

**Problem:** Computational Model (based on Daw et al., 2011) does not reflect the same pattern of results as seen in the behavioral data using stay behavior.

Behavioral Results (regressions):

- Age x Condition x Transition x Outcome interaction (p=0.001130)
  - Younger Adults:
    - Condition
    - Transition
    - Outcome
    - Condition x Transition
    - Transition x Outcome
    - Condition x Transition x Outcome
      - 6040: Outcome, Transition x Outcome
      - 8020: Transition, Outcome, Transition x Outcome
  - Older Adults:
    - Outcome
    - Transition x Outcome
    - Condition x Transition x Outcome
      - 6040: Outcome
      - 8020: Outcome, Transition x Outcome

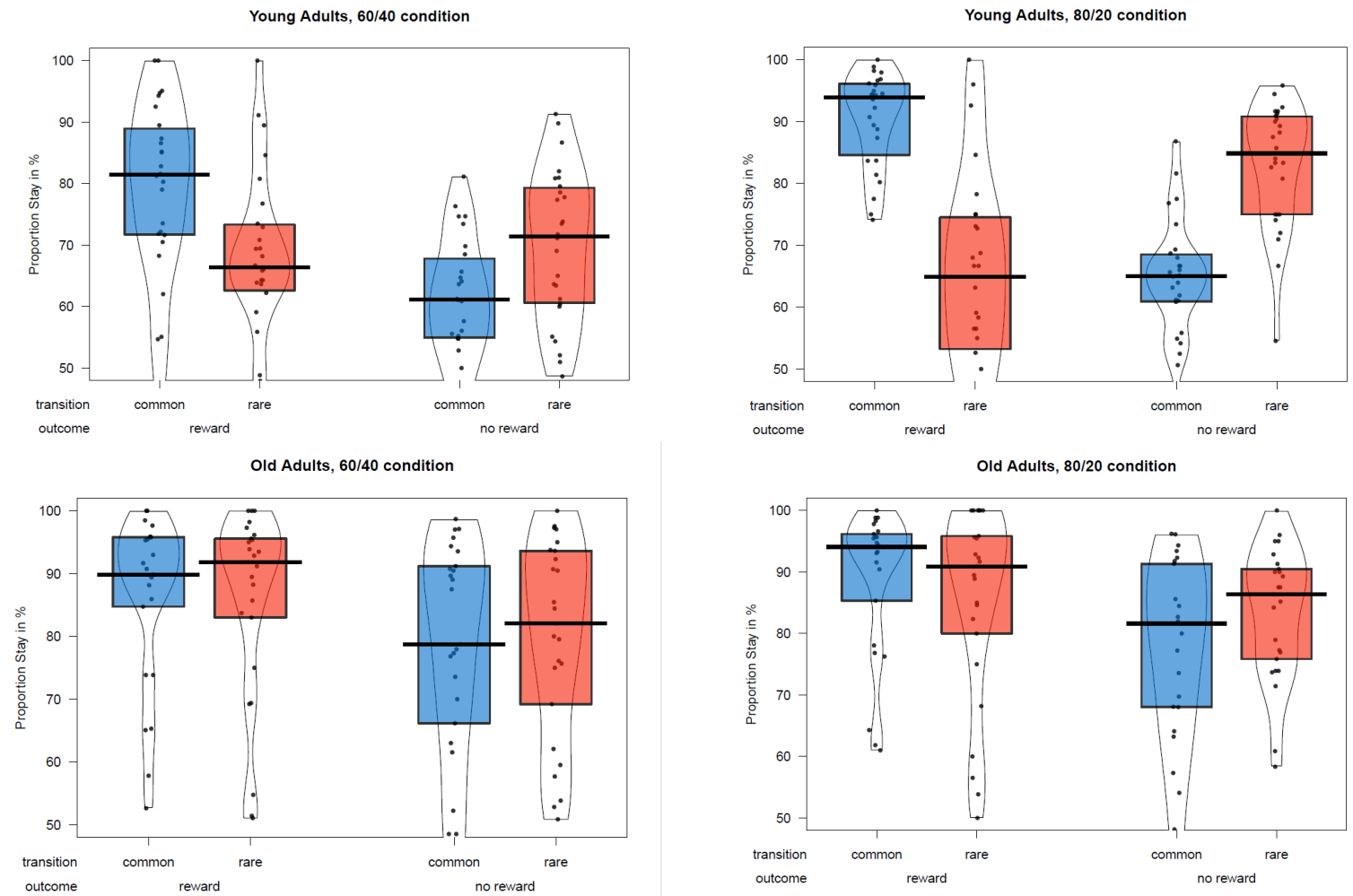
Computational Model Results (Daw et al., 2011):

Parameter	
Beta parameter at stage 1	Age Group (p= 0.00009) *
Beta parameter at stage 2	Age Group (p= 0.0028) *
Alpha at stage 1	
Alpha at stage 2	Age Group (p= 0.013) *
Lambda	Condition (p= 0.047) *
Omega (model-based weight)	Age Group (p= 0.0029) *
Choice stickiness	Age Group (p= 0.000000047) *

