Electronic Supplementary Material 1

Parameter recovery, recorded dyadic trajectories, and fitted parameters.

Parameter Recovery

Supplementary Figure S1 shows the generating and recovered parameter values across 100 simulation trials for each examined model variant. The corresponding Pearson correlation coefficients are summarized in Figure 4 of the main manuscript.

In the Cres model (Figure S1A), restricted preference parameters showed positive associations between generating and recovered values, but also considerable dispersion, systematic deviations, and saturation near parameter bounds.

In the BantiCres model (Figure S1B), the antisymmetric transition probabilities were generally recovered more reliably than the restricted preferences. Preference recovery remained limited, with considerable dispersion and boundary effects.

In the BantiHighCres model (Figure S1C), tighter transition constraints improved recovery for some preference parameters. These results illustrate how parameter constraints influence identifiability.

Dashed identity lines mark perfect parameter recovery. Red dotted sigmoid curves, where displayed, are descriptive nonlinear fits and are not used to calculate the Pearson correlation coefficients. A positive correlation alone does not establish unbiased recovery: dispersion, saturation at the admissible bounds, and departures from the identity line must also be considered. These scatterplots therefore complement the summary correlations shown in Figure 4 of the main manuscript.

Recorded Conversation Trajectories

Supplementary Figures S2–S17 display sound and motion observations alongside in-sample, observation-conditioned predictions for each of the 16 couples. The figures were organized into 16 parameter-target profiles, representing an approximate $2 \times 2 \times 2 \times 2$ selection over two parameters in each partner: the restricted preference for self-sound and partner-no-sound (C_{sound}) and action-0 inactive-state persistence ($B_{0,0}$) in the fitted `BantiCres` model.

The updated plot headings use *low* and *high* to identify the approximate parameter-target levels used for this selection. These labels are *not* binary classifications of actual parameter values, recorded activity, psychological arousal, or measured latent states; assignment to a target profile does not imply that a parameter lies on one side of a universal numeric cutoff. In particular, $B_{0,0} = P(s_{t+1} = 0 \mid s_t = 0, a_t = 0)$ is the probability of remaining in the inactive state under the "stay" action, so a higher $B_{0,0}$ indicates *greater inactivity persistence*, not higher behavioral activity.

Light-gray traces depict recorded binary sound and motion observations (0/1). Orange curves show the model's observation-conditioned, in-sample predicted probability of behavior for that partner, while blue dashed curves show the other agent's prediction of the same partner's behavior. The colored joint-behavior strips represent *recorded* dyadic states (neither partner, man only, woman only, or both partners active); they are not predictions. The time axes represent retained one-second intervals, which vary in duration across couples. These examples are descriptive fits, not free-running simulations or out-of-sample validation.

Table S1 provides the profile-to-couple correspondence, target labels and selected fitted parameter values appearing in the plots.

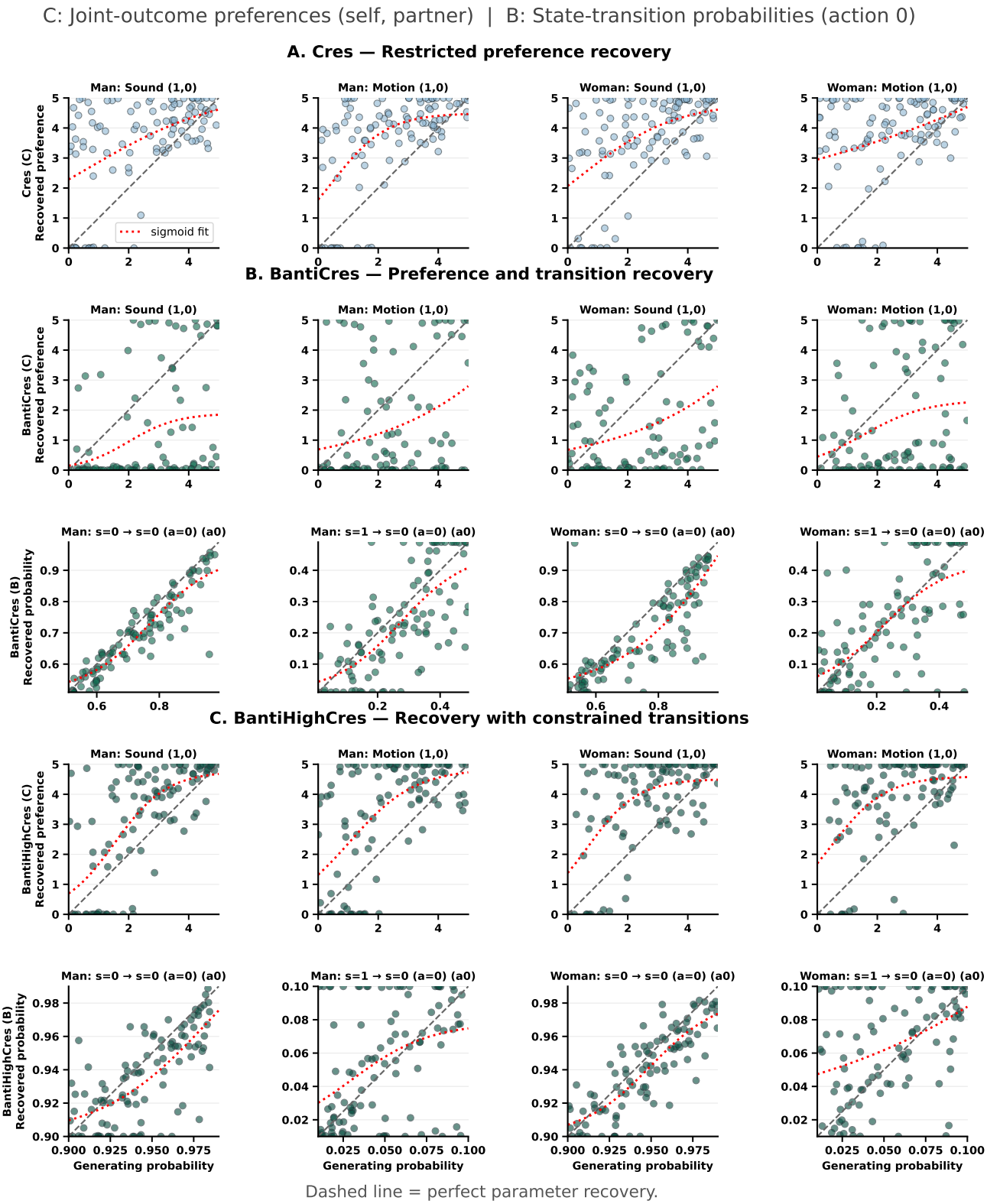


Figure S1: Generating-versus-recovered parameters across 100 simulation trials per model variant. A. Restricted preference recovery in Cres. B. Recovery of restricted preferences and antisymmetric transitions in BantiCres. C. Recovery under tighter transition constraints in BantiHighCres. Points show generating versus recovered parameters. Dashed lines indicate perfect recovery; red dotted curves (where shown) are descriptive sigmoid fits rather than recovery statistics. Corresponding Pearson correlations are shown in Figure 4 of the main manuscript.

Table S1: Target profiles and fitted sound-preference and action-0 inactive-state persistence parameters for the sixteen illustrated dyads. Each target pair is ordered man/woman. Low/high labels denote approximate selection targets, not observed activity or thresholded parameter categories.

Profile	Couple	Target C (M/W)	Target $B_{0,0}$ (M/W)	C_s^M	C_s^W	$B_{0,0}^M$	$B_{0,0}^W$
01	2	low/low	low/low	0.000	1.681	0.815	0.518
02	4	low/low	low/high	0.001	0.001	0.788	0.903
03	10	low/low	high/low	0.000	0.378	0.845	0.642
04	6	low/low	high/high	0.000	0.016	0.835	0.800
05	3	low/high	low/low	1.519	3.015	0.619	0.550
06	12	low/high	low/high	3.772	4.952	0.825	0.838
07	13	low/high	high/low	3.493	4.996	0.947	0.773
08	9	low/high	high/high	3.422	2.649	0.850	0.943
09	7	high/low	low/low	4.998	0.000	0.842	0.811
10	11	high/low	low/high	4.867	4.394	0.747	0.919
11	5	high/low	high/low	4.857	0.236	0.851	0.789
12	14	high/low	high/high	4.587	0.125	0.916	0.817
13	1	high/high	low/low	4.994	4.993	0.715	0.866
14	8	high/high	low/high	4.985	4.516	0.810	0.969
15	16	high/high	high/low	5.000	5.000	0.855	0.838
16	15	high/high	high/high	5.000	5.000	0.990	0.970

