

Update on Self-Regulation Ontology Project

Poldrack/Marsch/Mackinnon et al.

Goals

- Develop an ontology of self regulation
- Use initial behavioral study to determine draft ontology for imaging
- Using imaging study to identify neurobehavioral ontology for subsequent target engagement testing

Initial behavioral study

- Target: 500 subjects
 - Discovery sample: 200 subjects
 - Validation sample: 300 subjects
- Will also perform followup retest with 50 subjects
- Validation sample will be opened once hypotheses are pre-registered on OSF

Battery development

- Surveyed literature broadly
- Identified 35 cognitive tasks and 28 surveys

Surveys

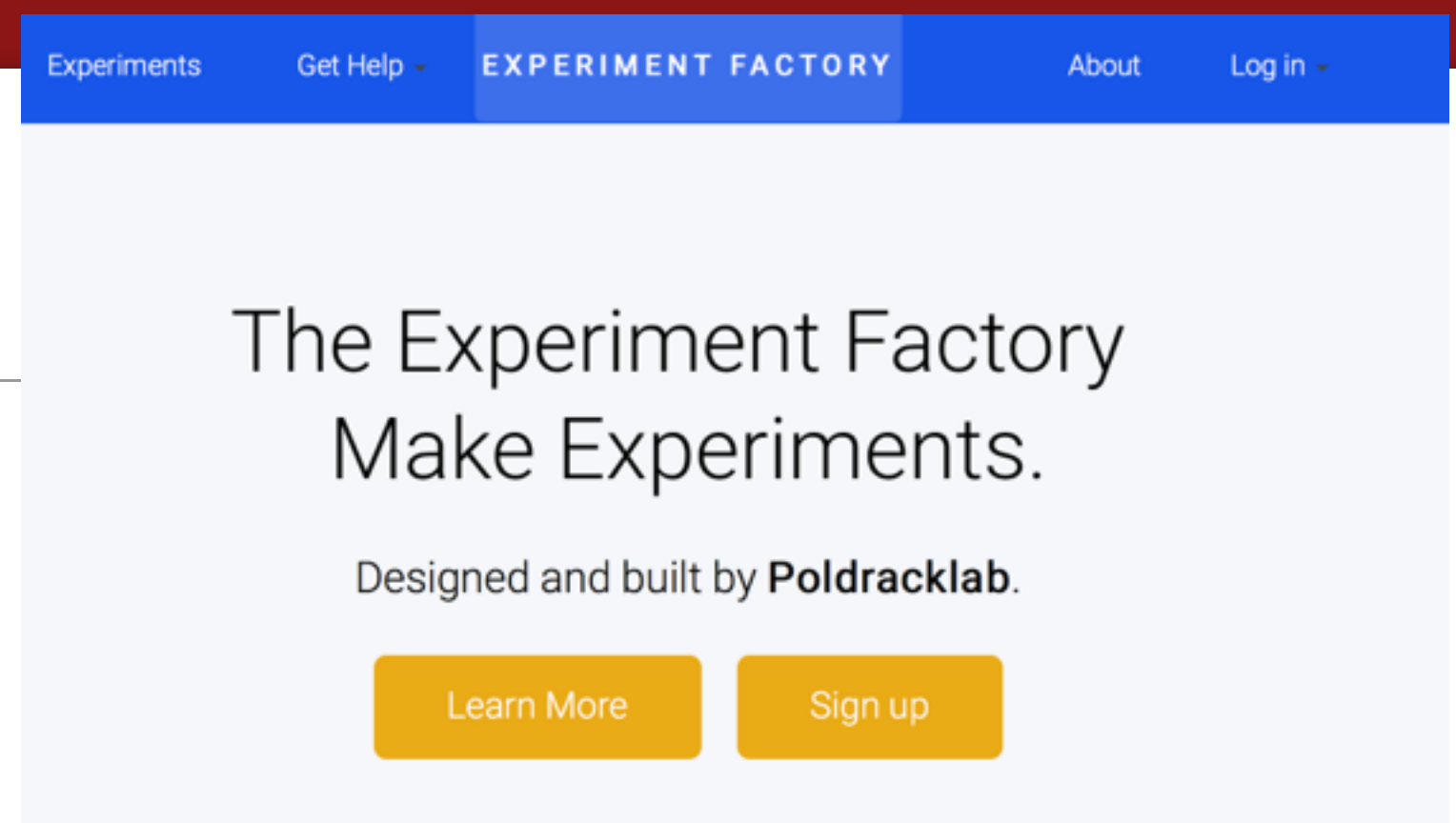
- alcohol/drugs survey
- BIS-11
- BIS-BAS
- Brief self control survey
- Cognitive reflection test
- Demographics
- Dickman functional/dysfunctional impulsivity
- DOSPERT
- Eating survey
- Emotion regulation questionnaire
- Five-facet mindfulness survey
- Future time perspective
- Grit scale
- Holt-Laury risk titrator
- Eysenck Impulsivity-venturesomeness survey
- K6 mental health survey
- Leisure time activity survey
- Mindful attention-awareness survey
- MPQ control
- selection optimization compensation survey
- Self-regulation survey
- Sensation-seeking survey
- Ten-item personality survey
- Theories of willpower survey
- Time perspective survey
- UPPS+P

