



Does Smile Synchrony Predict Working Alliance Quality in Psychotherapy?

Dasha A. Yermol and Jeffrey M. Girard, *University of Kansas*



Introduction

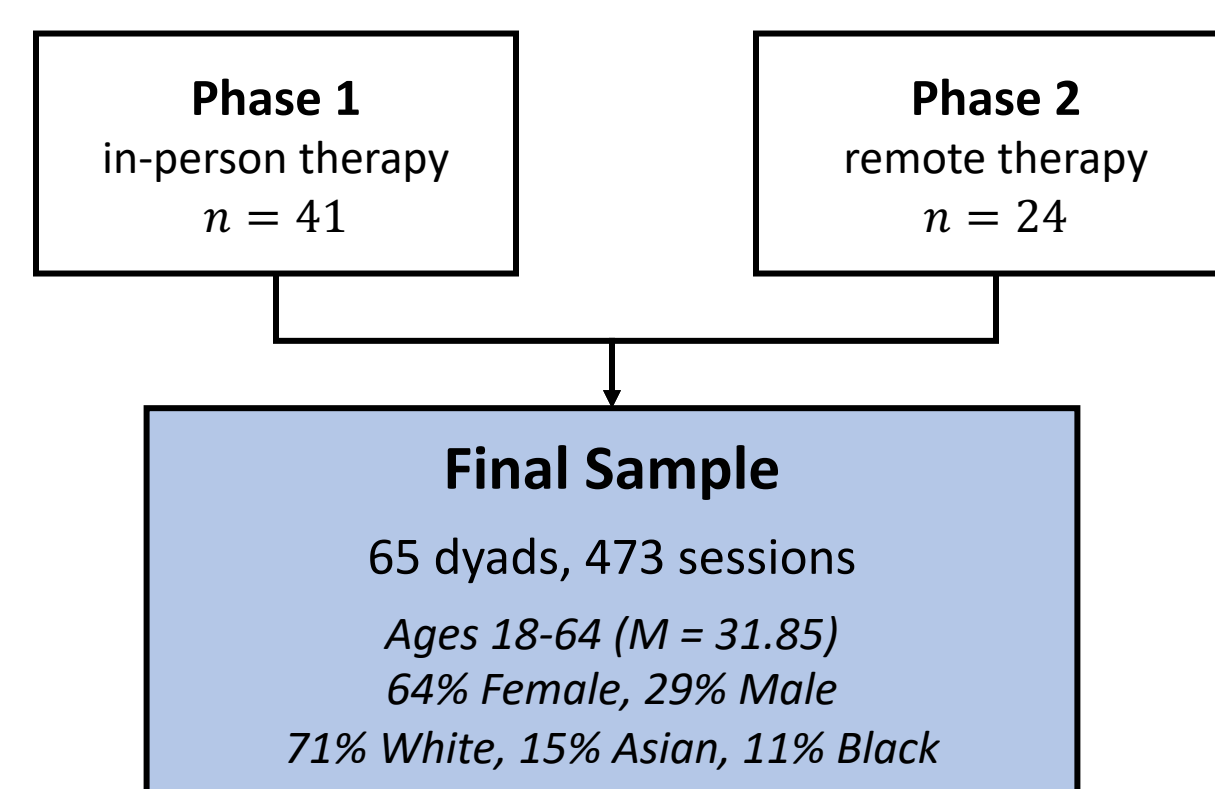
- The **working alliance** is the collaborative and affective bond between patient and therapist^{1, 2} and an important predictor of treatment success³
- Little is known about the mechanisms underlying working alliance formation and maintenance
- Nonverbal synchrony** (i.e., coordinated movements) may play an important role in working alliance^{4, 5}
- Smiles are highly visible nonverbal behaviors that convey important affective and social information⁶

