From Monitoring to Precision: Machine-Learning Approaches to Personalizing Predictors of Psychotherapy Process & Outcome

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Work in progress · descriptive overview · no outcome results yet

◆ THE QUESTION WE SET OUT TO ANSWER ◆

Can routine outcome monitoring — questionnaires only, no session text — be turned into a personalized forecast of who improves, in which domain, and who is at risk of deterioration?

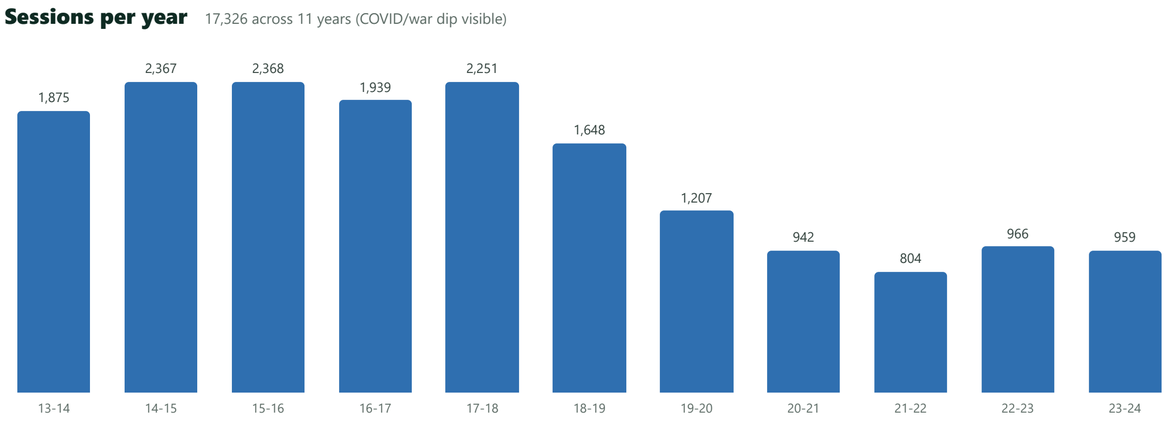
We set out to answer this with **11 years** of the clinic's routine data — a broad, multi-informant, session-by-session battery.

OUR APPROACH a two-phase machine-learning program — **benchmark** a per-client outcome forecast at **session 3-5**, then **personalize** it by domain & flag deterioration

17,326	924	693	504	129,894	22	3	11
sessions	dyads	clients	therapists	questionnaire administrations	measures	informants	years 2013-24

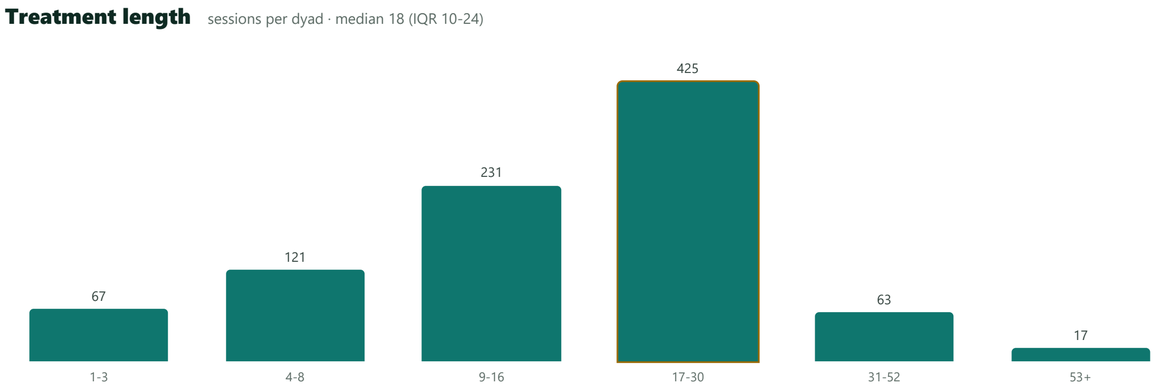
Sessions per year

17,326 across 11 years (COVID/war dip visible)



Treatment length

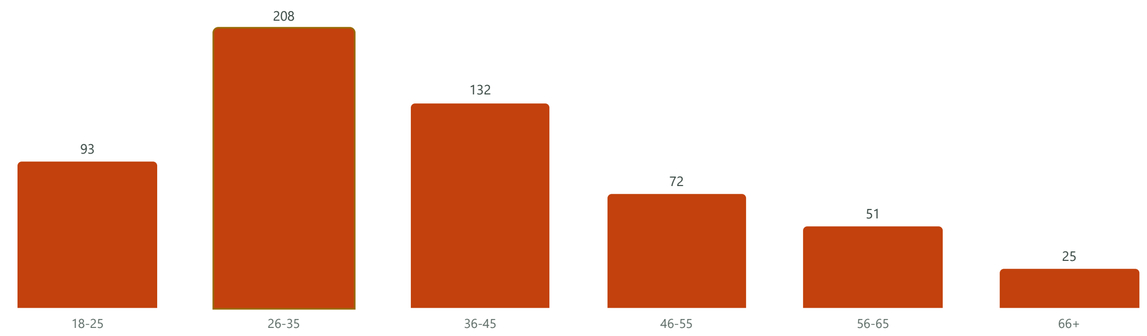
sessions per dyad · median 18 (IQR 10-24)