Tasks

- adaptive n-back
- angling risk task
- attention network task
- Bickel titrator
- choice reaction time
- Columbia card task cold
- Columbia card task hot
- dietary decision task
- digit span
- directed forgetting
- discount titrate
- dot pattern expectancy
- go-nogo
- hierarchical rule task
- information sampling task
- keep-track task
- Kirby discounting task
- local-global letter
- motor selective stop signal
- probabilistic selection task
- psychological refractory period
- Raven's progressive matrices
- recent probes
- shape matching
- shift task
- Simon task
- simple reaction time
- spatial span
- stimulus selective stop signal task
- stop signal task
- Stroop task
- three-by-two task switching
- tower of London
- two stage decision task
- writing task

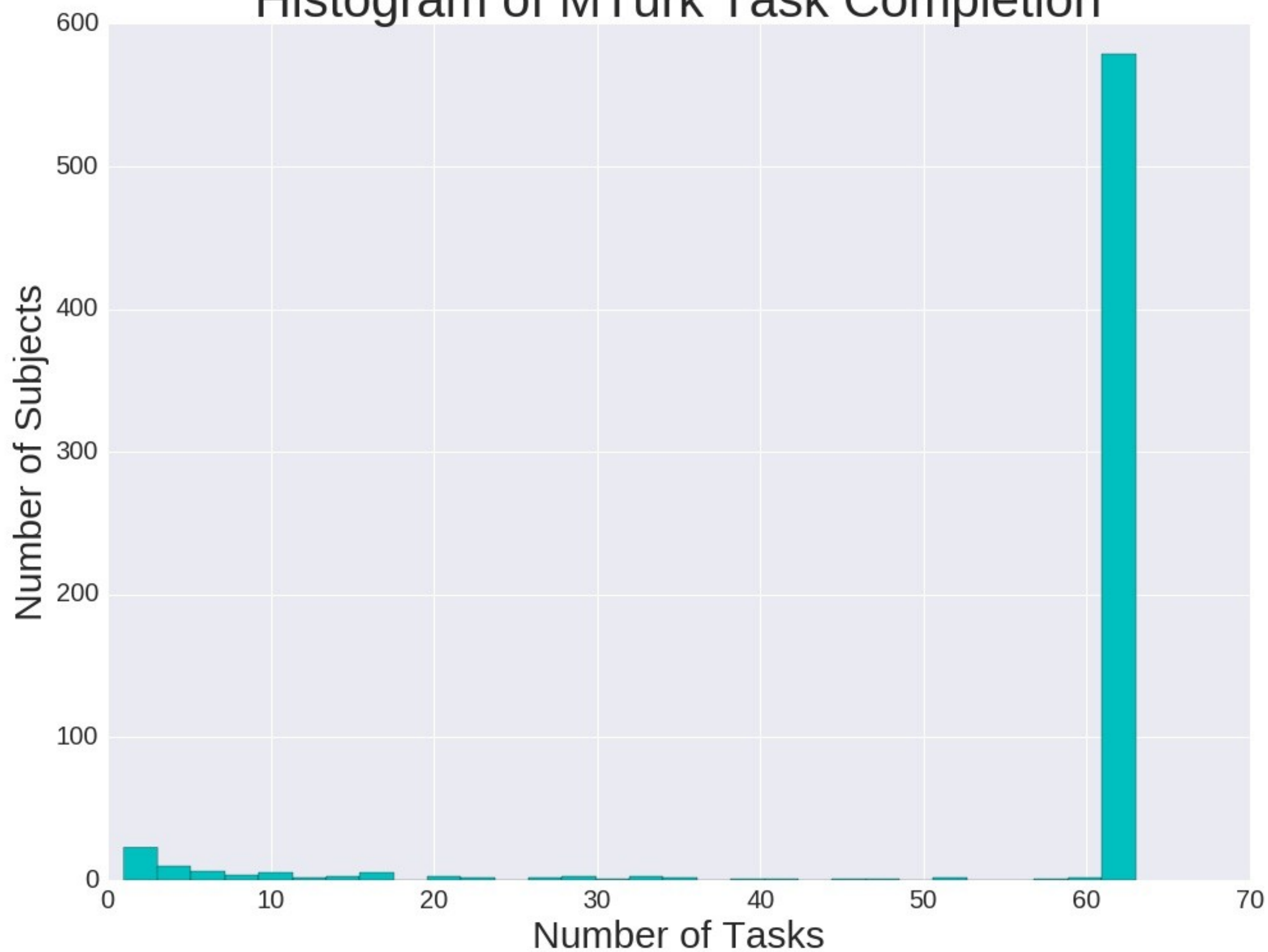
mTurk Data Collection

- Developed a platform to allow repeated visits over time
- expfactory.org
- Started 3/17 and finished 5/26



Home Concept View Experiments Surveys Games			
PREVIEW	EXP_ID	TEMPLATE	CONTRIBUTORS
DEMO	angling_risk_task_always_sunny	jspsych	Ian Eisenberg,Zey
DEMO	bickel_titrator	jspsych	Ian Eisenberg,Zey
DEMO	local_global_shape	jspsych	Ian Eisenberg,Zey
DEMO	willingness_to_wait	jspsych	Ian Eisenberg,Zey
DEMO	attention_network_task	jspsych	Ian Eisenberg,Zey
DEMO	random_number_generation	jspsych	Ian Eisenberg,Zey
DEMO	stim_selective_stop_signal	jspsych	Ian Eisenberg,Zey

Histogram of MTurk Task Completion



Keys to success

- Flexibility in data collection
 - Allow subjects to return whenever they want, over the course of a week
- Engagement with mTurk community

Wgeo said: ↑

Yes, honestly it amazed me how completely accurate your time estimates were. That almost never happens.

I went through all 5 stages of grief.

Denial - Theres no way this HIT is actually 10 hours long

Anger - What the hell, this block takes 40 minutes!?

Bargaining - Please god, please make the next 5 blocks take a few minutes a piece

Depression - I never should have started this, now look what I got myself into

Acceptance - Well Ive done 30 blocks, theres no going back now

[-] texaskevin06 2 points 10 hours ago

I think \$60 is the high end of what most people make on mTurk. I make roughly that much a day and I can tell you that I would do that \$60 survey everyday for the rest of my time on mTurk if I could.

A few of the tasks were pretty bad but most of them were very easy. It ended up taking less than 10 hours and I got an \$11 bonus so \$71 for about 9 hours is well worth it for me, especially not having to worry about rejections or having to find HITs all day.