Research Question

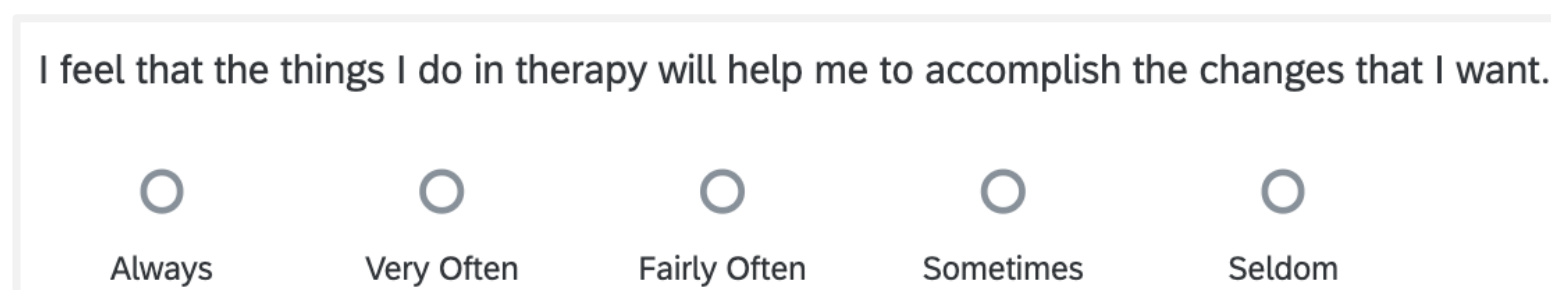
Is smile synchrony associated with working alliance quality throughout psychotherapy?

Data Collection

- Adult outpatients with DSM-5 depressive disorders
- Patients were randomly assigned to receive 8 sessions of either brief cognitive-behavioral therapy (CBT) or brief interpersonal psychotherapy (IPT)



- Patients rated the working alliance after each session using the 12-item Working Alliance Inventory⁷