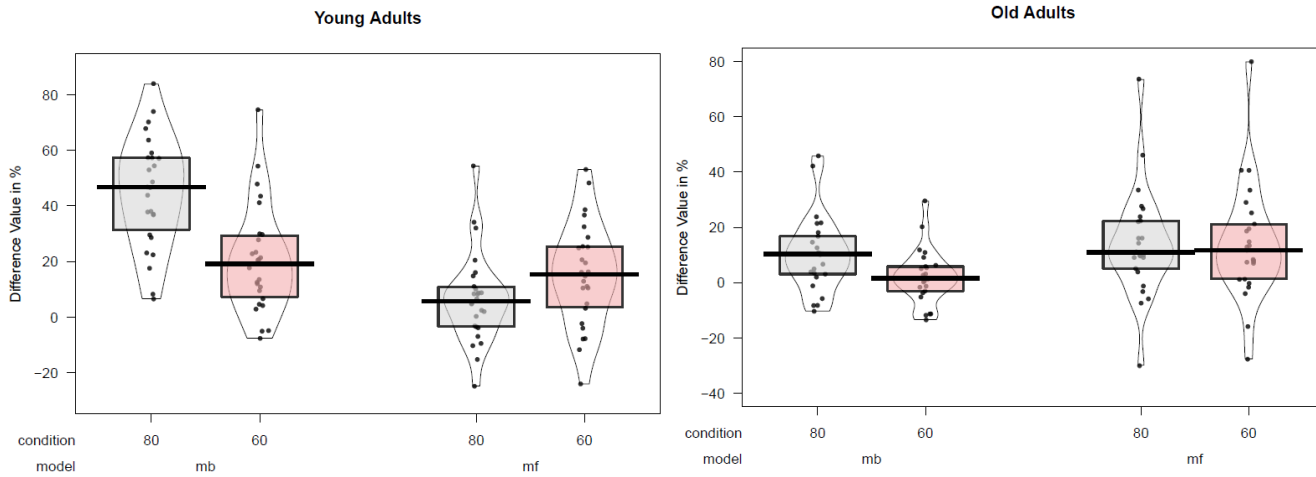
**Question:** What can be done to solve this discrepancy?

- Can the model be modified?

## Behavioral Results



*Figure X.* Probability of repeating first choice (stay behavior) as a function of the transition on the previous trial (common or rare transition) and the outcome on the previous trial (reward or no reward). Stay probabilities are displayed separately for each condition (60-40 and 80-20) across both age groups (younger and older adults). Vertical black lines represent the median, while boxes represent the inter-quartile range. Black dots represent individual participants' data, and the black outline represents the overall distribution.



*Figure X.* Difference values (stay probability) for model-based behavior ((common reward + rare no reward) – (rare reward + common no reward)) and model-free behavior ((common reward + rare reward) – (common no reward + rare no reward)). Difference values are displayed separately for each condition (60-40 and 80-20). Vertical black lines represent the mean, while boxes represent the 95% confidence interval around the mean. Black dots represent individual participants' data, and the black outline represents the overall distribution.

<b>Predictor</b>	<b><math>\beta</math></b>	<b><i>SE</i></b>	<b><i>p</i></b>
(Intercept)	1.538	0.107	< 2e-16
Age group	-0.400	0.107	0.000189
Condition	-0.110	0.043	0.010254
Transition	0.054	0.029	0.060371
Outcome	0.280	0.046	1.43e-09
Age group x Condition	-0.096	0.043	0.023359
Age group x Transition	0.073	0.028	0.010343
Condition x Transition	-0.033	0.021	0.107384
Age group x Outcome	-0.061	0.046	0.185781
Condition x Outcome	-0.001	0.021	0.966840
Transition x Outcome	0.304	0.021	< 2e-16
Age group x Condition x Transition	-0.030	0.020	0.144209
Age group x Condition x Outcome	0.020	0.021	0.329659
Age group x Transition x Outcome	0.177	0.021	< 2e-16
Condition x Transition x Outcome	-0.148	0.020	3.66e-13
Age group x Condition x Transition x Outcome	-0.066	0.020	0.001130

*Table X.* Mixed-effects logistic regression Coefficients indicating the effects of age group, condition, previous transition and previous outcome on first-stage choice.

	Predictor	$\beta$	<i>SE</i>	<i>p</i>
<b>Younger Adults</b>	Intercept	1.133	0.100	< 0.001
	Condition	-0.206	0.045	< 0.001
	Transition	0.125	0.040	0.002
	Outcome	0.219	0.058	< 0.001
	Condition x Transition	-0.059	0.026	0.021
	Condition x Outcome	0.024	0.026	0.358
	Transition x Outcome	0.479	0.026	< 0.001
	Condition x Transition x Outcome	-0.215	0.026	< 0.001
<b>Older Adults</b>	Intercept	1.955	0.196	< 0.001
	Condition	-0.002	0.079	0.980
	Transition	-0.014	0.040	0.715
	Outcome	0.332	0.073	< 0.001
	Condition x Transition	-0.011	0.032	0.745
	Condition x Outcome	-0.028	0.033	0.396
	Transition x Outcome	0.130	0.032	< 0.001
	Condition x Transition x Outcome	-0.081	0.032	0.010