YES! I was able to submit the \$60 hit, thanks to the requester for such great commuciation and resolving the issues in a timely manner. Mturk needs more requester like **SelfConcept**.

Sealpup666 said: ↑

That's from the \$60 HIT

that will help refill my attention meds I had to eat like **tic-tacs** to get thru that thing....lol

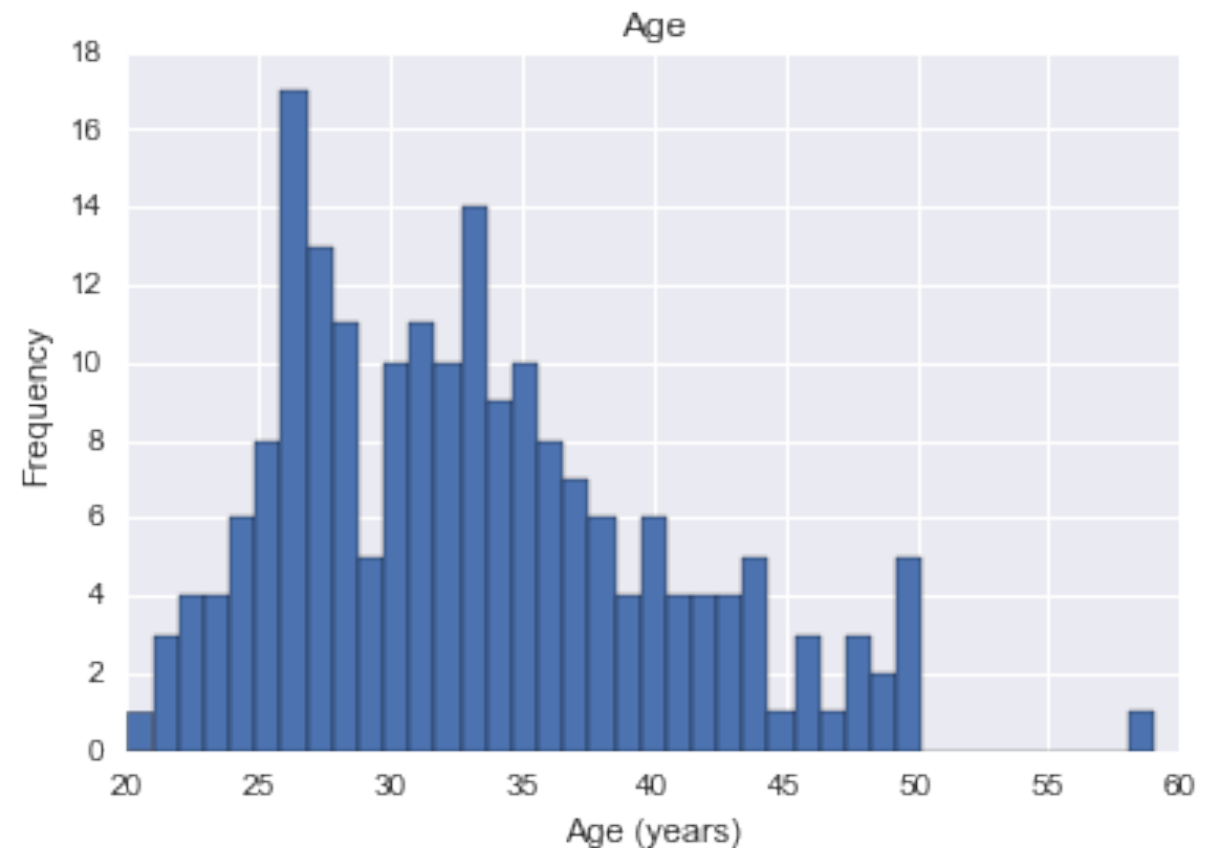
rs303909, Aug 10, 2016 Reputation Report

