Dear Andrew,

First of all, we would like to thank you for handling our manuscript, and the two reviewers for their constructive feedback on our work. Below, we list their comments **in bold**, and explain how we have addressed each comment in the revision. Text from the revised manuscript is in green. We have also highlighted the changes in the revised manuscript.

Kind regards on behalf of all co-authors,

Zhang Chen

Review by Katrijn Houben

I commend the authors for their scientific rigor and the clarity with which they have conducted and presented their research. The Stage 1 manuscript provided a well-structured and thorough introduction to the study, with clearly articulated aims and a clear description of the study methods and analyses. The Stage 2 manuscript now presents the results and discussion with the same level of detail and transparency. The results are clearly described, align well with the preregistered analysis plan, and are complemented by exploratory analyses that, for the most part, are accompanied by a clear and thoughtful rationale for their inclusion. I was particularly interested to see how the findings addressed the study aims and added to the understanding of the research question. However, I have a few questions and suggestions regarding the exploratory analyses that I believe could further enhance the clarity and impact of the manuscript:

In the section 'exploratory analyses' p. 26-27, the authors describe additional analyses that were performed on participants' performance in the training, which were not preregistered. However, the results section also includes other non-preregistered analyses such as those on the memory tasks and post-training ratings on p.35 under 'Further exploratory analyses (not pre-registered)'. For clarity and transparency, it would be helpful if the authors would include a description of all conducted non-preregistered exploratory analyses within in the section 'exploratory analyses' p. 26-27.

Thank you for this suggestion. We now briefly describe all exploratory analyses (including the one suggested below by the reviewer) on page 25-26:

Furthermore, we examined participants' performance in the memory tasks, as a kind of "manipulation check," since the approach/avoidance instruction group would be expected to remember the approach/avoidance contingencies better than the go/no-go instruction group, whereas the go/no-go instruction group would be expected to remember the go/no-go contingencies better than the approach/avoidance group. To accomplish this, we computed the average responses in each cell in the approach/avoidance and go/no-go memory tasks separately, and analyzed them with 2 (response, go vs. no-go; within-subjects) by 2 (consequence, approach vs. avoidance; within-subjects) by 2 (instruction group, go/no-go vs. approach/avoidance; between-subjects) Bayesian repeated-measures ANOVAs. Furthermore, we explored the potential role of memory in the choice effects. For the choices between approach and avoidance items, we computed participants' memory of the approach vs. avoidance status for each pair, and added memory as an extra predictor into the pre-registered analysis above. Similarly, for the choices between go and no-go items, we computed their memory of the go vs. no-go status for each pair, and added memory as a predictor in the pre-registered analysis. Lastly, we also explored whether the training led to changes in rating (as observed previously in Chen & Van Dessel, 2024), by computing the average change in ratings from before to after the training for each condition. The change scores were then analyzed with 2 (response, go vs. no-go) by 2 (consequence, approach vs. avoidance) Bayesian repeated-measures ANOVAs, for the two groups separately. For brevity, we mentioned the main findings from these exploratory analyses in the *Further exploratory analyses (not pre-registered)* subsection at the end of the Results section. More detailed information on the analyses and results are in the online Supplemental Materials. As a robustness check, for the exploratory analyses that involved data aggregation (i.e., on accuracy and response times in the training, scores in the memory tasks, and ratings before and after the training), we also conducted mixed-effects analysis, by using the maximal random effects structure on both the participant and the item level. The conclusions remained the same. Detailed results of these mixed-effects analyses are available in the analysis file on OSF.

In addition, memory tasks were included to test memory for the stimulus-response contingencies during training. The authors also note that these tasks were included as previous work has shown that memory of stimulus-response contingencies correlated with training effects. However, no such tests are mentioned in the paper in the section 'Further exploratory analyses (not pre-registered)' p. 35. It is only indicated that 'the approach/avoidance group remembered the approach vs. avoidance conditions of items better than the go/no-go group, whereas the go/no-go group remembered the go vs. no-go conditions of items better than the

approach/avoidance group.' While informative, the actual rationale for including these memory tasks seemingly was to test whether contingency awareness correlated with training effects, which is currently not directly tested.

