimental design, we provided evidence that learners tracked pairwise statistics, or edges linking nodes across all three graph structures. However, the extent to which learners displayed sensitivity to novel edges was predicted by learning rate only in the lattice and modular graphs. In other words, the overall timecourse of learning throughout exposure to sequences generated by a random graph was not associated with sensitivity to local transition statistics on subsequent measures. We therefore propose that graphs featuring regular structural organization (i.e., lattice and modular) might serve to boost knowledge of local regularities.

Further, by capitalizing on a complementary within-subjects experimental design, we directly contrasted the acquisition of sequences generated by distinct graph structures. Compellingly, learning rates for the modular graph condition were significantly faster relative to both the lattice and random graph conditions. While the differences between the highly structured modular condition and the relatively unstructured random condition were perhaps to be expected, the differences between the modular condition and the lattice condition were uniquely insightful. In particular, nodes within the lattice and modular graphs were precisely equated in degree. They only differed in their meso-scale architecture, wherein neighboring nodes within the modular graph were densely interconnected with one another. While the lattice graph was also highly structured, it lacked this key organizational property, to the detriment of the learner, which demonstrates that the learned pairwise associations do not capture the full scope of learners' pattern sensitivity. Instead, we provide evidence that learners clearly benefit from modularity when it underpins the generation of complex motor sequences. Notably, our performance measure associated with modularity, the surprisal effect, persisted even when altering graph topology and the walk taken upon that topology. However, the effect observed when we considered an altered transition structure was significantly weaker than the effect observed when we considered the original transition structure. We believe that we have ruled out simple confounds, particularly in having shown that the relationship between reaction time on the random and Hamiltonian walks is specific to those edges that bridge clusters, and not an artifact of our analysis methods. However, ruling out these simple confounds is not wholly satisfying, and it remains an open question whether the weakening of the surprisal effect reflects limited training in the first stage of the experiment, or whether learners discard their previous response biases as they adapt to the new statistical structure of the second stage of the experiment. Regarding the first point, while sensitivity to statistical structure emerges in a short time frame, persistence and generalization to new contexts may require more extensive training. Likewise, it would interesting to retest our current experimental setup, but without a shift to the Hamiltonian walk, to ask whether the break itself disrupts previously learned statistics. We note that learned statistics are particularly sensitive to contextual shifts[38], and therefore it is possible