Memo: Pivot from Cross-Domain Mapping to Behavioral Alignment Framework

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To: Synchrony Advisory Committee

From: Will Flower

# Purpose

This memo summarizes why the original T0.4 cross-domain mapping approach did not pass review, and why the new Behavioral Alignment Framework provides a stronger, more defensible path forward.

# Original Approach: Cross-Domain Kinematic Mapping

- Attempted to map human joint/stride dynamics directly to quadruped limb dynamics.  
- Relied on biomechanical correspondence that could not be rigorously validated.  
- Failed review due to unprovable invariants and risk of invalid mappings.

# New Approach: Behavioral Alignment Framework

- Shifts focus from kinematic similarity to semantic intent alignment.  
- Maps human behavioral intents (rest, steady, rapid, transition) into species-native quadruped behaviors (walk, trot, canter, gallop).  
- Leverages curated behavior library with duty, phase, and spectral priors.  
- Explicitly models and reports uncertainty, ensuring clinical and research interpretability.

# Why This Pivot is Better

1. \*\*Valid Invariants\*\*: Works in task/intent space rather than joint space, where invariants are provable.  
2. \*\*Species-Native\*\*: Outputs quadruped behaviors directly interpretable by trainers and clinicians.  
3. \*\*Uncertainty-Aware\*\*: Provides calibrated uncertainty and flags ambiguous cases.  
4. \*\*Testable\*\*: Tiered validation metrics (accuracy, plausibility, distributional match) are objective and preregisterable.  
5. \*\*Practical\*\*: Requires smaller curated libraries instead of impossible biomechanical mappings.

# Recommendation

Proceed with the Behavioral Alignment Framework for D1 review. Retire the original cross-domain mapping path. Emphasize uncertainty, plausibility, and alignment with species-native behavior to reviewers.