Quality control

- Subjects are only included if they complete the entire battery
- Subjects are removed if they fail basic quality control on >3 tasks
- Components of “basic” QC are accuracy, reaction time, response distribution and missed percentage
- Individual tasks may have internal checks as well, used to remove particular variables: Probabilistic Selection, Stop Signal Tasks, Two Step task

Demographics

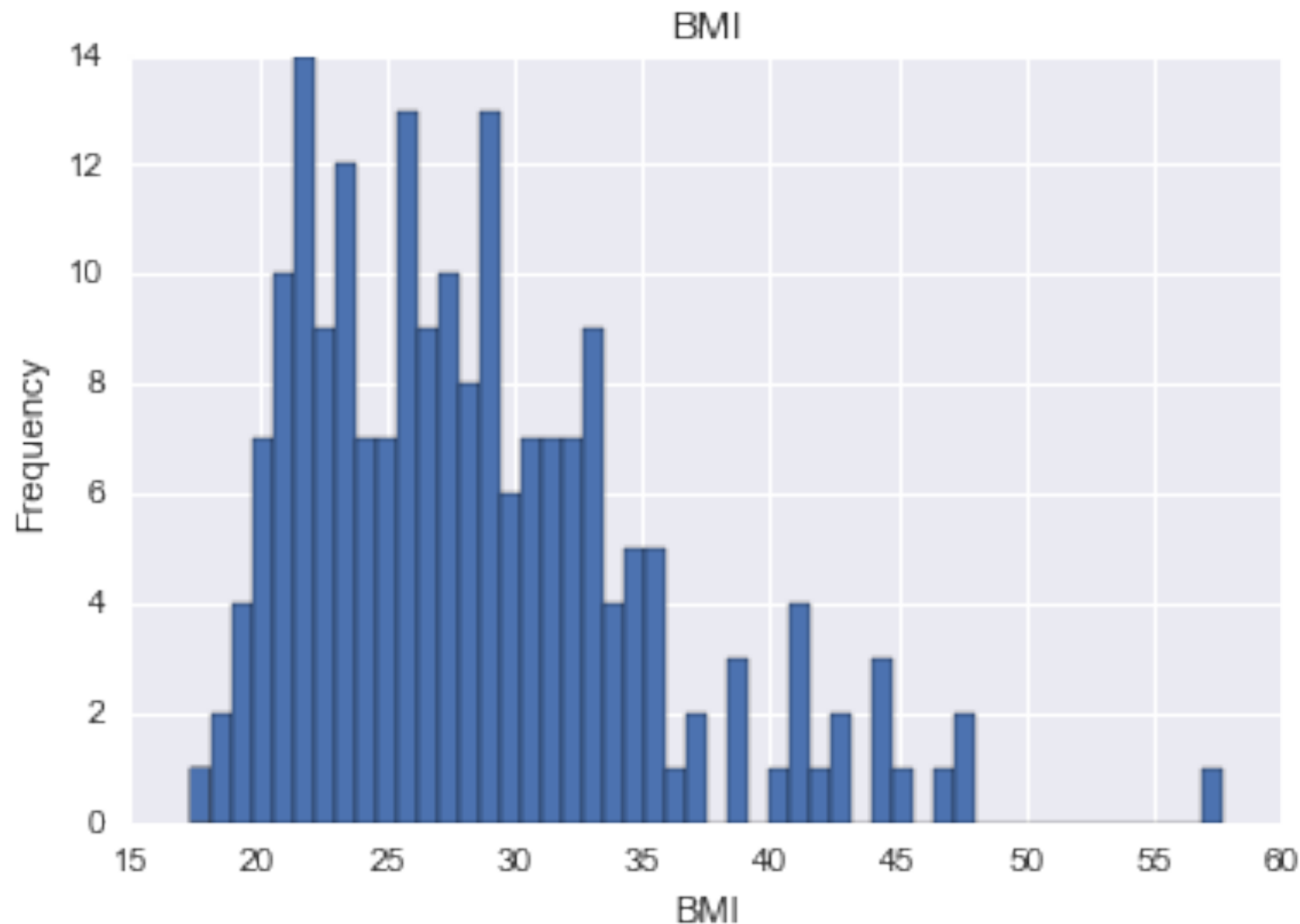
- 50/50% male/female
- 81% white
- mean age 33.04 (range 20-59 years)
- 25.5% have children
- 36% report lifetime psychiatric history
 - 20% depression
 - 7% anxiety
 - 3% ADHD