We have now added two sets of exploratory analyses to the online Supplemental Materials, in which we examined the potential role of memory in the choice effects induced by approach/avoidance and go/no-go actions.

> To explore the potential role of stimulus-action contingency memory in the choice effects induced by approach/avoidance and go/no-go actions respectively, we conducted two sets of exploratory analyses.
>
> The first analysis focused on the choices between approach and avoidance items. For each choice pair, we first retrieved participants' responses in the approach/avoidance memory task for the corresponding items. A difference score in their memory responses between the approach and avoidance item was then computed for each pair. This difference score ranged from 4 to -4, with positive values indicating that participants' stimulus-action contingency memory was overall in the same direction as the trained contingency (more positive values indicate more confidence in memory), negative values indicating that their stimulus-action contingency memory was in the opposite direction as the trained contingency (more negative values indicate more confidence in memory), and 0 indicating no difference in memory between approach and avoidance items.
>
> This AAT memory score was added as an extra predictor into the pre-registered analysis on approach vs. avoidance choices. The pseudocode for the brms model was: choice ~ response * instruction group * AAT memory + (response * AAT memory | participant) + (response * instruction group * AAT memory | left candy) + (response * instruction group * AAT memory | right candy).

Table 2: Stimulus-action contingency memory in the effects induced by approach/avoidance actions.

Predictor	Estimate	SE	Lower	Upper
Intercept	0.135	0.070	-0.003	0.273
Response (Go vs. NoGo)	0.106	0.148	-0.186	0.395
Instruction group (AAT vs. GNG)	0.181	0.129	-0.072	0.433
AAT memory	**0.297**	**0.040**	**0.219**	**0.376**
Response * Instruction group	-0.080	0.277	-0.630	0.455
Response * AAT memory	0.090	0.064	-0.036	0.215
Instruction group * AAT memory	0.113	0.080	-0.044	0.273
Response * Instruction group * AAT memory	-0.044	0.134	-0.309	0.221

Note. SE = the standard error of the posterior estimates. Lower, Upper = the lower and upper bound of the 95% credible interval. In bold: statistically credible effects.

The results from the model are shown in Table 2. We observed a positive effect for AAT memory, suggesting that for choice pairs where participants had better memories of the trained approach/avoidance contingencies, they also showed a stronger effect of approach vs. avoidance actions on their choices. The effect of AAT memory was credible in both the AAT instruction group (estimate = 0.353, 95% CI = [0.246, 0.466]) and the GNG instruction group (estimate = 0.240, 95% CI = [0.127, 0.353]). The effect of instruction group was no longer statistically credible after including AAT memory as a predictor.

The second analysis focused on the choices between go and no-go items. We similarly created a GNG memory score for each choice pair. This GNG memory score similarly ranged from -4 to 4, with positive values indicating contingency memory in the same direction as the trained contingency, and negative values indicating contingency memory in the opposite direction as the trained contingency. This memory score was added as a predictor into the pre-registered analysis on go vs. no-go choices. The pseudocode for the brms model was: choice ~ consequence * instruction group * GNG memory + (consequence * GNG memory | participant) + (consequence * instruction group * GNG memory | left candy) + (consequence * instruction group * GNG memory | right candy).

Table 3: Stimulus-action contingency memory in the effects induced by go/no-go actions.

Predictor	Estimate	SE	Lower	Upper
Intercept	**0.208**	**0.066**	**0.078**	**0.338**
Consequence (Approach vs. Avoidance)	0.100	0.134	-0.161	0.363
Instruction group (GNG vs. AAT)	0.138	0.141	-0.138	0.415
GNG memory	**0.223**	**0.032**	**0.161**	**0.286**
Consequence * Instruction group	0.497	0.259	-0.010	1.005
Consequence * GNG memory	-0.053	0.057	-0.166	0.059
Instruction group * GNG memory	**0.195**	**0.065**	**0.067**	**0.323**
Consequence * Instruction group * GNG memory	-0.134	0.110	-0.348	0.083

Note. SE = the standard error of the posterior estimates. Lower, Upper = the lower and upper bound of the 95% credible interval. In bold: statistically credible effects.