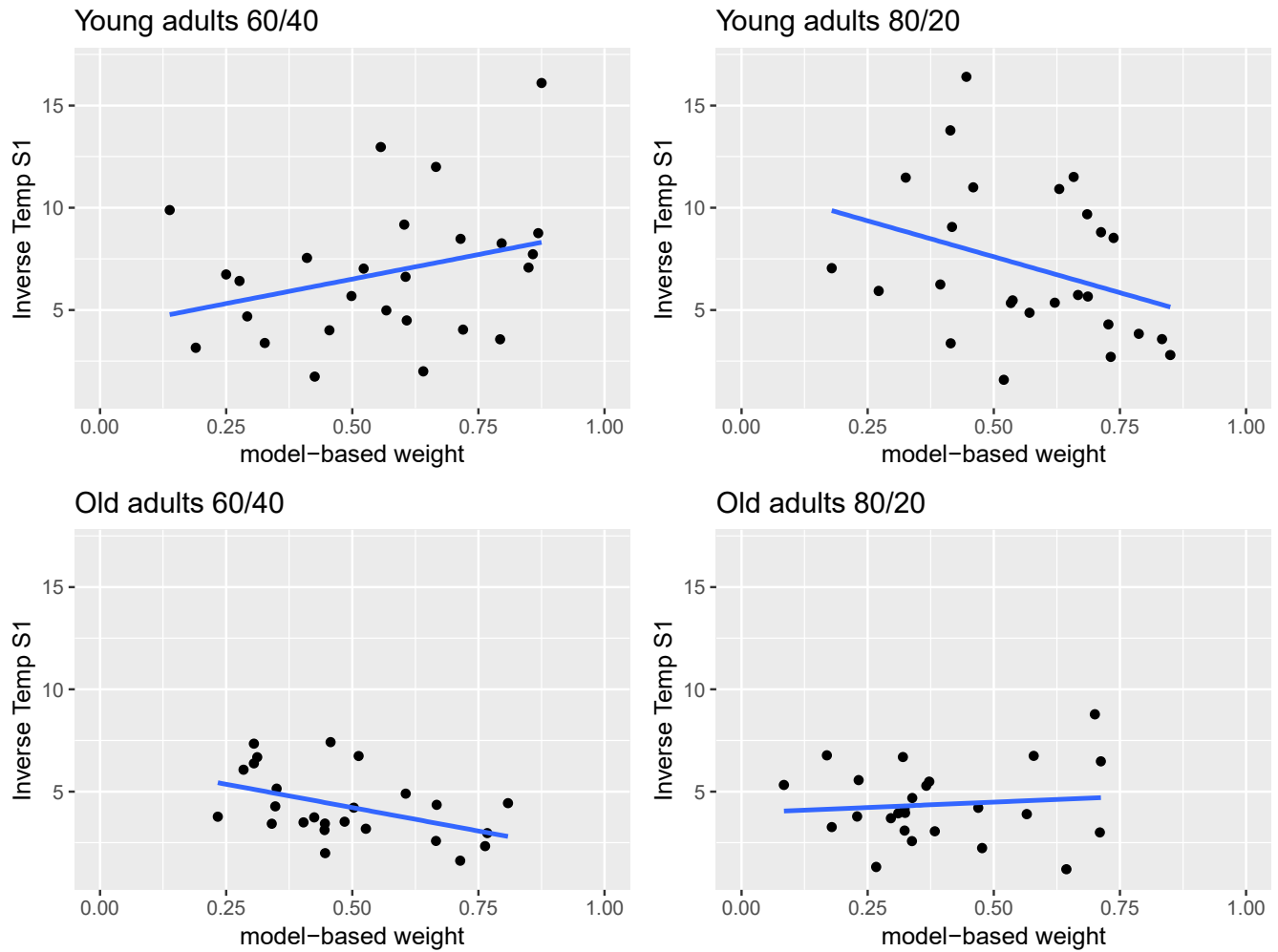
*Table X.* Mixed-effects logistic regression Coefficients indicating the effects of condition, previous transition and previous outcome on first-stage choice for both younger and older adults.

**Computational Model Results**

<b>Inverse Temperature (Stage 1)</b>	<b><u>Age Group</u></b>	<b><u>Mean values</u></b>
	Younger adults	<u>60/40</u> : 6.789491952 <u>80/20</u> : 7.114860717
	Older adults	<u>60/40</u> : 4.285251583 <u>80/20</u> : 4.366639578
<b>Omega (model-based weight)</b>	Younger adults	<u>60/40</u> : 0.557883093 <u>80/20</u> : 0.569596318
	Older adults	<u>60/40</u> : 0.484785148 <u>80/20</u> : 0.38852263