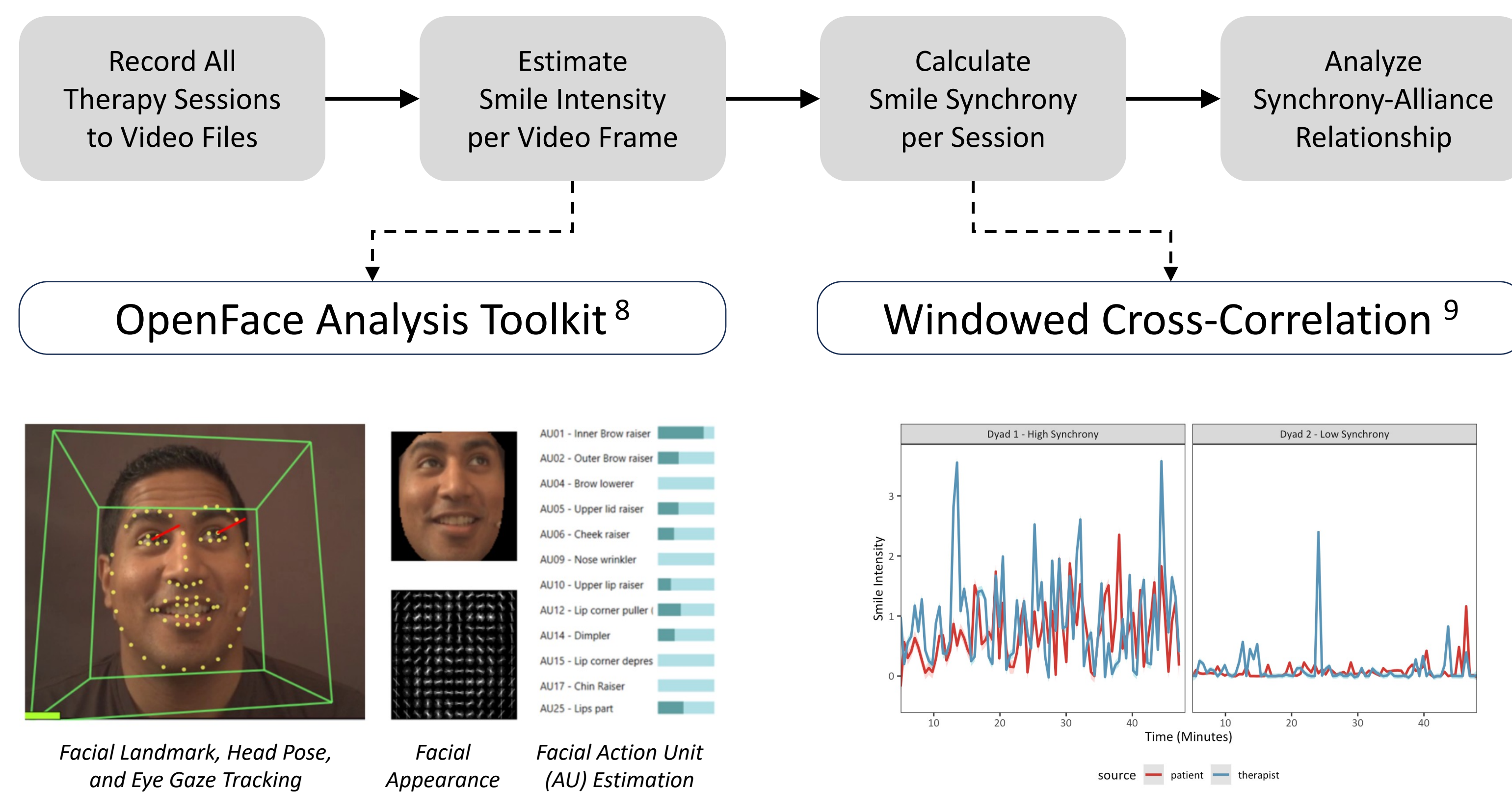


Hypotheses

Hypothesis 1: Dyads with higher average smile synchrony (across all 8 sessions) will also tend to have higher average working alliance quality

Hypothesis 2: Sessions with higher-than-average smile synchrony (for a specific dyad) will also tend to have higher-than-average working alliance quality