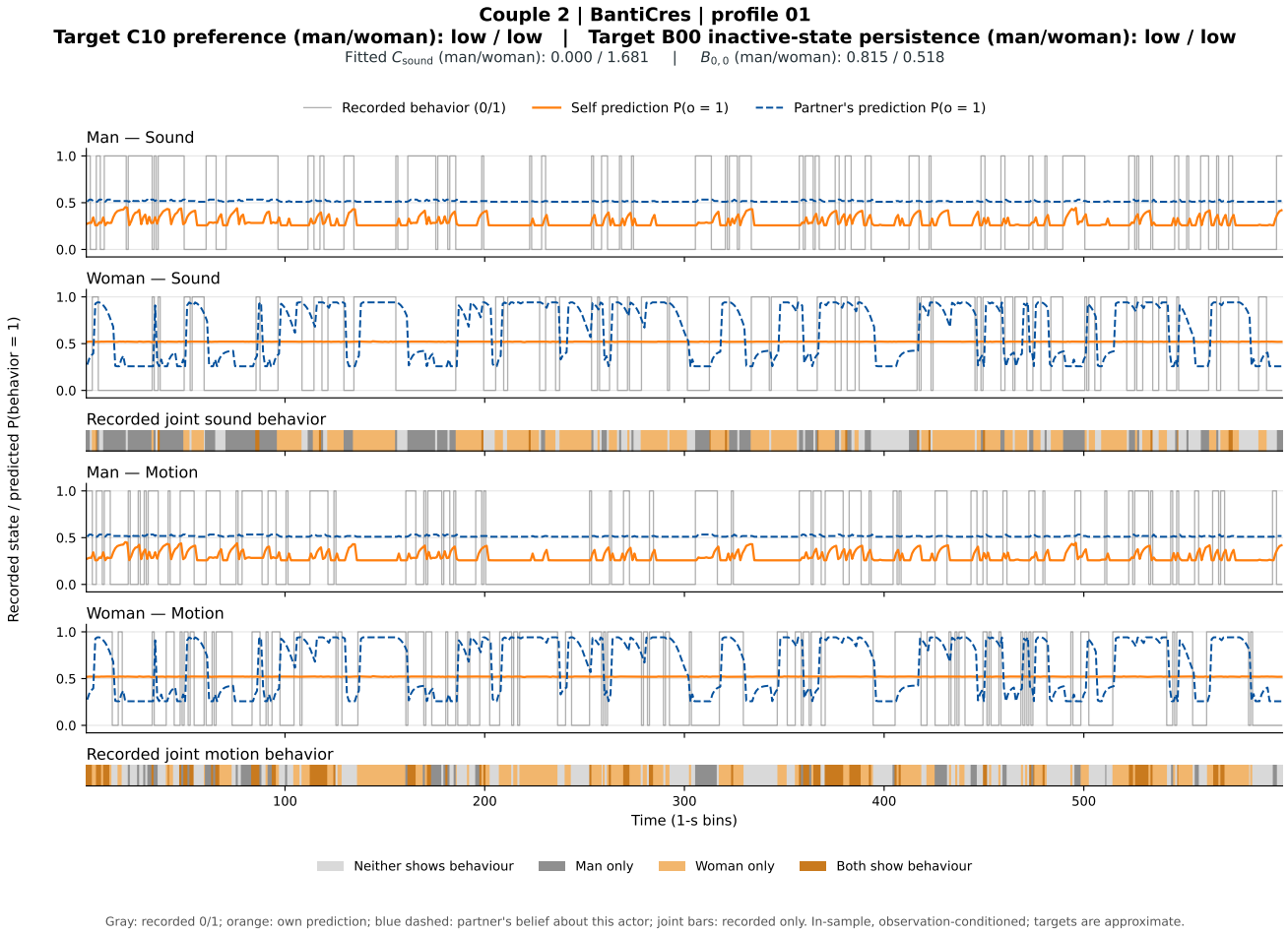


Figure S2: Recorded binary activity and fitted activity probabilities for Couple 2 (target profile 01). Approximate low/high parameter targets (man/woman): C_{sound} = low/low; $B_{0,0}$ = low/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

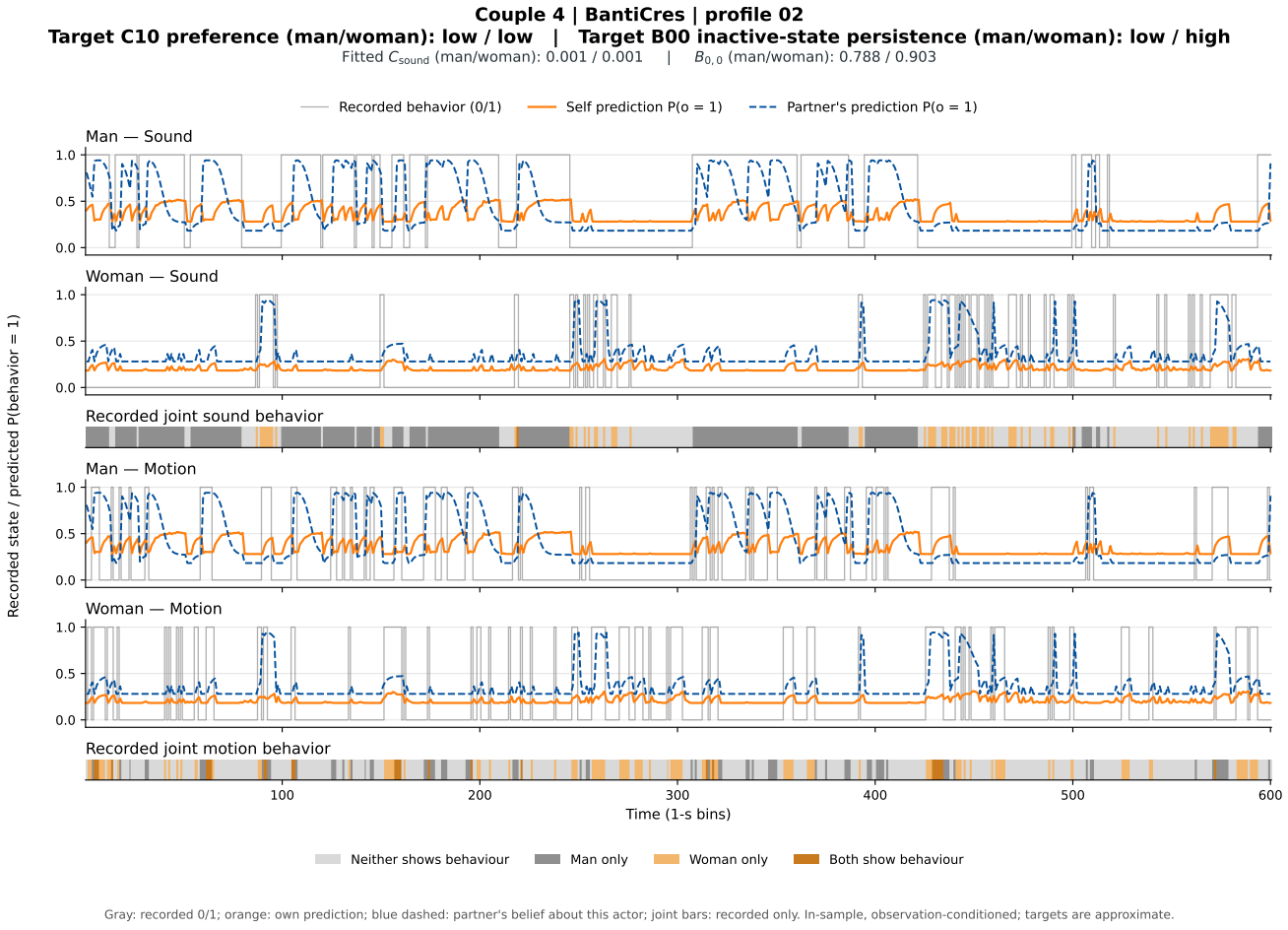


Figure S3: Recorded binary activity and fitted activity probabilities for Couple 4 (target profile 02). Approximate low/high parameter targets (man/woman): C_{sound} = low/low; $B_{0,0}$ = low/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

