Report Toy Model

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Purpose: To show HVc-RA pathway needs RL help to produce accurate imitation.

- 2 Pathways
- Different set of weights.
- Fully connected.
- HL via one, RL via other
- Weights accumulated in each RA population with negligible noise, and passed through a sigmoidal function.
- Weights from all RA populations accumulated with negligible noise, and passed through a sigmoidal function, to produce final output.

Pathway with HL:
Input: Syllable/Duration encoding through HVc,
Updation of weights:

$$\Delta_1 = pPos * HVc * RA \tag{1}$$

$$\Delta_2 = pDec * (1 - HVc) * RA \tag{2}$$

$$\Delta_3 = pDec * HVc * (1 - RA) \tag{3}$$

$$\Delta_{HL} = \Delta_1 + \Delta_2 + \Delta_3 \tag{4}$$

Pathway with RL:
Input: Syllable/Duration encoding through HVc,
Noise: Introduced in this set of weights.
Updation of weights:

$$error = \text{Euclidean distance} \tag{5}$$

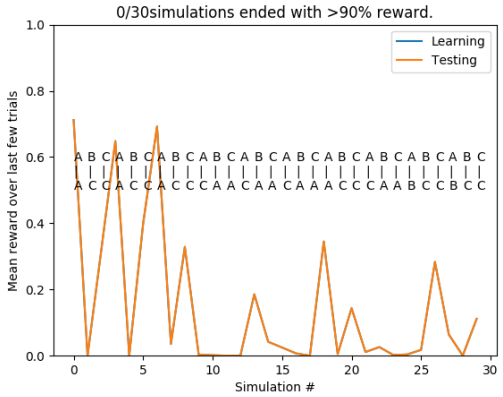
$$R_{curr} = \text{Function of normalised error} \tag{6}$$

$$R_{prev} = \text{mean reward over recent trials} \tag{7}$$

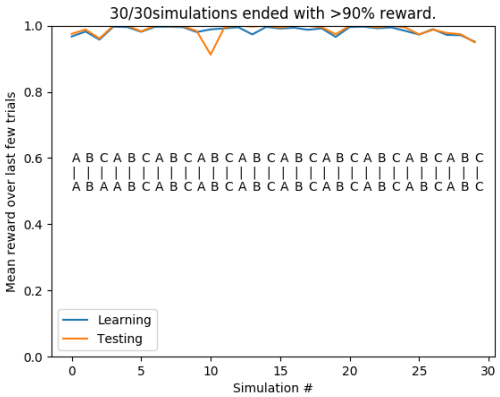
$$\Delta_{RL} = eta * Noise * (R_{curr} - R_{prev}) * HVc * RA \tag{8}$$

$$\tag{9}$$

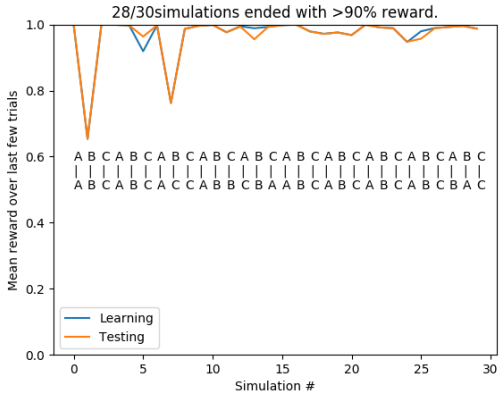
Learning rule for HVc-RA pathway with RL:



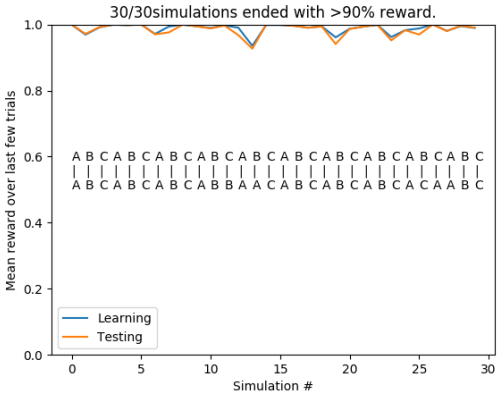
(a) HL in HVc-RA pathway without AFP influence



(b) RL in AFP

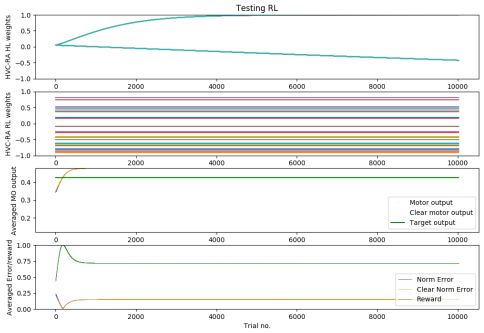


(c) Early HL in HVc-RA pathway with AFP influence

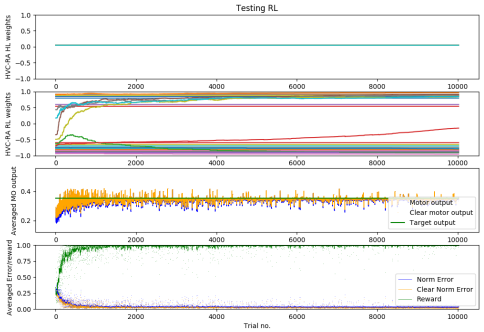


(d) Late HL in HVc-RA pathway with AFP influence

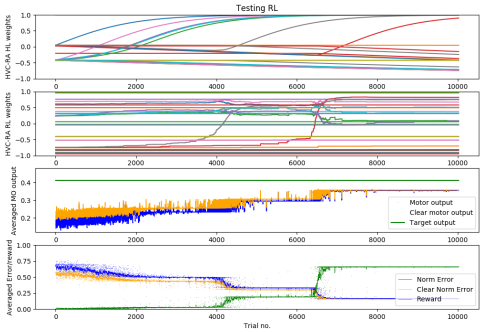
Figure 1: Variation in learning with changing HL-RL interactions: Avg reward obtained in the last 500 trials, for 30 syllables.



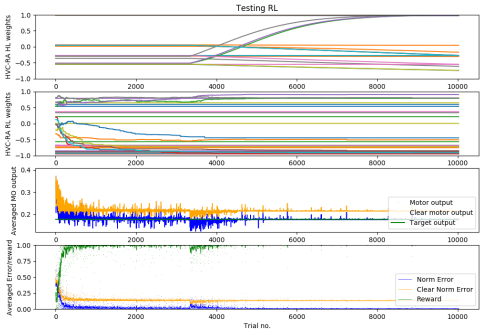
(a) HL in HVc-RA pathway without AFP influence



(b) RL in AFP



(c) Early HL in HVc-RA pathway with AFP influence



(d) Late HL in HVc-RA pathway with AFP influence

Figure 2: Variation in learning with changing HL-RL interactions: Sample result for learning 1 syllable.