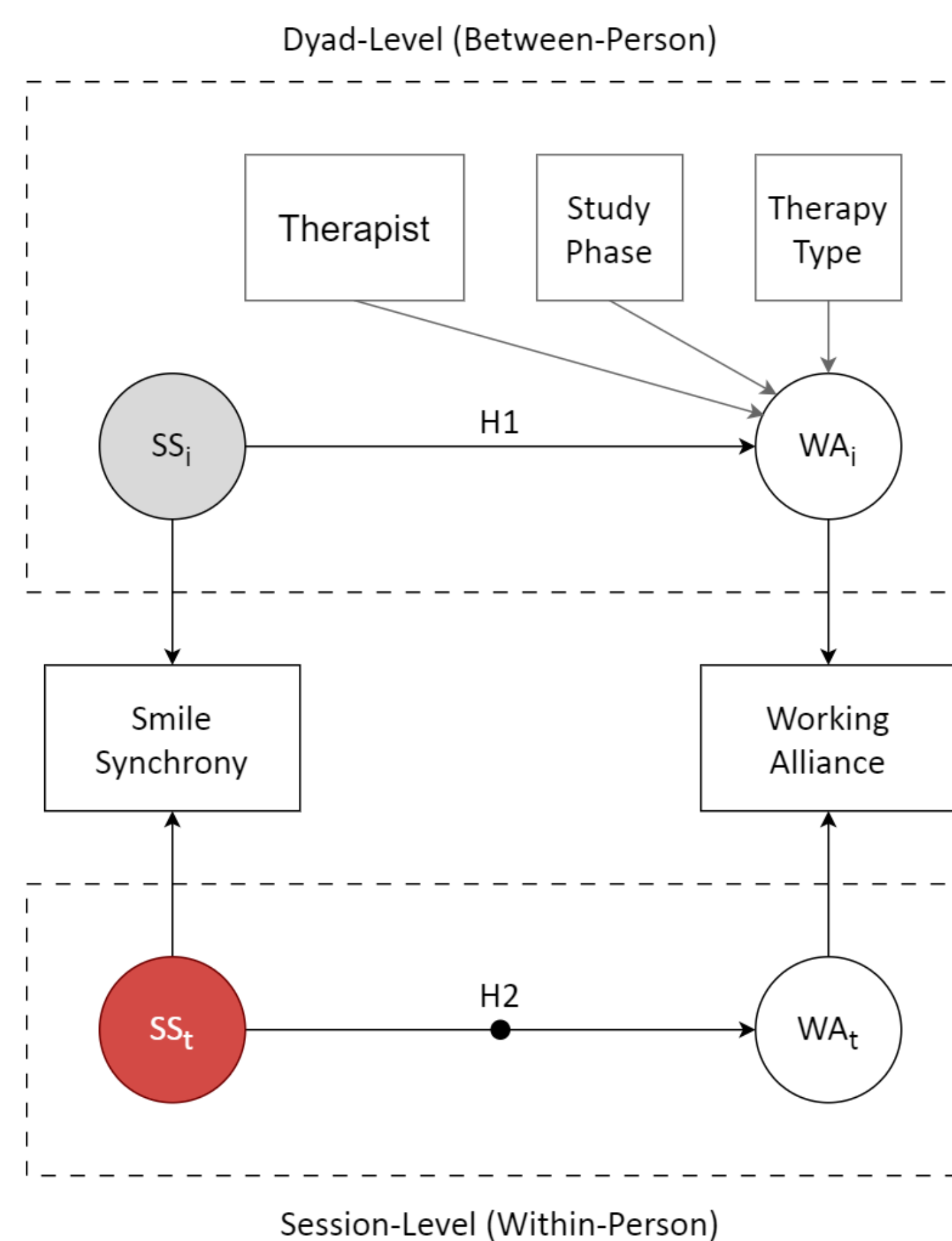
Data Processing



- We used computer vision and machine learning tools to estimate patients' and therapists' smile intensities
- We operationalized smiling as contraction of AU12 (the lip corner puller) from the Facial Action Coding System
- We omitted frames that had low tracking confidence
- We quantified the extent to which patients and therapists are coordinated in their smiling
- We specified a windowed cross correlation procedure with 3 sec time windows and 6 sec allowed lag time
- We captured a global synchrony score for each session

Model and Results

Hierarchical Bayesian Model¹⁰



- Decompose SS and WA into dyad- and session-components
- Predict WA components from corresponding SS components
- Control for therapist, study phase, and therapy type