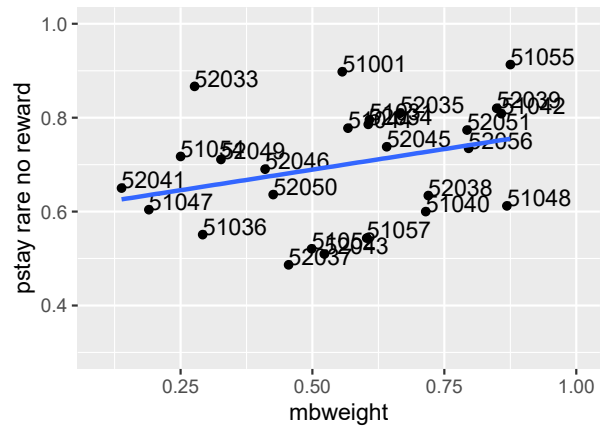
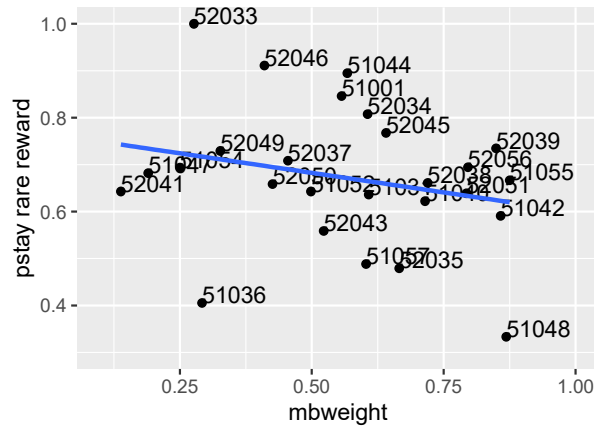
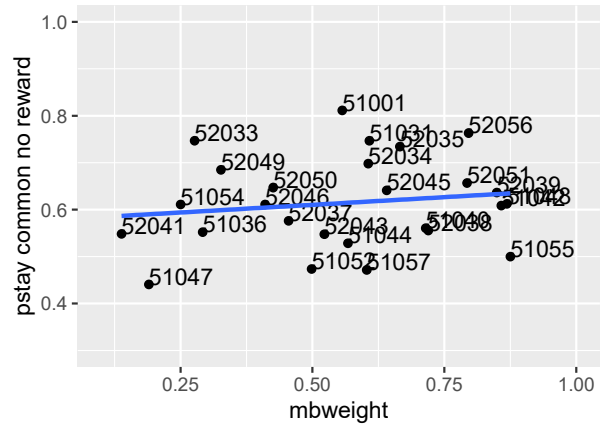
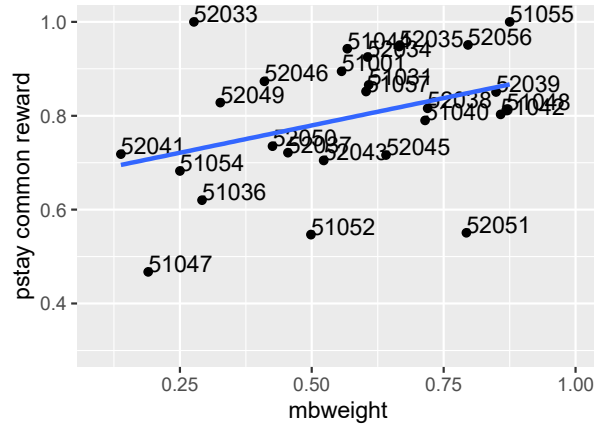
## ANOVA Results:

<b>Parameter</b>	
Beta parameter at stage 1	Age Group* (p= 0.00009) * Condition (p= 9.68) Interaction (p= 0.808)
Beta parameter at stage 2	Age Group* (p= 0.0028) * Condition (p= 0.32) Interaction (p= 0.370)
Alpha at stage 1	Age Group (p= 0.34) Condition (p= 0.52) Interaction (p= 0.93)
Alpha at stage 2	Age Group (p= 0.013) * Condition (p= 0.31) Interaction (p= 0.30)
Lambda	Age Group (p= 0.89) Condition (p= 0.047) * Interaction (p= 0.41)
Omega (model-based weight)	Age Group (p= 0.0029) * Condition (p= 0.22) Interaction (p= 0.11)
Choice stickiness	Age Group (p= 0.000000047) * Condition (p= 0.82) Interaction (p= 0.38)