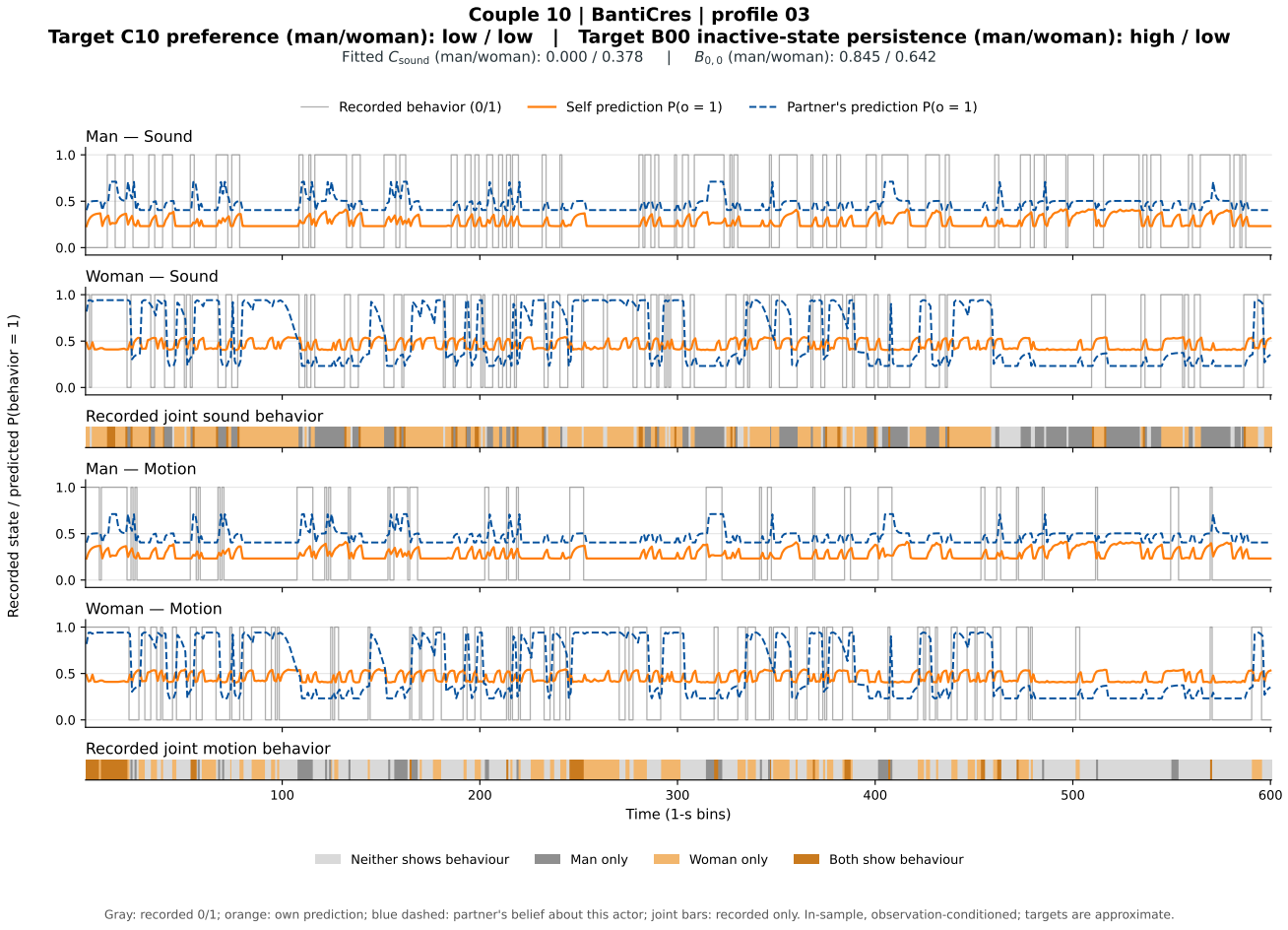


Figure S4: Recorded binary activity and fitted activity probabilities for Couple 10 (target profile 03). Approximate low/high parameter targets (man/woman): $C_{\text{sound}} = \text{low/low}$; $B_{0,0} = \text{high/low}$. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

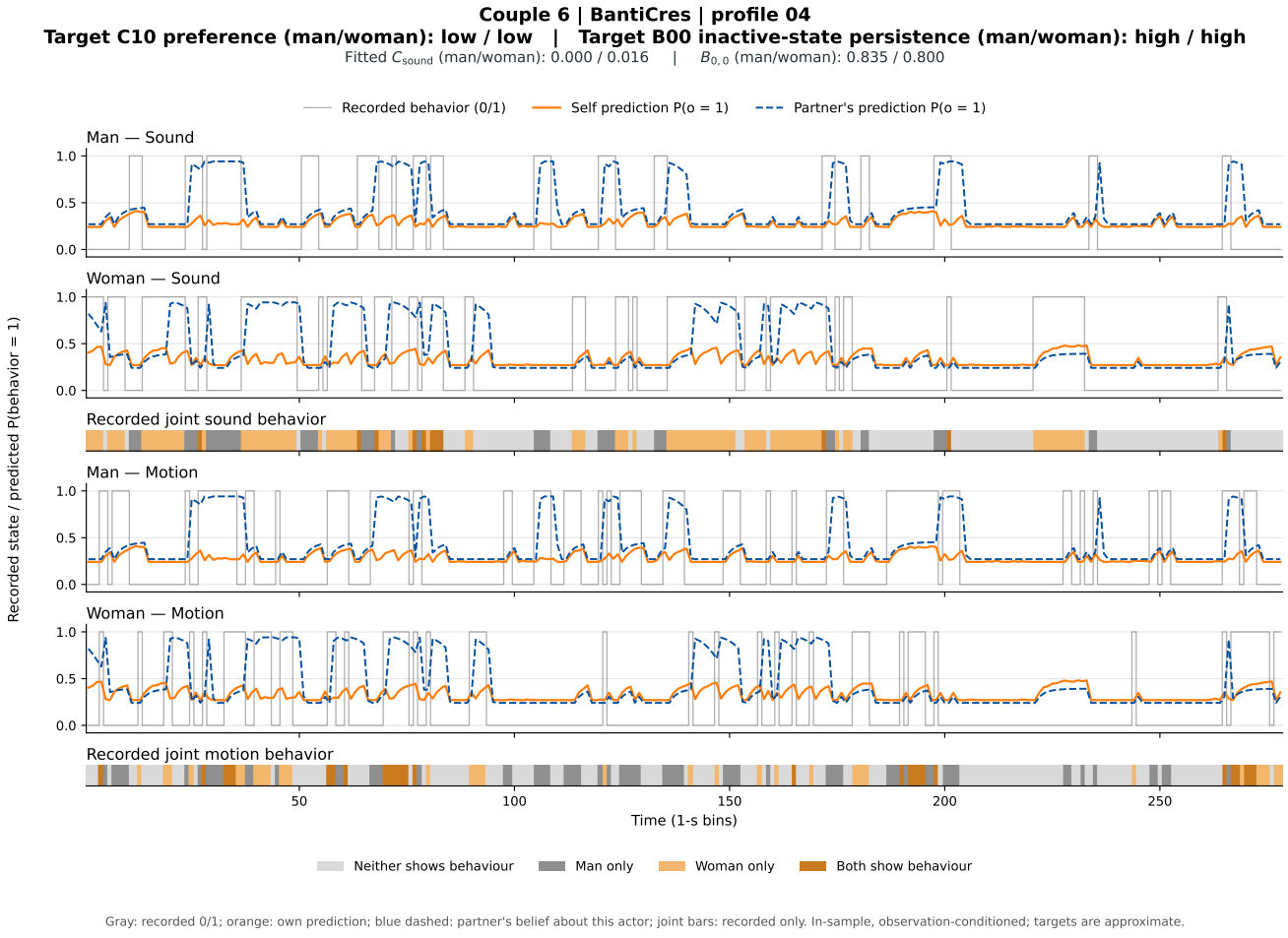
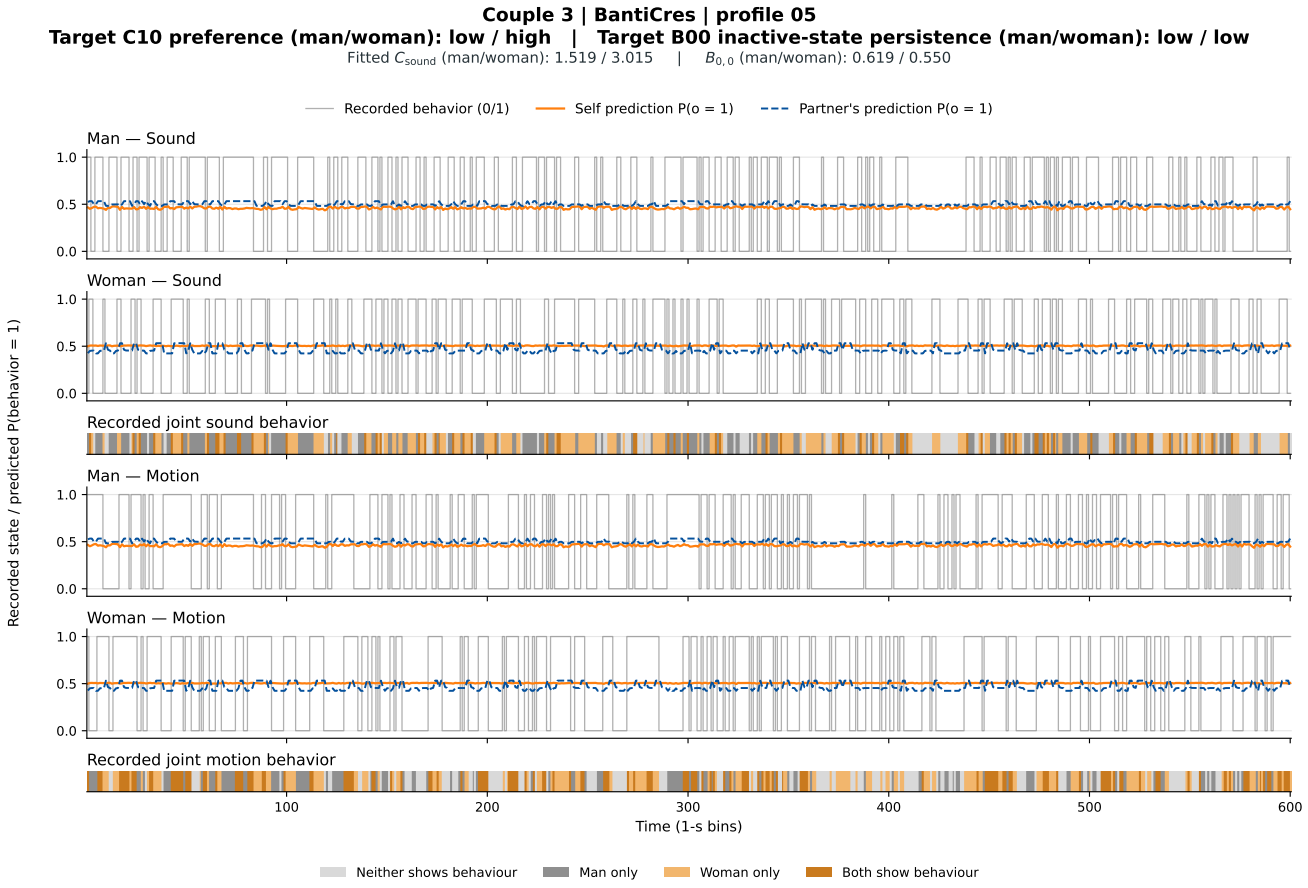


Figure S5: Recorded binary activity and fitted activity probabilities for Couple 6 (target profile 04). Approximate low/high parameter targets (man/woman): C_{sound} = low/low; $B_{0,0}$ = high/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.