Relevant self-regulation issues

- Percentage ever divorced: 10.5
- Percentage with current gambling problem: 1.5
- Percentage with at least one traffic ticket in last year: 8.5
- Percentage arrested at least once: 16.5
- Percentage arrested more than once: 8.0
- Percentage with >\$10,000 credit card debt: 7.0

Obesity



0.33 percent subjects with $\text{BMI} > 30$ (obese)

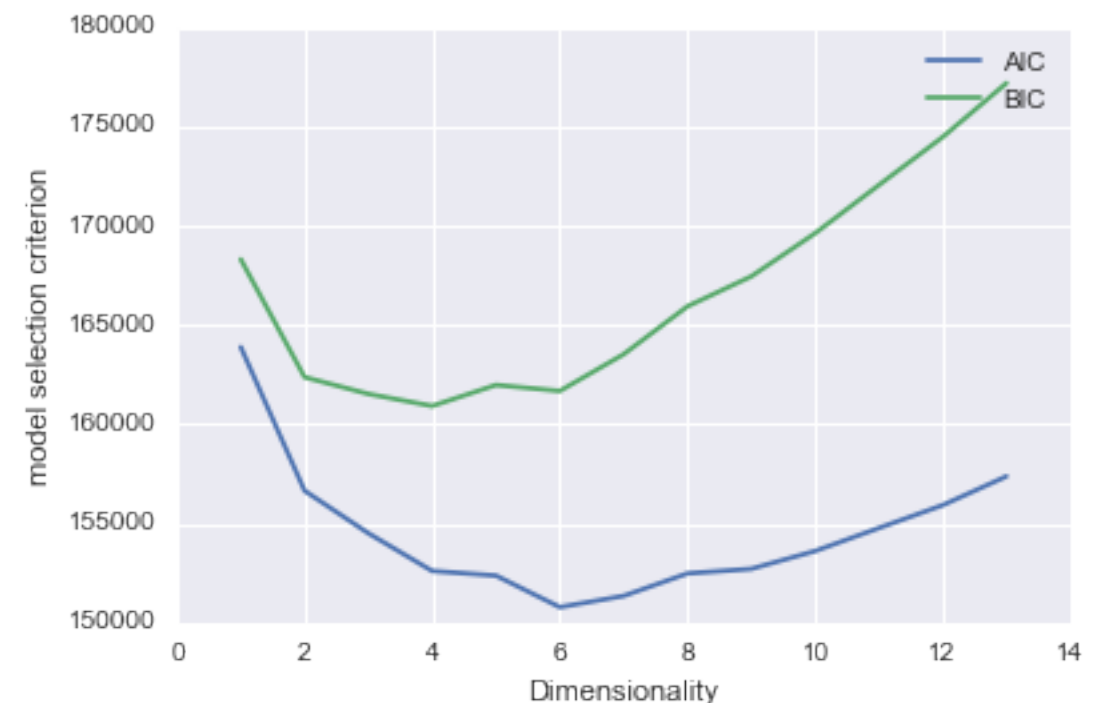
0.08 percent subjects with $\text{BMI} > 40$ (extreme obesity)

