Revision 2

I was impressed with this paper the first time, but needed a bit more clarity in the presentation. This version improves that quite a bit and adequately responds to my and the other reviewers' requests (IMHO). My comments are pretty minor.

Specifics:

lines 99-100: This says that sessions were on consecutive days, but the Procedure says they were spaced a week apart.

It was indeed weekly spaced, thank you for spotting the error in the text. Updated.

Figure 3: The diagram on the lower right is probably supposed to be the Markove model, but it is neither mentioned nor described at all in the legend.

Corrected.

276-277: "successfully recruit previously learned models": I thought this referred to the fact that on Day 10 the better-performing model tracks the switching. That's clear in Fig. 5E, but is not exactly convincing across subjects glancing as Fig. S8 and no summary across subjects is provided.

Text and caption updated.

294: vanes -> wanes

Corrected.

Fig. 6D,F: The correspondence between the model samples and participants/days is not clarified in the legend and is indicated by red circles on day numbers and a skinny red line connecting the model to that day that I missed completely until I stared at the figure for quite some time. You should make the connections more obvious AND mention it in the legend. Another option (not mutually exclusive) is to put a title in the corner of each model sample that says something like "Participant 102, Day 2".

The caption has been rewritten.

327: The main text here only suggests that KL is used to measure the match between predictions, whereas the Appendix gives another justification for why KL is the right thing to do. You should allude to that other justification here as well.

Text updated.

338: identified FOR all?

Corrected.

340: FOR several participants (or maybe IN, but not AT)

Corrected.

436: characteristic OF all participants

Corrected.

3 after 603: A glitch here. S_t,Y_t \memberof \mathcal{N}. The sequence... [Yeah, I know my latex is wrong ;^)]

Corrected.

695: inbetween -> in between

Corrected.

697: last 60 -> the last 60

Corrected.

Table 1, Hierarchical prior over state transitions, Notation: Shouldn't that be \alpha,\gamma ???

Corrected.

711: predictions many -> prediction of many

Corrected.

759: seen on -> seen in

Corrected.

775: are subset -> are a subset

Corrected.

822: take THE mean ... over THE last 60

Corrected.

824: IN Fig. 5

Corrected.

827: predicting A correct trial

Corrected.

Supplement, p. 2, para. 2: The reference for Hierarchical Dirichlet didn't get filled in.

Corrected.

Supplement, Fig. S3: I have a notation here "Compare the resulting HMMs". I can't remember what sort of comparison I was thinking of... ;^(

We did a direct comparison of the ground truth synthetic internal models and the recovered internal models through calculating KLs between inferred and ground truth predictive probabilities. However, we decided to omit the figure from the manuscript since the extensive explanation it required diverts attention unnecessarily.

Appendix B, para. 2: Note that THE quantity we obtained…

Corrected.

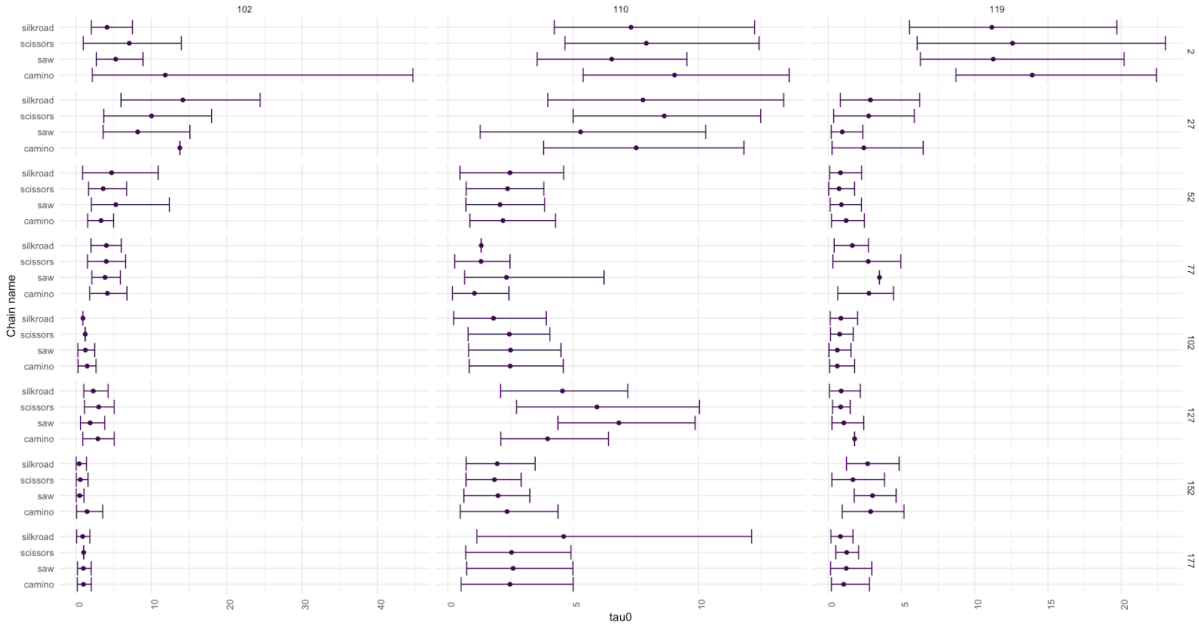
Reviewer #2: I have no further questions.