Gray: recorded 0/1; orange: own prediction; blue dashed: partner's belief about this actor; joint bars: recorded only. In-sample, observation-conditioned; targets are approximate.

Figure S6: Recorded binary activity and fitted activity probabilities for Couple 3 (target profile 05). Approximate low/high parameter targets (man/woman): C_{sound} = low/high; $B_{0,0}$ = low/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

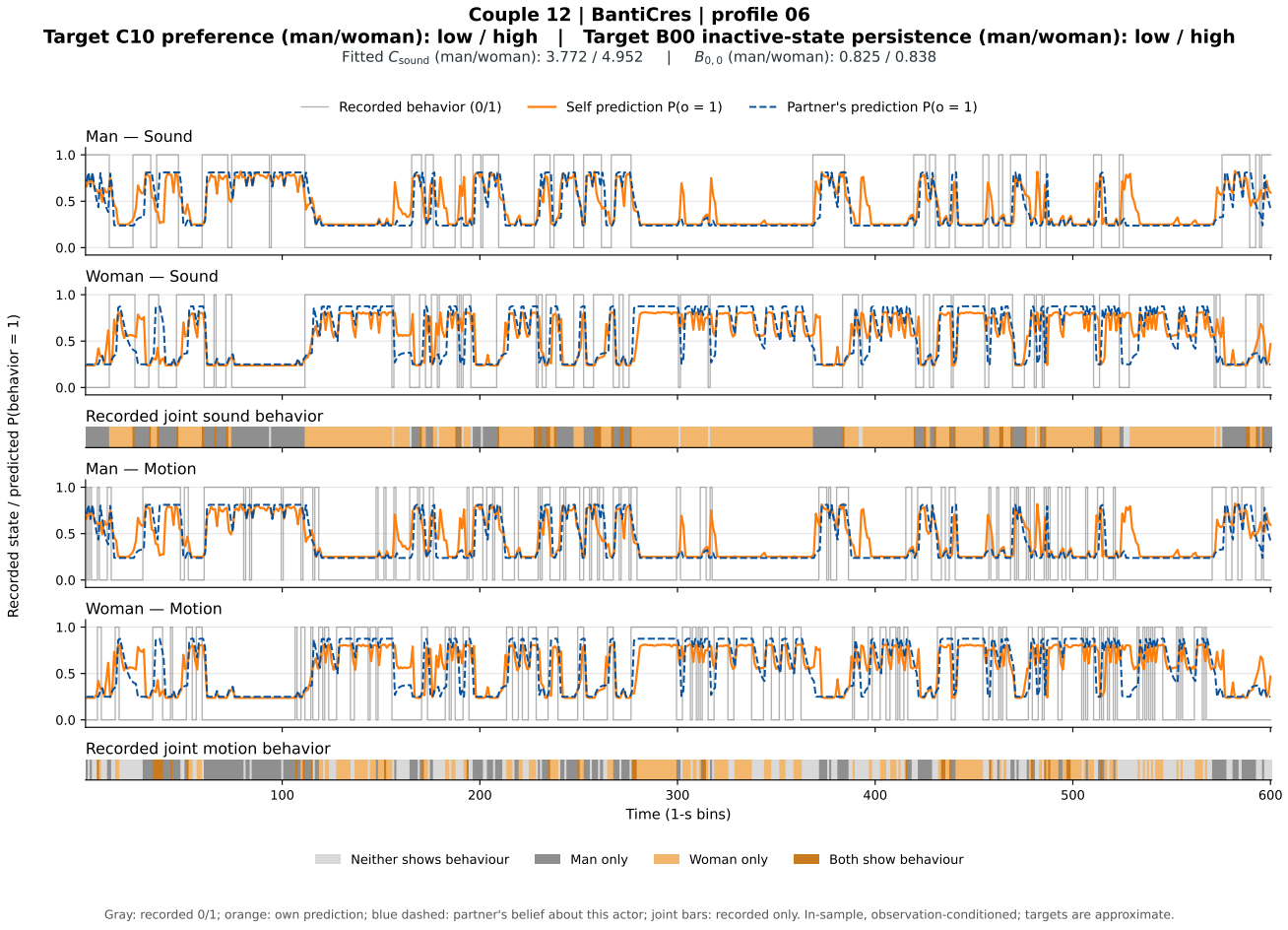


Figure S7: Recorded binary activity and fitted activity probabilities for Couple 12 (target profile 06). Approximate low/high parameter targets (man/woman): C_{sound} = low/high; $B_{0,0}$ = low/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

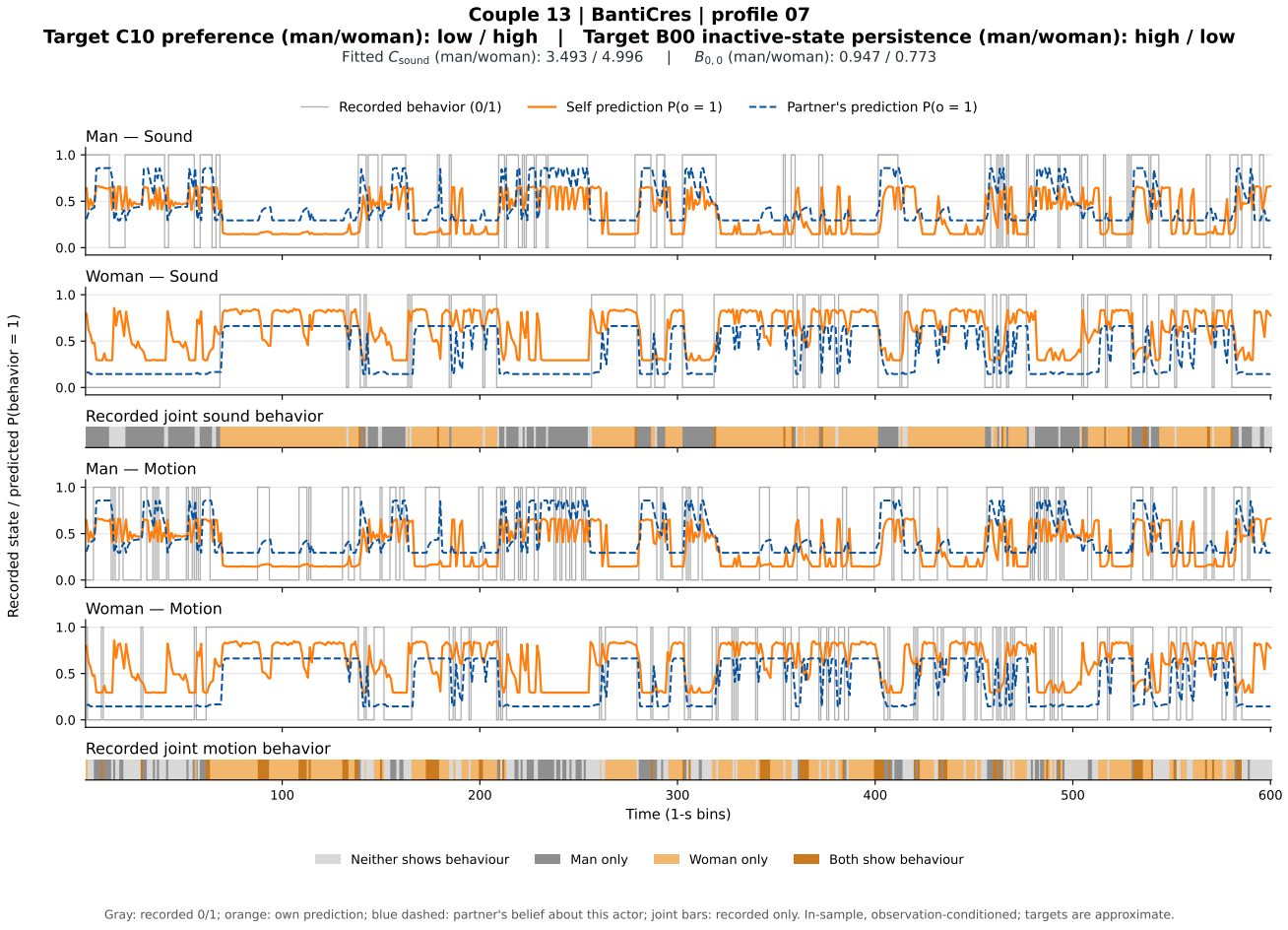


Figure S8: Recorded binary activity and fitted activity probabilities for Couple 13 (target profile 07). Approximate low/high parameter targets (man/woman): C_{sound} = low/high; $B_{0,0}$ = high/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