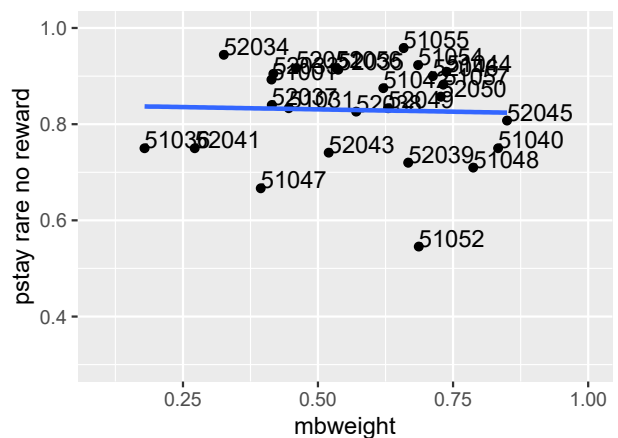
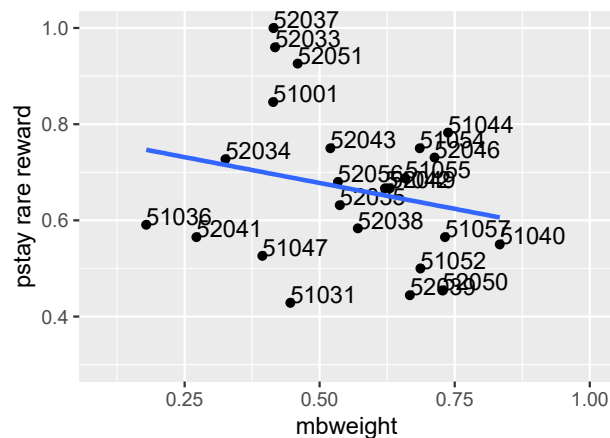
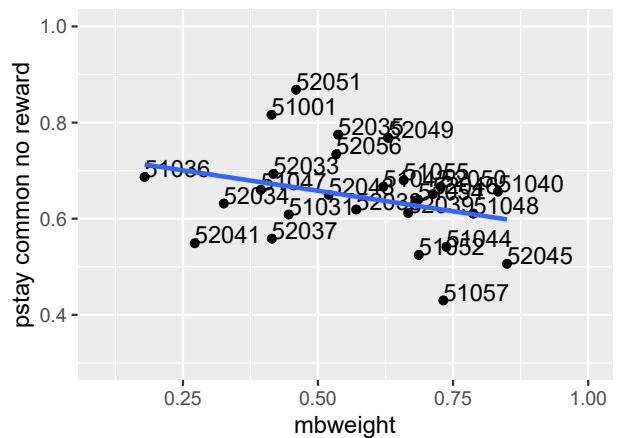
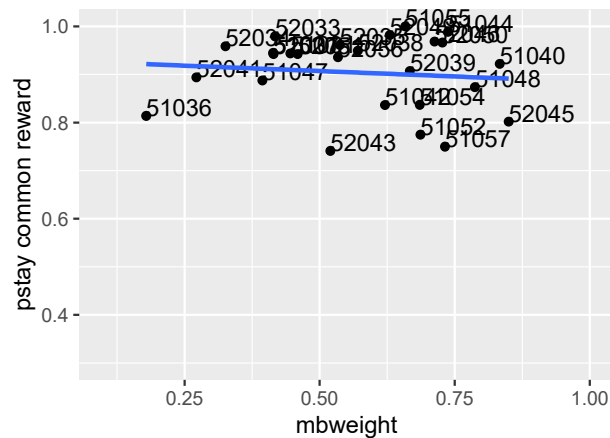


*Figure X.* Correlations between the model-based weights ( $\omega$ ) and the inverse temperature parameter ( $\beta$ ) at stage 1 for younger and older adults in both conditions.

Young adults, 60/40, mb weight

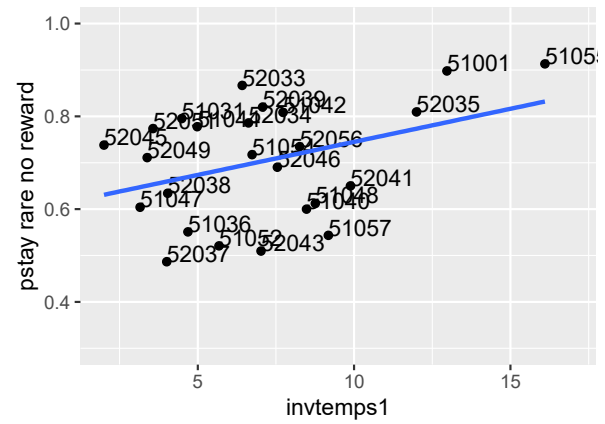
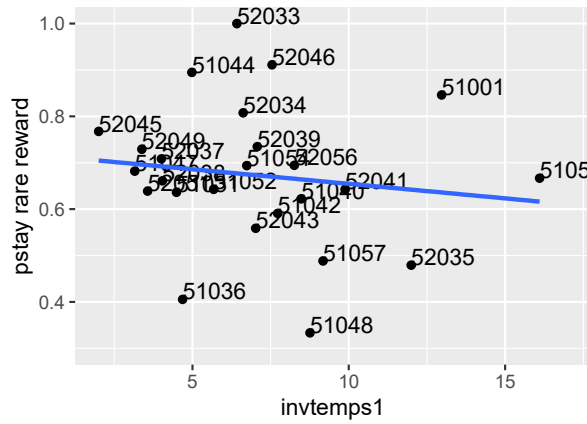
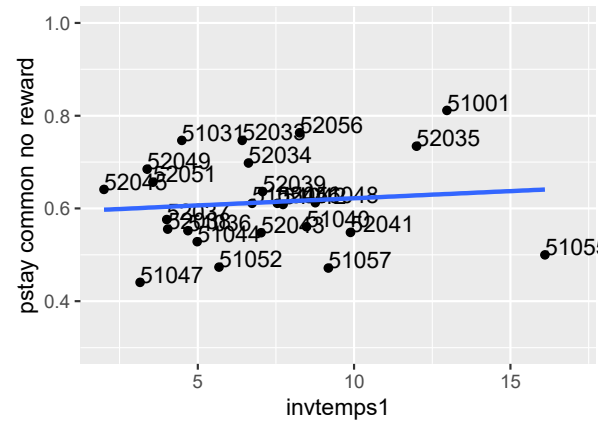
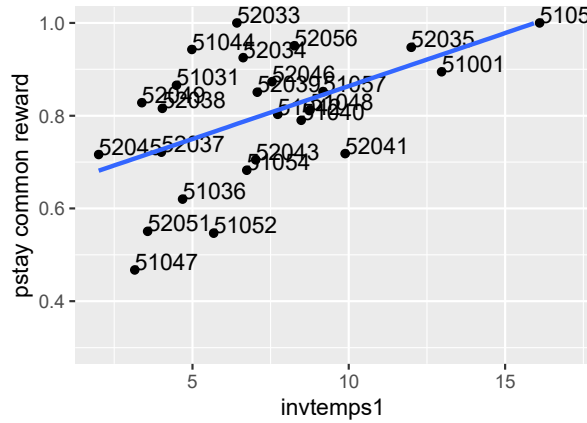