The results from the model are shown in Table 3. In line with the results above, we observed a positive effect for GNG memory, suggesting that for choice pairs where participants had better memories of the trained go/no-go contingencies, they also showed a stronger effect of go vs. no-go actions on their choices. There was also a statistically credible interaction effect between GNG memory and instruction group, showing that the effect of GNG memory on choices was stronger in the GNG instruction group (estimate = 0.320, 95% CI = [0.232, 0.409]) than in the AAT instruction group (estimate = 0.125, 95% CI = [0.036, 0.216]). The intercept was credibly larger than 0, suggesting that when participants reported no difference in memory for go and no-go items, they still chose go items more frequently than no-go items. Lastly, the effect of instruction group was also not statistically credible after including GNG memory as an extra predictor.

Overall, the current results on contingency memory were consistent with previous findings on both the go/no-go (Chen & Veling, 2022) and approach/avoidance training (Van Dessel et al., 2016), suggesting that similar cognitive mechanisms (e.g., forming propositions based on the learned contingencies) may underlie the choice effects observed here and similar effects induced by go/no-go and approach/avoidance training tasks in previous work.

In the *Further exploratory analyses (not pre-registered)* section in the main text, we briefly mentioned the main findings from these exploratory analyses (page 35).

Participants' memories of stimulus-action contingencies positively correlated with the effects of approach/avoidance and go/no-go actions on choices. More

concretely, for the choices between approach and avoidance items, participants showed a stronger preference for approach over avoidance items when they had better memories of the approach vs. avoidance status of the items. Similarly, for the choices between go and no-go items, they showed a stronger preference for go over no-go items when they had better memories of the go vs. no-go status of the items. In both sets of analyses, the effects of instruction group were no longer statistically credible after including memory as an extra predictor. These results were consistent with previous findings with the go/no-go training (Chen & Veling, 2022) and the approach/avoidance training (Van Dessel, De Houwer, & Gast, 2016), which might suggest common cognitive mechanisms (e.g., forming propositions based on the learned contingencies) for these effects.

Finally, the discussion is well-balanced, offering a clear and concise summary of the study's findings while effectively placing them within the context of prior research. The authors thoughtfully discuss their results in light of relevant theoretical frameworks, providing valuable insights into the broader implications of their findings. The authors also pinpoint the study's limitations along with clear suggestion for further research on this topic.

We thank the reviewer for their positive evaluation of our manuscript.

Review by Alexander MacLellan

The manuscript submitted was an interesting and enjoyable read, with a well-defined research question, procedure, and appropriate analysis plan matching what was submitted at Stage 1. Below are my assessments against the Stage 2 criteria, and I would recommend this manuscript is accepted as a Stage 2 Registered Report.

2A. Whether the data are able to test the authors' proposed hypotheses (or answer the proposed research question) by passing the approved outcome-neutral criteria, such as absence of floor and ceiling effects or success of positive controls or other quality checks.

This criteria has been met, with pre-registered sample sizes achieved after exclusions.

2B. Whether the introduction, rationale and stated hypotheses (where applicable) are the same as the approved Stage 1 submission.

This criterion has been met.

2C. Whether the authors adhered precisely to the registered study procedures.

This criterion has been met, with the authors providing reasonable clarifications to pre-registered analyses. In one place they deviated from their registered analysis (removing random slopes from Bayesian ANOVAs), though this was justified.

2D. Where applicable, whether any unregistered exploratory analyses are justified, methodologically sound, and informative.

This criterion has been met, with unregistered analyses clearly labelled, and the authors have not relied on exploratory analyses when drawing their conclusions.

2E. Whether the authors' conclusions are justified given the evidence.

The authors have made sound conclusions that are justified from the procedure and results achieved.

Alexander MacLellan

We thank the reviewer for their positive assessment of our work.