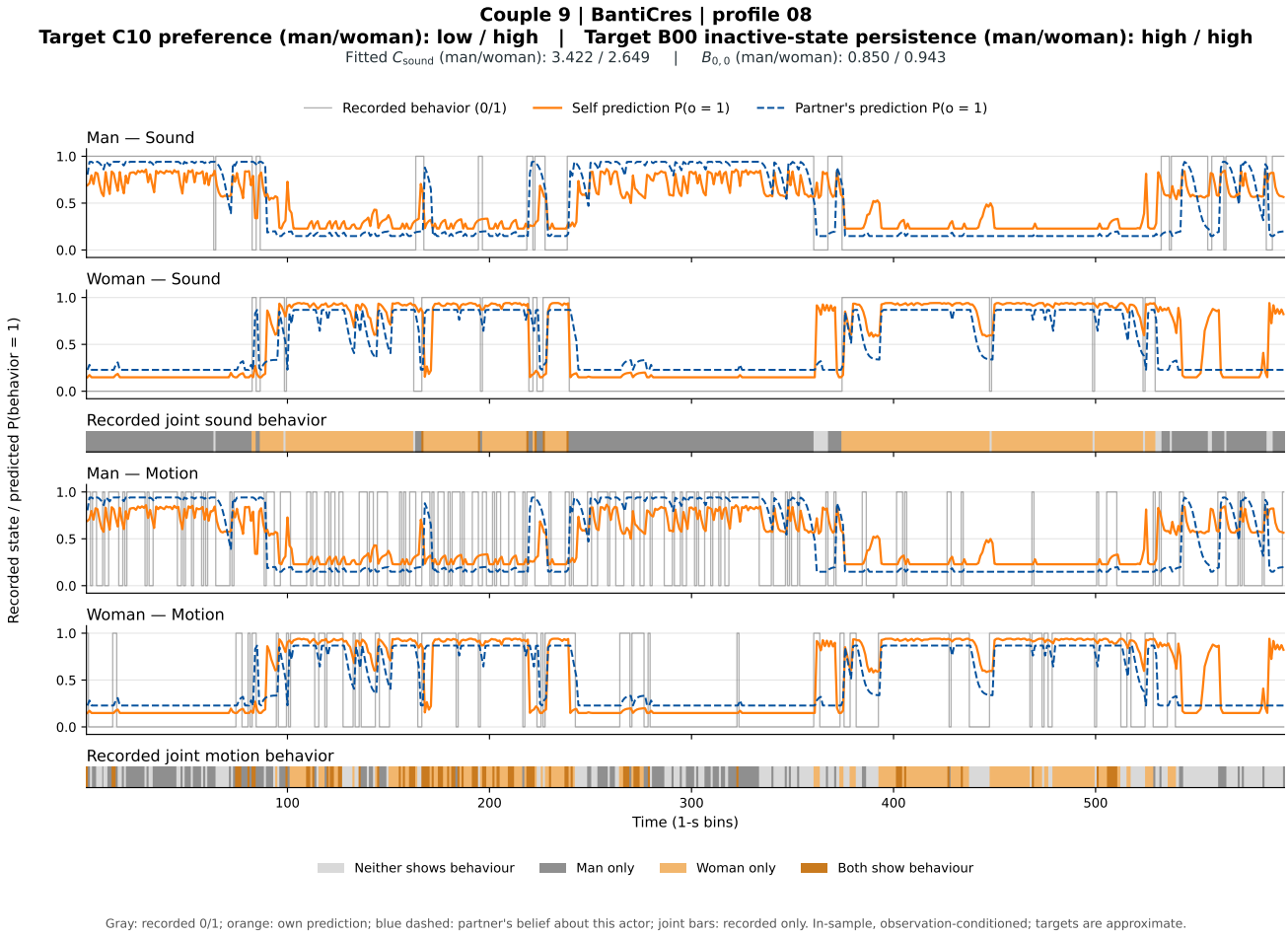
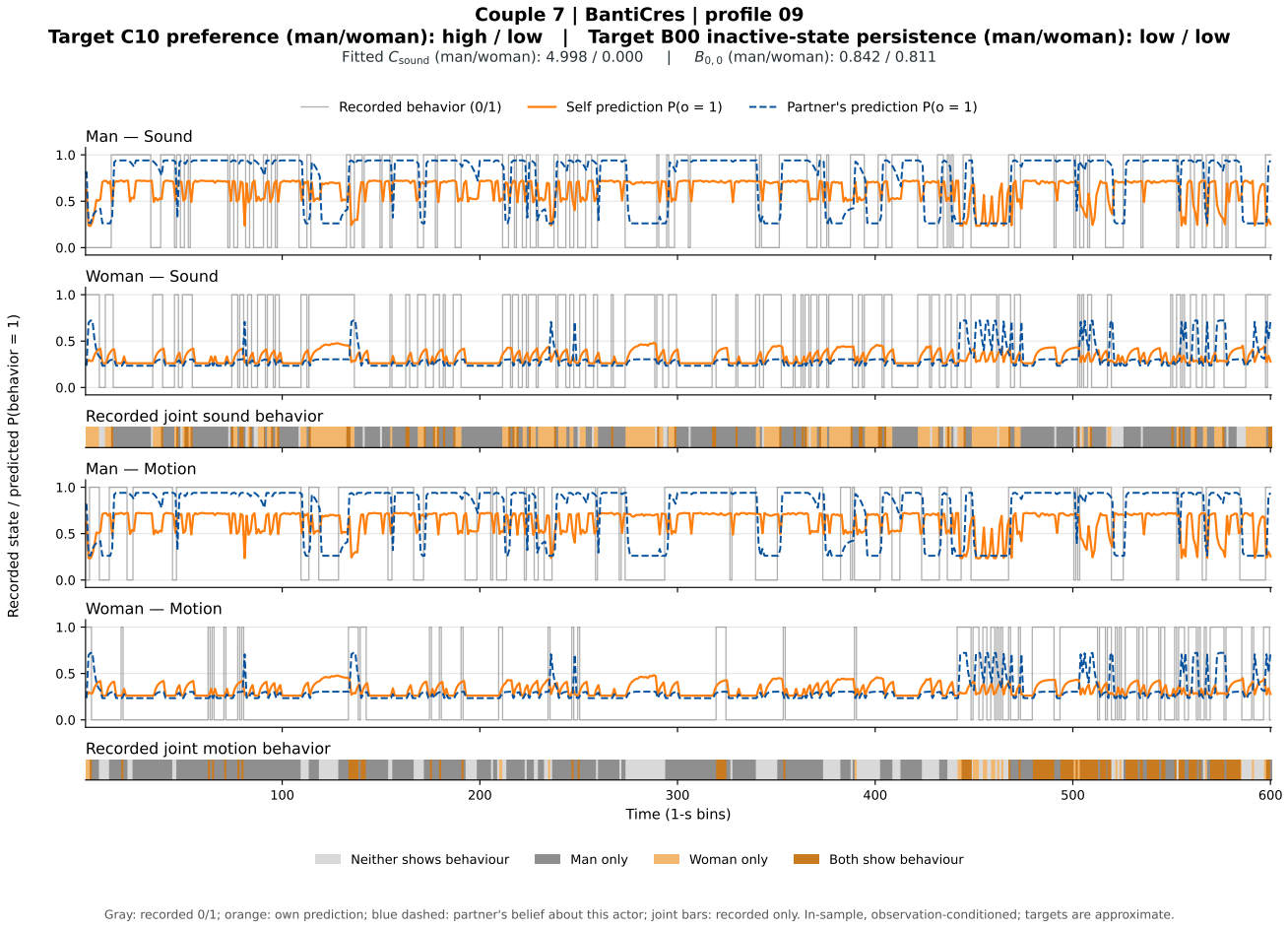


Figure S9: Recorded binary activity and fitted activity probabilities for Couple 9 (target profile 08). Approximate low/high parameter targets (man/woman): C_{sound} = low/high; $B_{0,0}$ = high/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.



Gray: recorded 0/1; orange: own prediction; blue dashed: partner's belief about this actor; joint bars: recorded only. In-sample, observation-conditioned; targets are approximate.

Figure S10: Recorded binary activity and fitted activity probabilities for Couple 7 (target profile 09). Approximate low/high parameter targets (man/woman): $C_{\text{sound}} = \text{high/low}$; $B_{0,0} = \text{low/low}$. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