Young adults, 80/20, mb weight

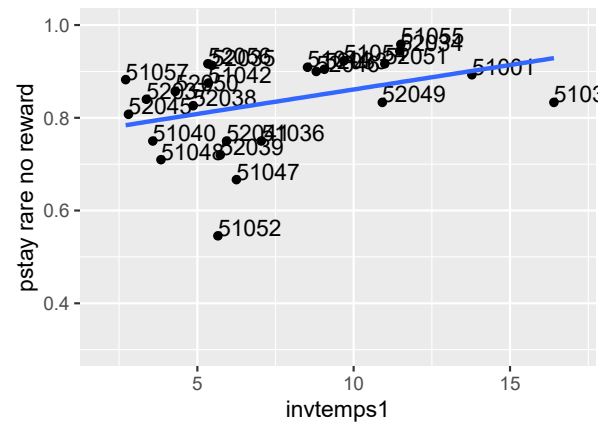
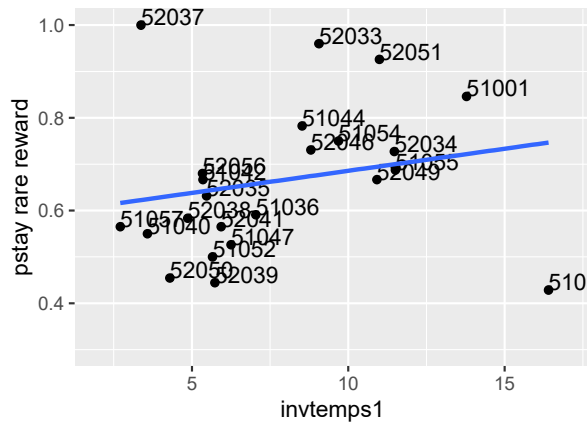
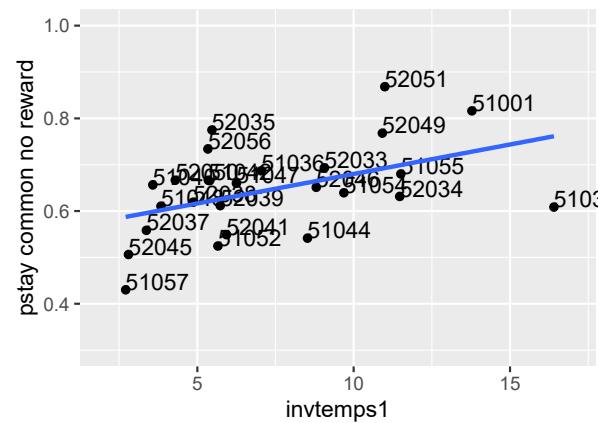
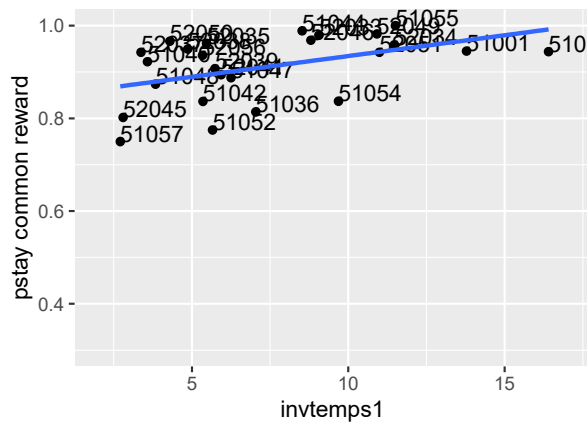