most dyads run **17-30** sessions

Client age distribution

consented clients · broad adult range



peak **26-35** · spanning 18 to 79

Three informants

same constructs, different eyes (dyads with data)

enables agreement & empathic-accuracy features

Who the clients are

consented analytic sample

37.9	59.6%	18-79
mean age (SD 13.2)	female	age range

a broad adult outpatient population

Returning clients

clients seen across multiple academic years

10	412	1.5
max years, one client	dyads with pre & post OQ-45	mean clients per therapist/yr

The measurement battery — 22 instruments, full names

informant (dot): client / therapist / therapist-on-client · items · consented N | right: how the battery feeds the model

SESSION — before / after every session

●	**ORS**	Outcome Rating Scale	4 it	699
●	**HSCL**	Hopkins Symptom Checklist	11 it	699
●	**WAI-6**	Working Alliance Inventory	6 it	622
●	**POMS**	Profile of Mood States	12 it	621
●	**SES**	Session Evaluation Scale	1 it	409
●	**Rupture**	Rupture self-report item	1 it	622

The longitudinal core — repeated before/after every session, giving each client a dense within-treatment trajectory.

BASELINE — once per academic year

●	**OQ-45**	Outcome Questionnaire-45	45 it	599
●	**BDI**	Beck Depression Inventory	21 it	598
●	**IIP**	Inventory of Interpersonal Problems	32 it	593
●	**DERS-18**	Difficulties in Emotion Regulation Scale	18 it	560
●	**ERQ**	Emotion Regulation Questionnaire	10 it	497
●	**PID-5**	Personality Inventory for DSM-5	25 it	347
●	**SPIN**	Social Phobia Inventory	17 it	448
●	**SE**	Rosenberg Self-Esteem Scale	10 it	449
●	**SWLS**	Satisfaction With Life Scale	5 it	326
●	**SHEEHAN**	Sheehan Disability Scale	3 it	189
●	**IPDE**	Int'l Personality Disorder Examination	77 it	143

THERAPIST — self-report

●	**WAI-6 (T)**	Working Alliance Inventory (therapist)	6 it	600
●	**IIP (T)**	Inventory of Interpersonal Problems (therapist)	32 it	374
●	**DERS (T)**	Difficulties in Emotion Regulation (therapist)	18 it	328

The therapist's own interpersonal style & emotion regulation — the basis for therapist-effect predictors.

CROSS-RATER — therapist-on-client

●	**tc-ORS**	Outcome Rating Scale (therapist-rated)	4 it	522
●	**tc-POMS**	Profile of Mood States (therapist-rated)	12 it	482

The therapist's view of the same client — enables client-therapist **agreement** & **empathic-accuracy** features, among the strongest known predictors.

FROM BATTERY TO FORECAST

22 instruments
3 informants · 11 years
129,894 questionnaire administrations

↓

Tree-ensemble model
missing-tolerant · leave-one-year-out CV · honest emulation

↓

6 personal forecasts
per client, by outcome domain — plus a deterioration flag

HOW WE WILL ANSWER IT

a two-phase machine-learning program · questionnaires only · figures are illustrative (no results yet)

Client #214 · session 5

personal forecast (illustrative)

Deterioration risk: **low** · recommend continue

Phase 1 · Benchmark

At session **3-5**, baseline + early sessions forecast each client's outcome, and we establish how accurately it can be done.

Phase 2 · Personalize

Trajectory-predicts-trajectory, data-driven profiles, SHAP explanations, deterioration flags, and per-client predicted gains via interactions.

Method

Curated, not blind · **Prediction, not inference** · **Missing-tolerant trees** · **Leave-one-year-out CV** · **Temporally honest**

INSTRUMENT SOURCES **ORS** Miller et al., 2003 · **HSCL** Derogatis et al., 1974 · **WAI** Horvath & Greenberg, 1989 · **POMS** McNair et al., 1971 · **SES** single clinic item · **Rupture** single clinic item · **OQ-45** Lambert et al., 1996 · **BDI** Beck et al., 1996 · **IIP** Horowitz et al., 1988 · **DERS-18** Victor & Klonsky, 2016 · **ERQ** Gross & John, 2003 · **PID-5** Krueger et al., 2012 · **SPIN** Connor et al., 2000 · **SE** Rosenberg, 1965 · **SWLS** Diener et al., 1985 · **SHEEHAN** Sheehan, 1983 · **IPDE** Loranger et al., 1994 · **DERS (T)** Gratz & Roemer, 2004

Work in progress
no outcome results yet

Routine monitoring, re-imagined as a personal forecast.

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