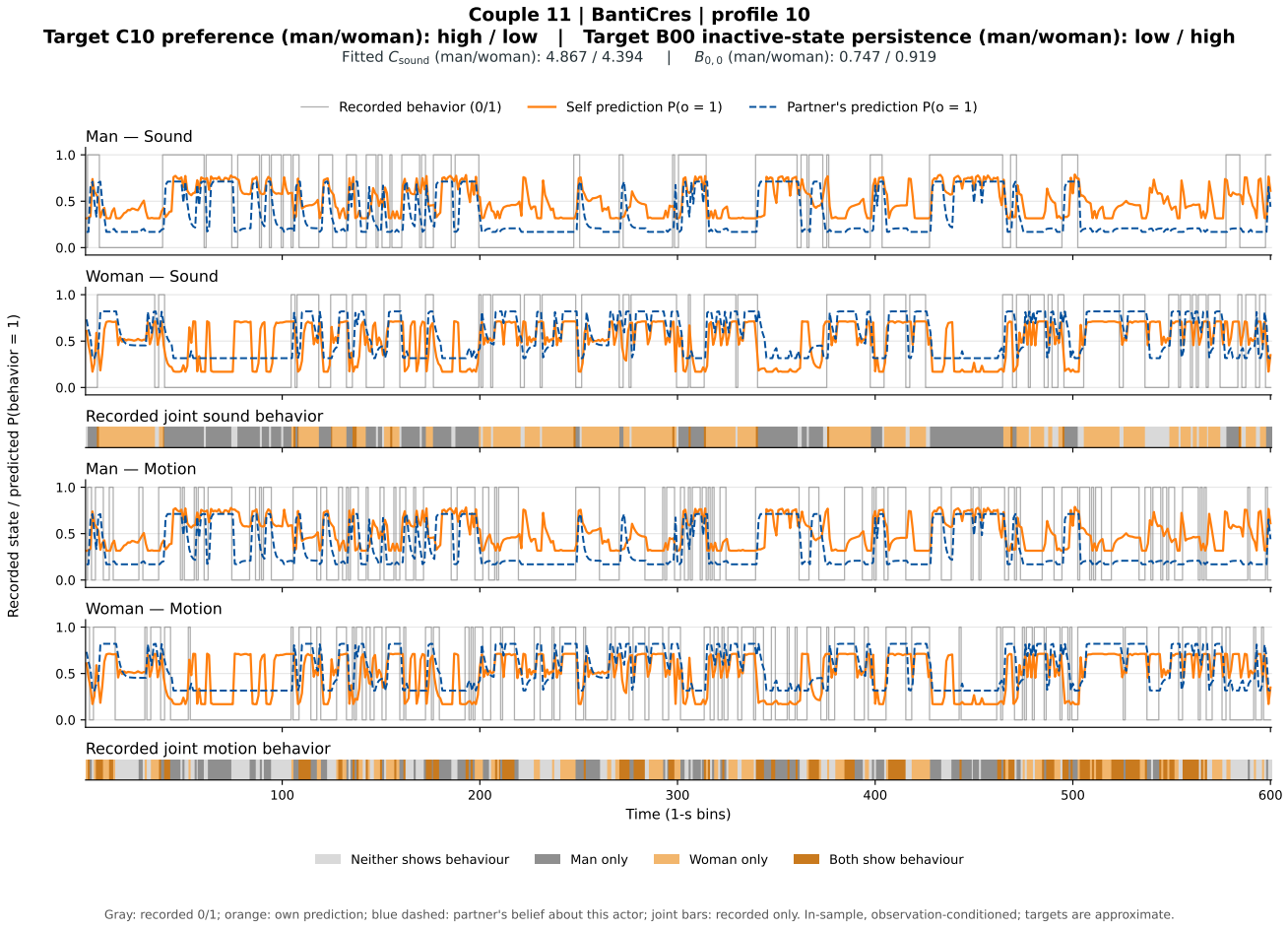


Figure S11: Recorded binary activity and fitted activity probabilities for Couple 11 (target profile 10). Approximate low/high parameter targets (man/woman): C_{sound} = high/low; $B_{0,0}$ = low/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

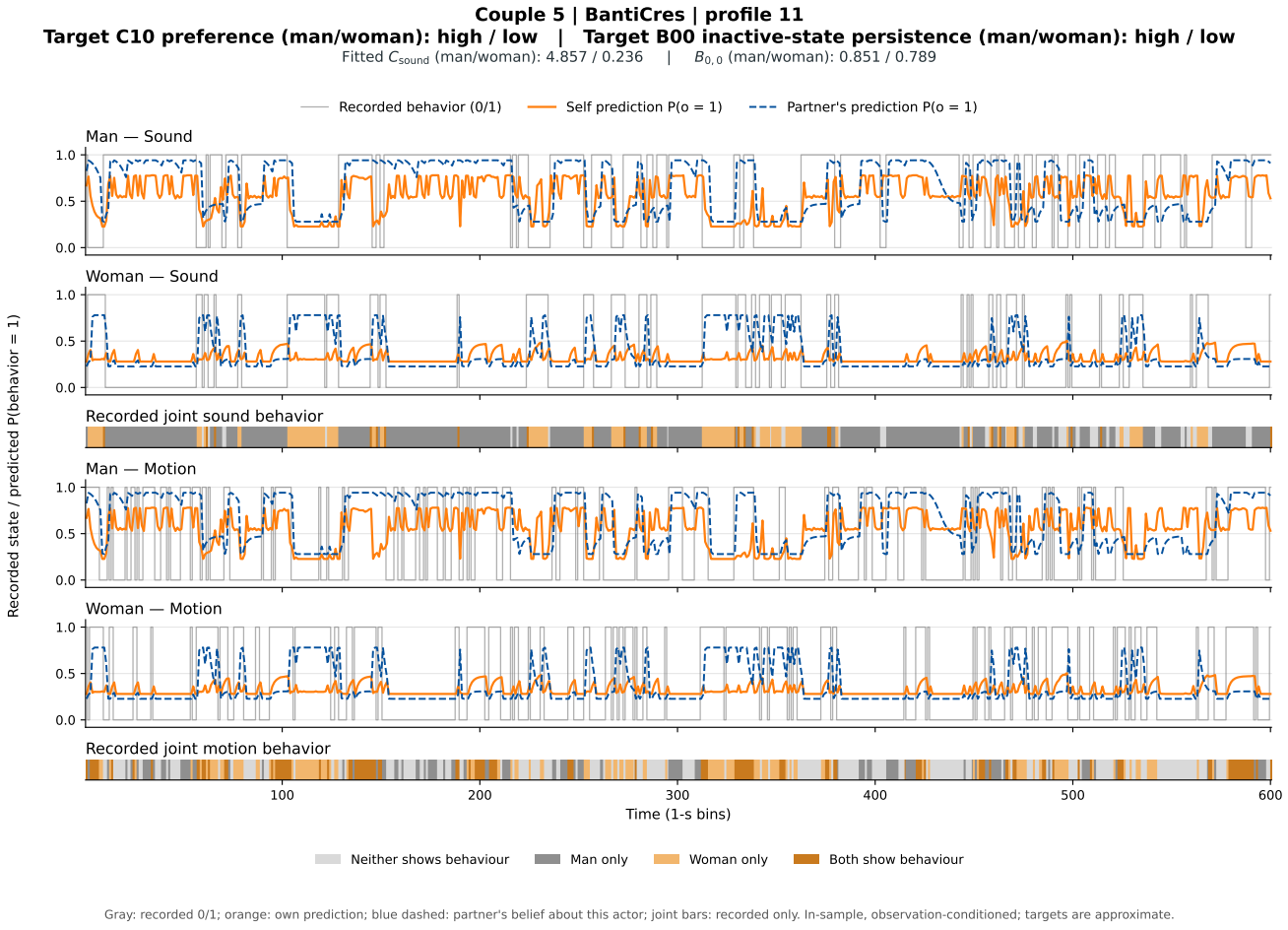


Figure S12: Recorded binary activity and fitted activity probabilities for Couple 5 (target profile 11). Approximate low/high parameter targets (man/woman): C_{sound} = high/low; $B_{0,0}$ = high/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

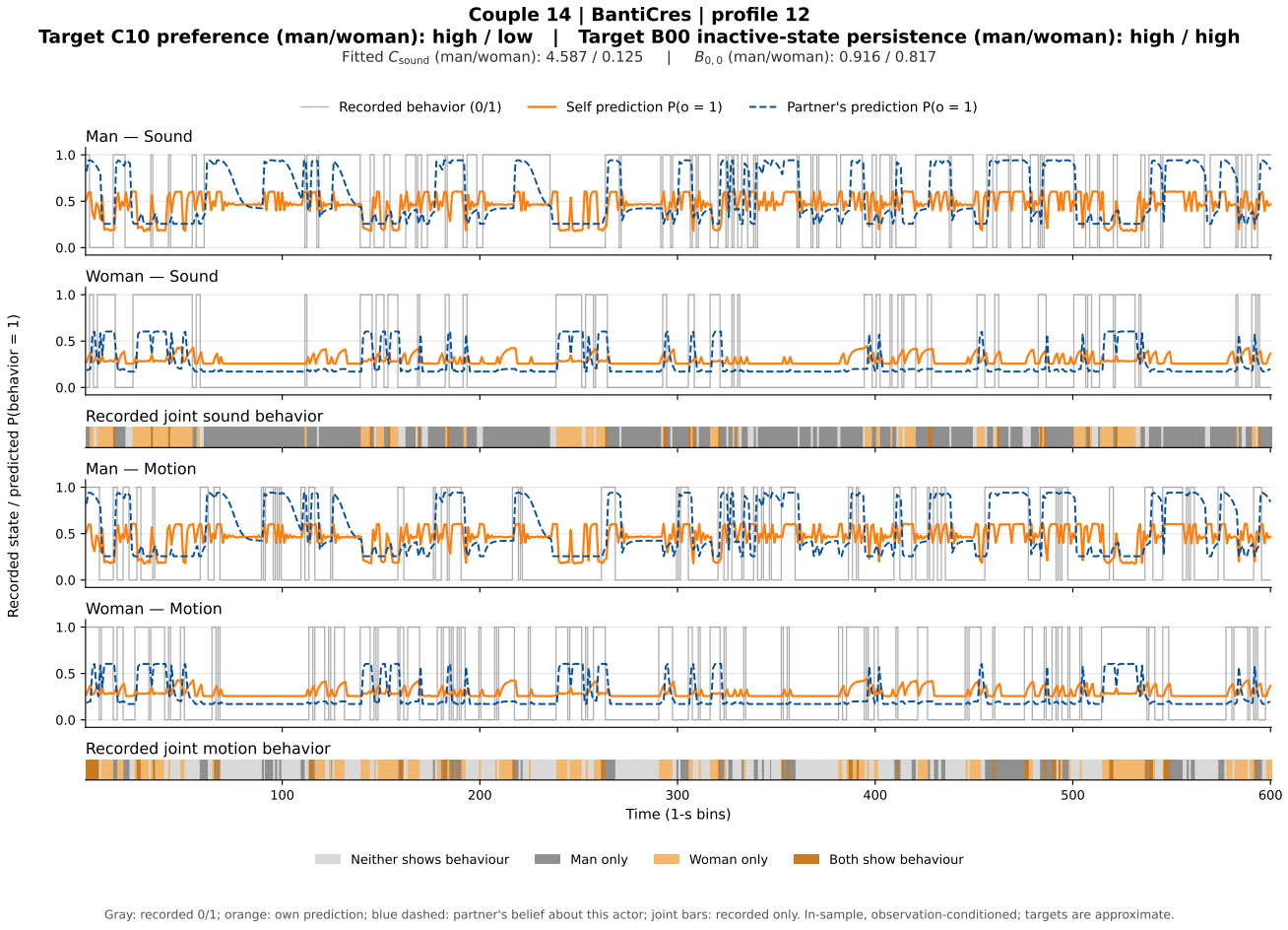


Figure S13: Recorded binary activity and fitted activity probabilities for Couple 14 (target profile 12). Approximate low/high parameter targets (man/woman): C_{sound} = high/low; $B_{0,0}$ = high/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