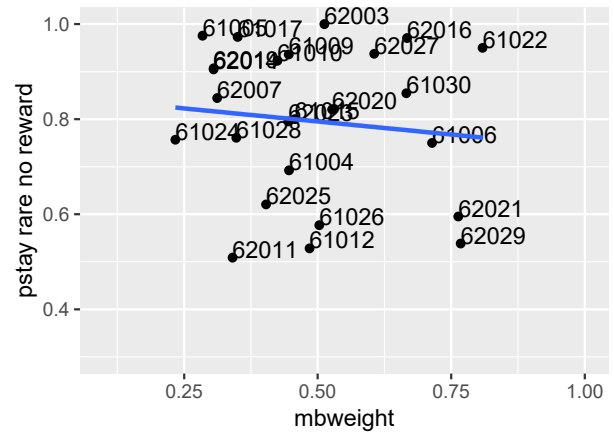
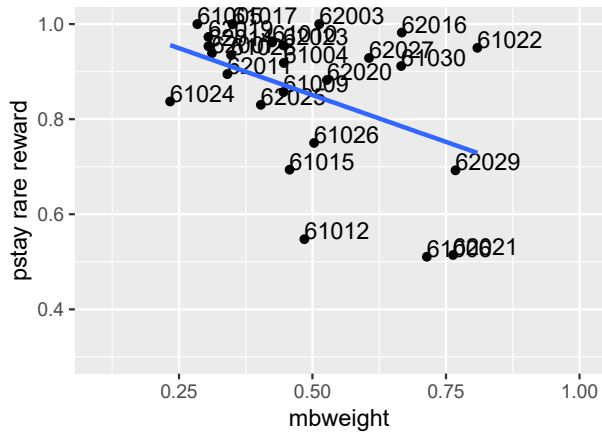
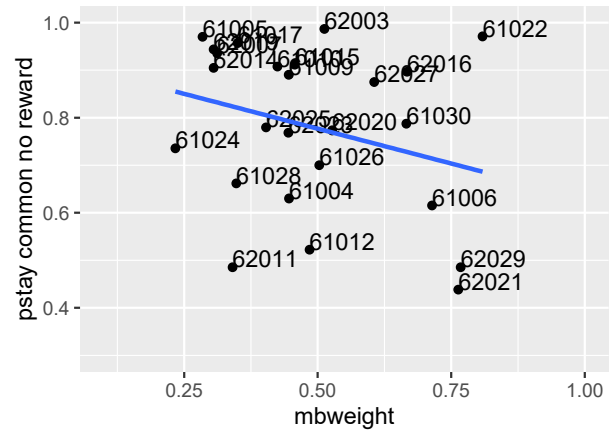
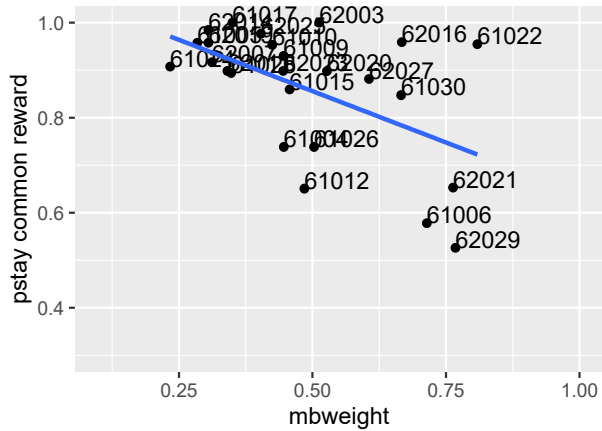
Young adults, 60/40, inverse temp S1



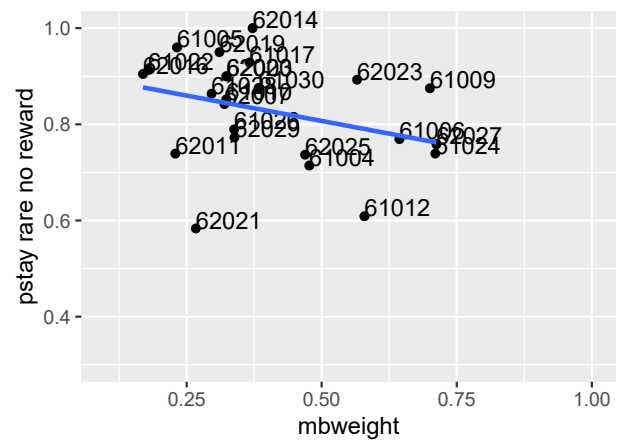
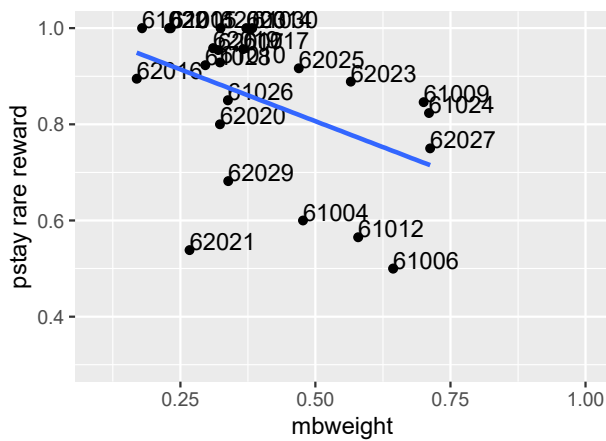
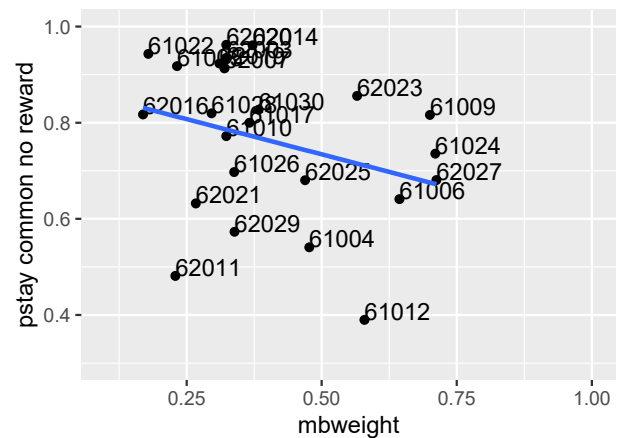
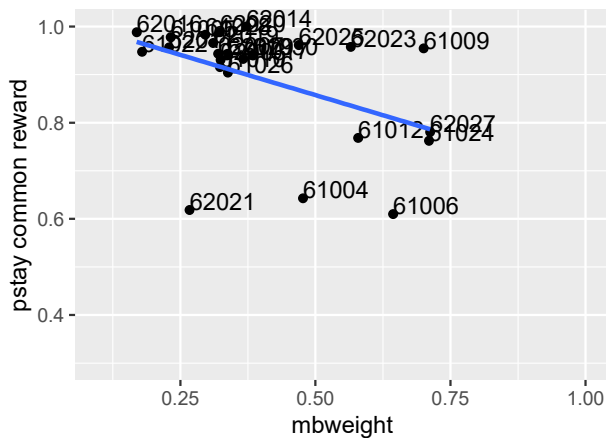
Young adults, 80/20, inverse temp S1