Reviewer #3: I appreciate the effort the authors have made to address my previous comments and I think the clarity of the manuscript is improved. Specifically, the description of the iHMM is now more detailed and accessible for uninitiated audiences. My concerns about the model validation and comparison have been resolved by the addition of the new version of Fig. S3B and the clarified description of how the models were fitted and evaluated. With most methodological concerns out of the way, I only have one remaining minor issue: In my previous review, I asked for MCMC diagnostics because of the custom inference method and high model complexity. While the authors have pointed to a plot validating an assumption of the model and clarified how much data were used to fit the model, they have not shown evidence for the convergence of the MCMC method.

To check proper mixing of the MCMC chains, we checked whether marginal distributions of the response time parameters as well as the number of states represented were identical across chains.

Our analysis showed reliable mixing of Sigma, mu, tau0: across chain variance was substantially lower than that within the chain. Occasionally in some of the chains, the number of states got stuck in one of the modes but in most of the cases this singular K was inside the support of the other chains.

All results presented were marginalised over all chains, therefore the effect of the exceptional singular chains were also annulled.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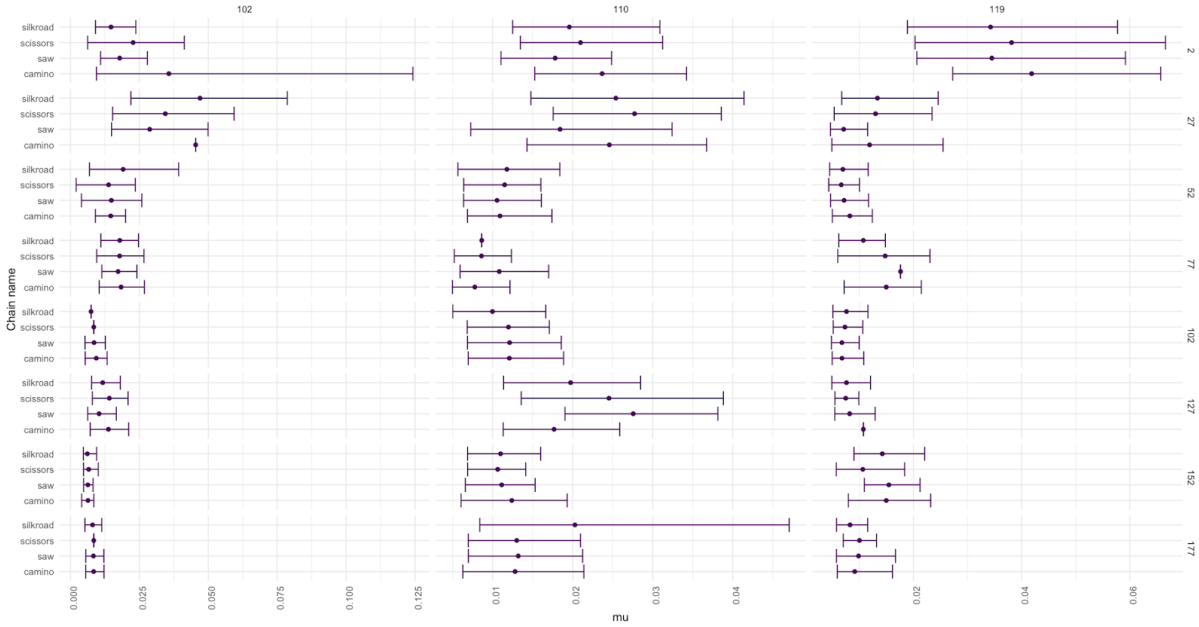
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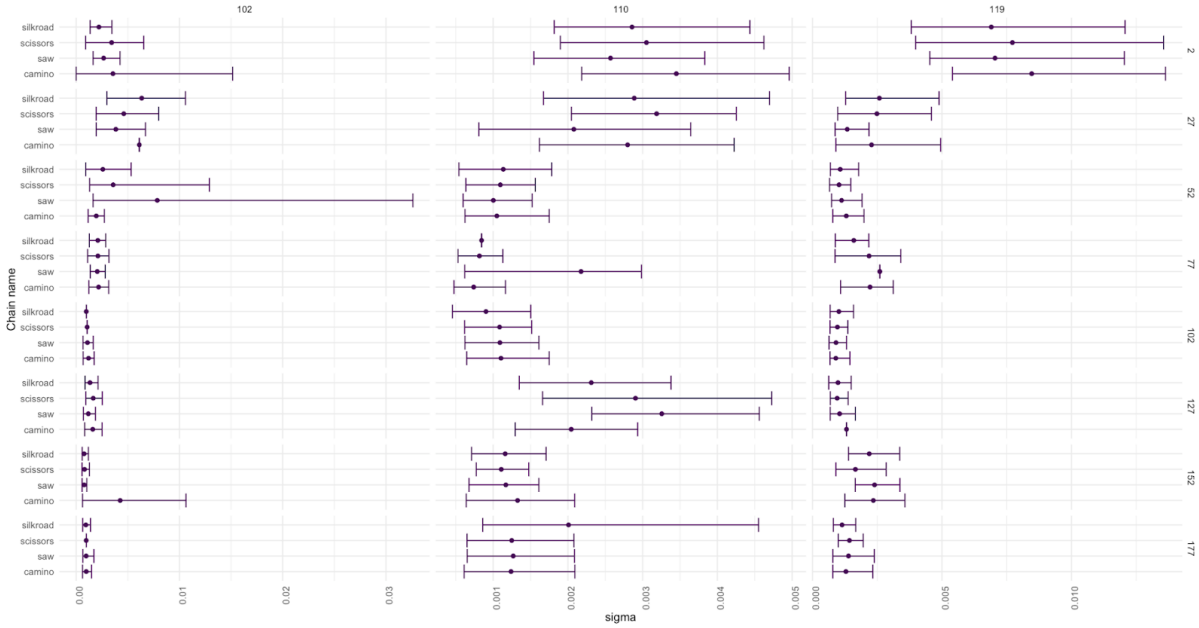