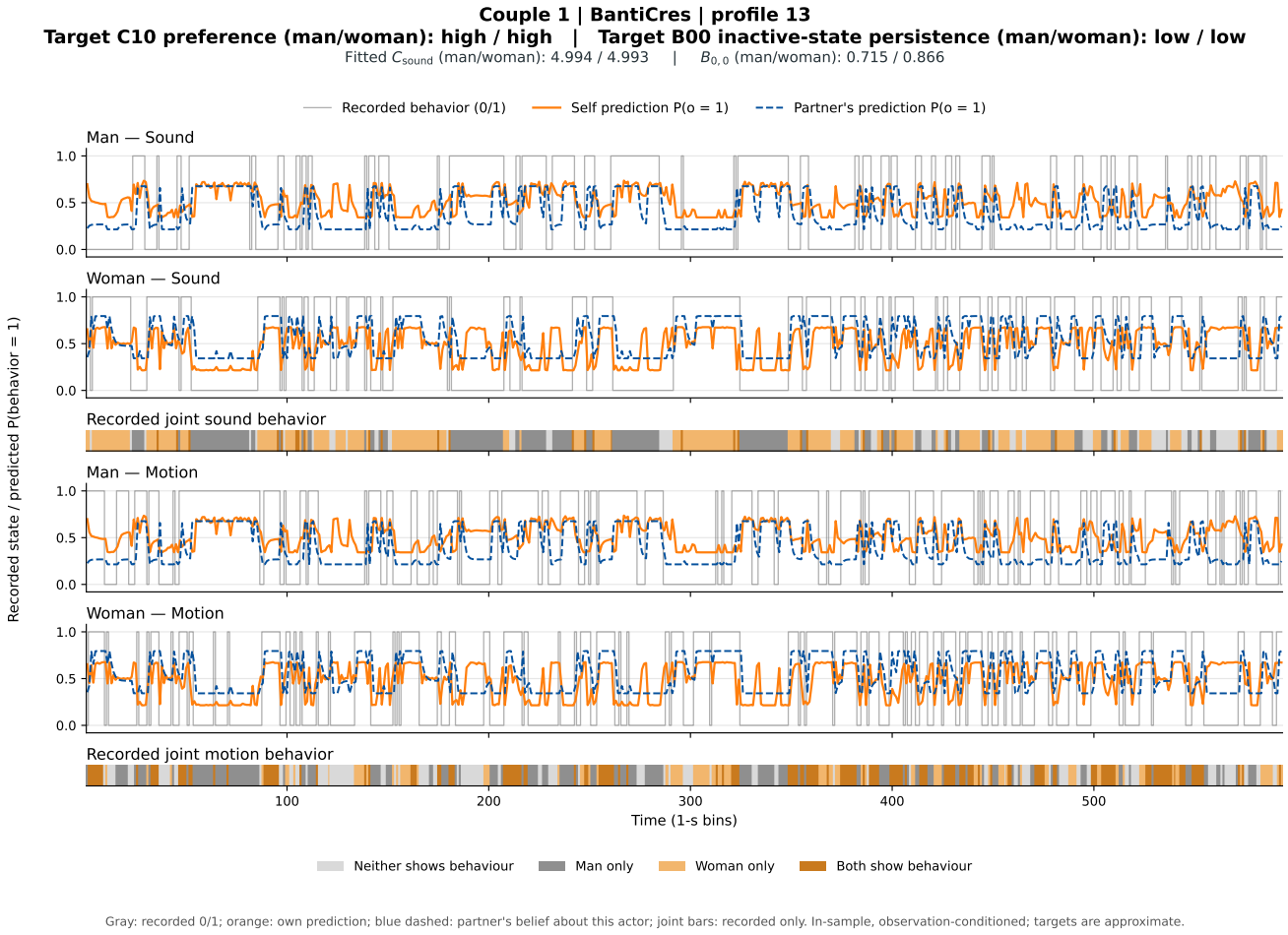


Figure S14: Recorded binary activity and fitted activity probabilities for Couple 1 (target profile 13). Approximate low/high parameter targets (man/woman): C_{sound} = high/high; $B_{0,0}$ = low/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

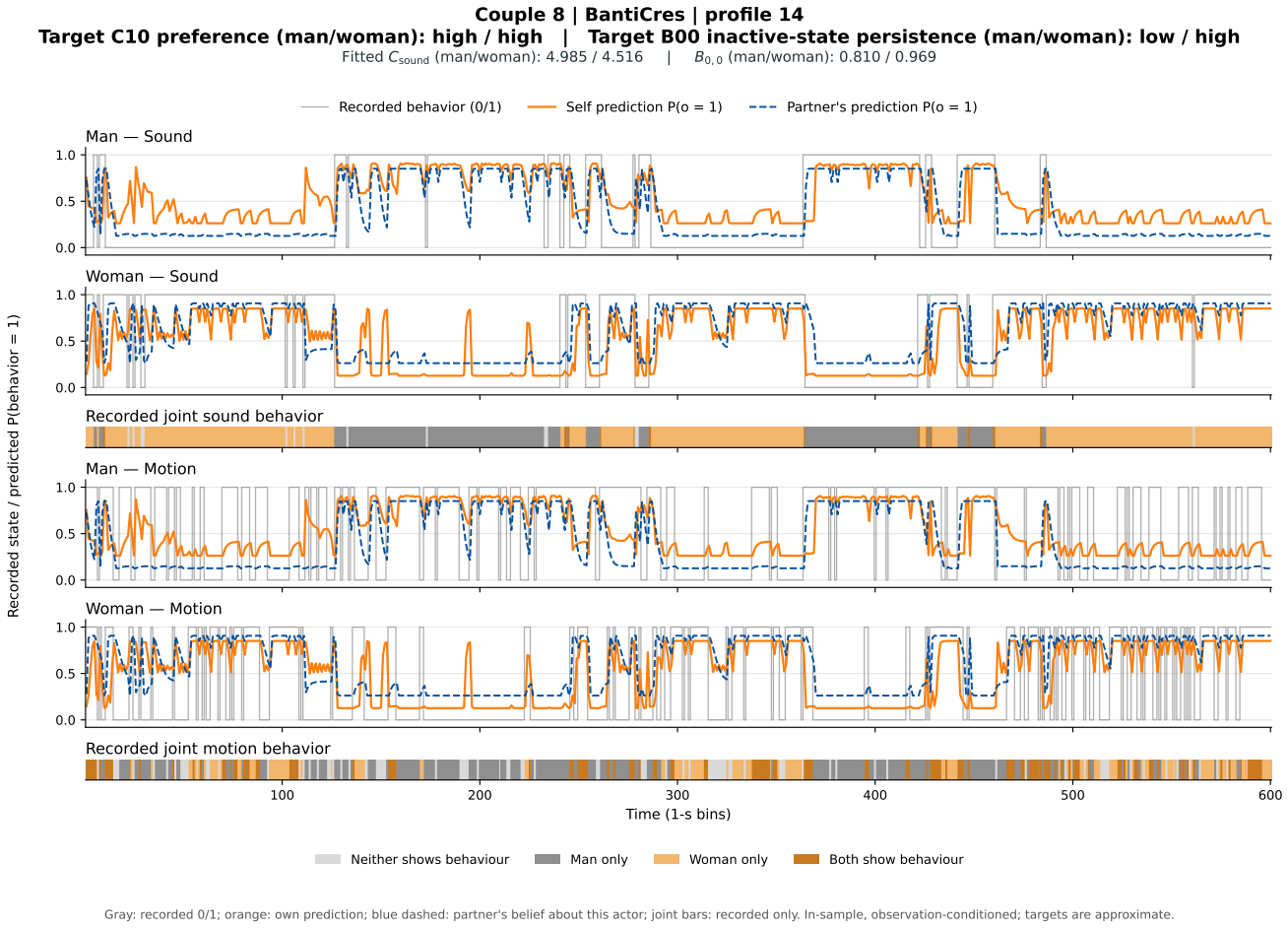


Figure S15: Recorded binary activity and fitted activity probabilities for Couple 8 (target profile 14). Approximate low/high parameter targets (man/woman): C_{sound} = high/high; $B_{0,0}$ = low/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