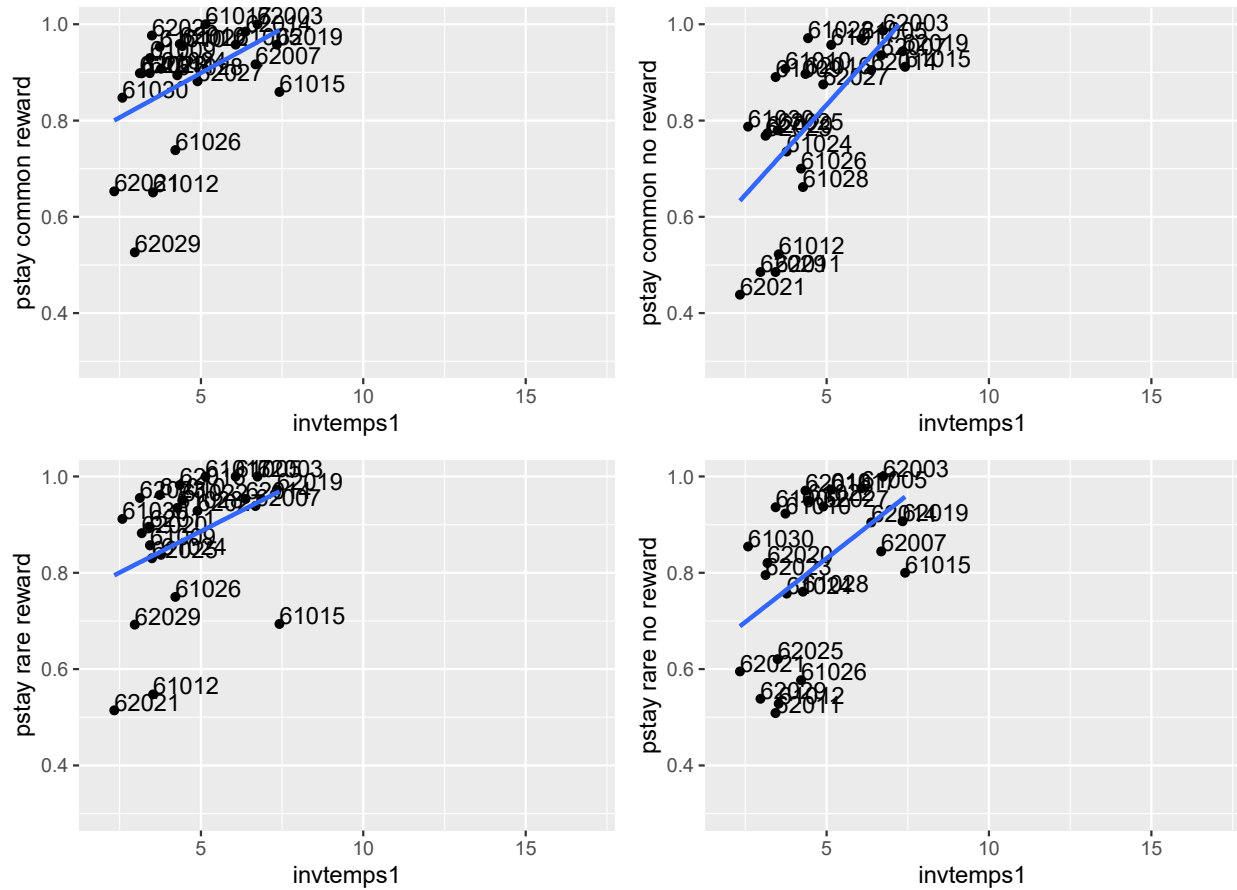
Old adults, 60/40, mb weight



Old adults, 80/20, mb weight



Old adults, 60/40, inverse temp S1



Old adults, 80/20, inverse temp S1