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Further, we would like to mention that we noticed a minor mistake on plot Fig5C where the AUC difference numbers were incorrectly shown. These are now corrected. Similarly, we replaced the same type of figure (Fig S7) with the corrected numbers.

Have the authors made all data and (if applicable) computational code underlying the findings in their manuscript fully available?
The PLOS Data policy requires authors to make all data and code underlying the findings described in their manuscript fully available without restriction, with rare exception (please refer to the Data Availability Statement in the manuscript PDF file). The data and code should be provided as part of the manuscript or its supporting information, or deposited to a public repository. For example, in addition to summary statistics, the data points behind means, medians and variance measures should be available. If there are restrictions on publicly sharing data or code —e.g. participant privacy or use of data from a third party—those must be specified.
Reviewer #1: No: I can't find any mention of it in the main text nor the supplement

We added a reference to this in the text (Data and Code Availability).

Reviewer #2: None
Reviewer #3: Yes
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Reviewer #1: Yes: Michael S Landy
Reviewer #2: No
Reviewer #3: No

Figure Files:

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Figure data:
https://figshare.com/articles/dataset/Tracking_the_contribution_of_inductive_bias_to_individualized_internal_models_--_figure_datasets/19620285

Experimental data:

Code for model and figures:
https://github.com/mzperix/asrt-beamsampling

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References:

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