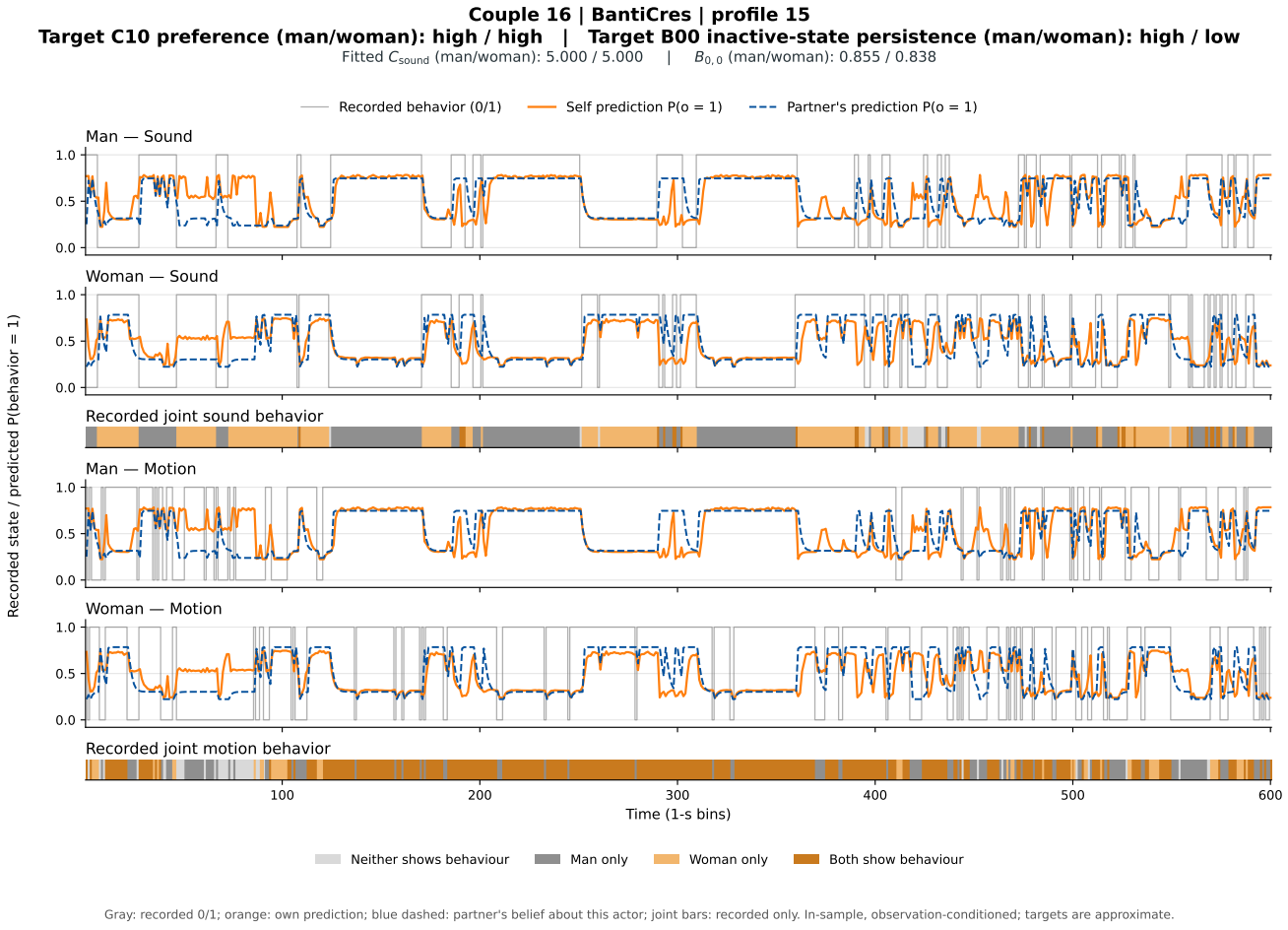
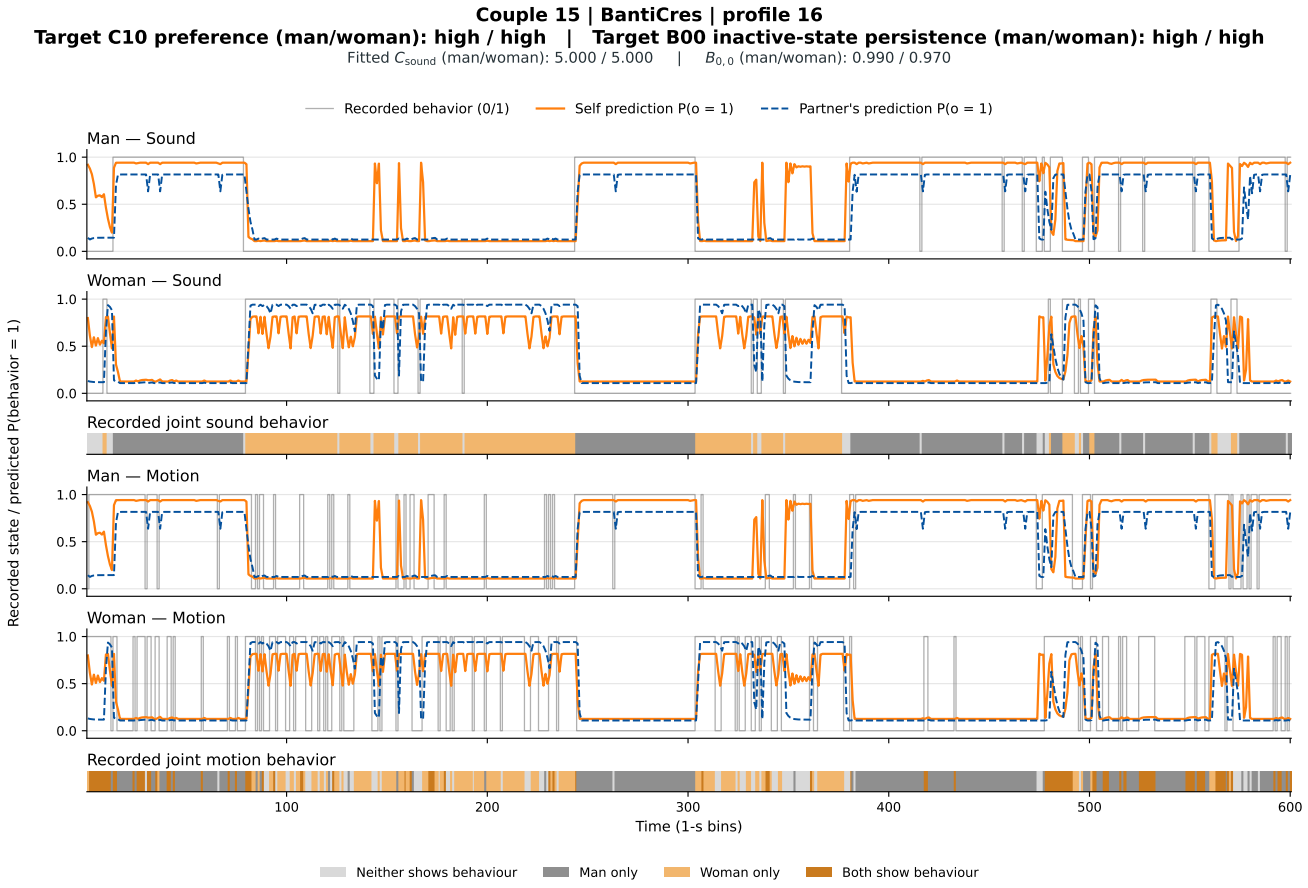


Figure S16: Recorded binary activity and fitted activity probabilities for Couple 16 (target profile 15). Approximate low/high parameter targets (man/woman): C_{sound} = high/high; $B_{0,0}$ = high/low. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.



Gray: recorded 0/1; orange: own prediction; blue dashed: partner's belief about this actor; joint bars: recorded only. In-sample, observation-conditioned; targets are approximate.

Figure S17: Recorded binary activity and fitted activity probabilities for Couple 15 (target profile 16). Approximate low/high parameter targets (man/woman): C_{sound} = high/high; $B_{0,0}$ = high/high. Gray traces show recorded binary sound and motion; orange curves show the agent's and blue dashed curves the partner's observation-conditioned in-sample predictions. Joint strips show recorded dyadic states only.

Fitted Parameters of Cluster Representatives

Supplementary Table S2 reports the fitted parameters for the four couples illustrated in Section 3.5 (Conversation Trajectories) of the main manuscript.

Table S2: Fitted `BantiCres` parameters of representative couples from couple-level GMM clusters.

Cluster	Couple	Partner	C_{sound}	C_{motion}	$B_{0,0}$	$B_{0,1}$
1	10	Man	0.000	0.000	0.845	0.010
1	10	Woman	0.378	0.000	0.642	0.280
2	3	Man	1.519	0.905	0.619	0.490
2	3	Woman	3.015	3.039	0.550	0.490
3	7	Man	4.998	4.999	0.842	0.266
3	7	Woman	0.000	0.025	0.811	0.012
4	12	Man	3.772	3.164	0.825	0.088
4	12	Woman	4.952	4.412	0.838	0.162

Each representative is the closest hard-assigned couple to the corresponding GMM center in standardized eight-parameter space. $B_{0,0}$ is the inactive-to-inactive transition probability under action 0; $B_{0,1}$ is the active-to-inactive probability under action 0.