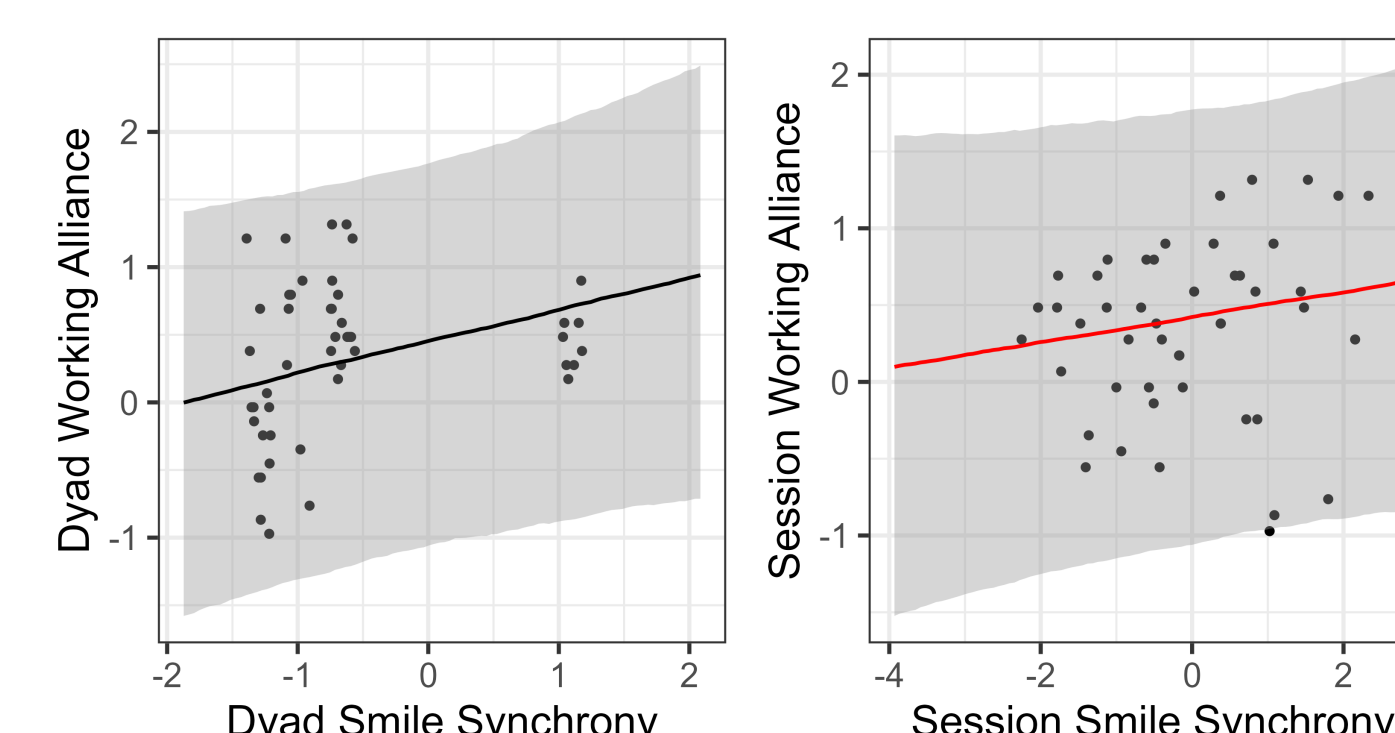
Parameter Estimate Tables

Parameter	Estimate	95% CI	p-value
Intercept	0.43	[-0.08, 0.95]	.051 †
H1: Dyad-level Synchrony	0.24	[-0.09, 0.54]	.071 †
H2: Session-level Synchrony	0.08	[0.02, 0.15]	.007 **
Phase (remote vs. in-person)	-0.19	[-1.31, 0.90]	.369
Therapy Type (IPT vs. CBT)	-0.11	[-1.15, 0.92]	.420
Phase × Therapy Type	-0.55	[-1.71, 0.62]	.183
Therapist Dummy Codes
Sigma	0.50	[0.46, 0.55]	<.001 ***
SD Random Intercepts	0.68	[0.51, 0.94]	<.001 ***
SD Random Slopes	0.05	[0.00, 0.16]	<.001 ***
Random Effect Correlation	-0.09	[-0.92, 0.89]	.473

Note. Conditional $R^2 = 0.67$, Marginal $R^2 = 0.29$

- H1 Results:** Dyads with more average smile synchrony (across sessions) had *marginally* higher average working alliance
- H2 Results:** Sessions with more-than-average smile synchrony (for a given dyad) had *significantly* higher-than-average working alliance (for a given dyad)

Conditional Effects Plots



Discussion

Key Takeaways

- Session-level smile synchrony is a significant predictor of perceived working alliance quality
- Between-dyad variability in working alliance quality is likely influenced by other factors than study phase and therapy type (e.g., personality or demographics)
- Nonverbal synchrony measures can potentially explain the dynamic nature of the working alliance

Future Directions

- Investigate other nonverbal synchrony measures (e.g., body movement) and facial expressions
- Explore nonverbal synchrony in other dyad types (e.g., friends or strangers) and social settings with higher smile variability (e.g., collaborative tasks)
- Examine other methods to quantify synchrony (e.g., Euclidean distance or dynamic time warping)

References

- Bordin, E. S. (1979). The generalizability of the psychoanalytic concept of the working alliance. *Psychotherapy: Theory, Research & Practice*.
- Horvath, A. & Luborsky, L. (1993). The role of the therapeutic alliance in psychotherapy. *Journal of Consulting and Clinical Psychology*.
- Webb, C. A., DeRubeis, R. J., and Barber, J. P. (2010). Therapist adherence/competence and treatment outcome: a meta-analytic review. *Journal of Consulting and Clinical Psychology*.
- Koole, S. L., and Tschacher, W. (2016). Synchrony in psychotherapy: A review and an integrative framework for the therapeutic alliance. *Frontiers in Psychology*.
- Ramseyer, F. & Tschacher, W. (2011). Nonverbal synchrony in psychotherapy: coordinated body movement reflects relationship quality and outcome. *Journal of Consulting and Clinical Psychology*.
- Fridlund, A. J. (2014). Human facial expression: An evolutionary view. *Academic press*.
- Horvath, A. O., & Greenberg, L. S. (1989). *Development and validation of the Working Alliance Inventory*. *Journal of Counseling Psychology*.
- Baltrusaitis, T., Zadeh, A., Lim, Y. C., & Morency, L. P. (2018). Openface 2.0: Facial behavior analysis toolkit. *In 2018 13th IEEE international conference on automatic face & gesture recognition*.
- Boker, S. M., Rotondo, J. L., Xu, M., & King, K. (2002). Windowed cross-correlation and peak picking for the analysis of variability in the association between behavioral time series. *Psychological Methods*.
- McElreath, R. (2020). *Statistical rethinking: A Bayesian course with examples in R and Stan* (2nd Edition). *CRC Press*.

Acknowledgements

This work was supported by NSF Awards 1721667 & 1722822. Thanks to Jeffrey Cohn, Holly Swartz, and Louis-Philippe Morency.

Presented at the 2024 *Society for Affective Science Conference*

Contact: dayermol@ku.edu