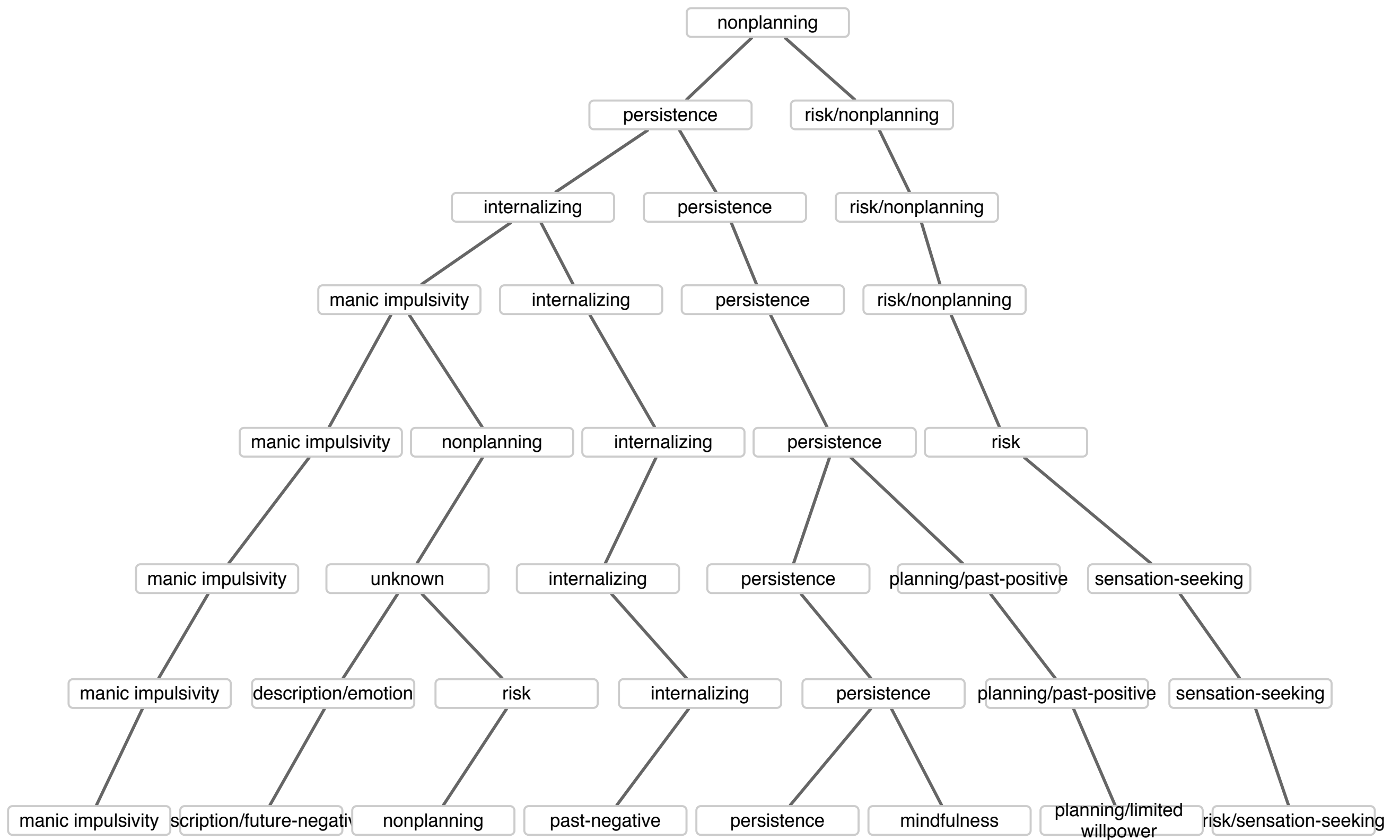
Drug use/smoking

- Percentage of lifetime smokers (100 cigs): 50.00
- Percentage of current smokers: 29.00
- Percentage of cannabis users (at all): 23.00
- Percentage of cannabis users (at least once/month): 12.50
- Percentage of daily cannabis users: 7.00
- Percentage of heavy drinkers (4+ times per week, 3+ drinks per time): 6.50
- Percentage reporting trouble stopping their drinking: 1.50

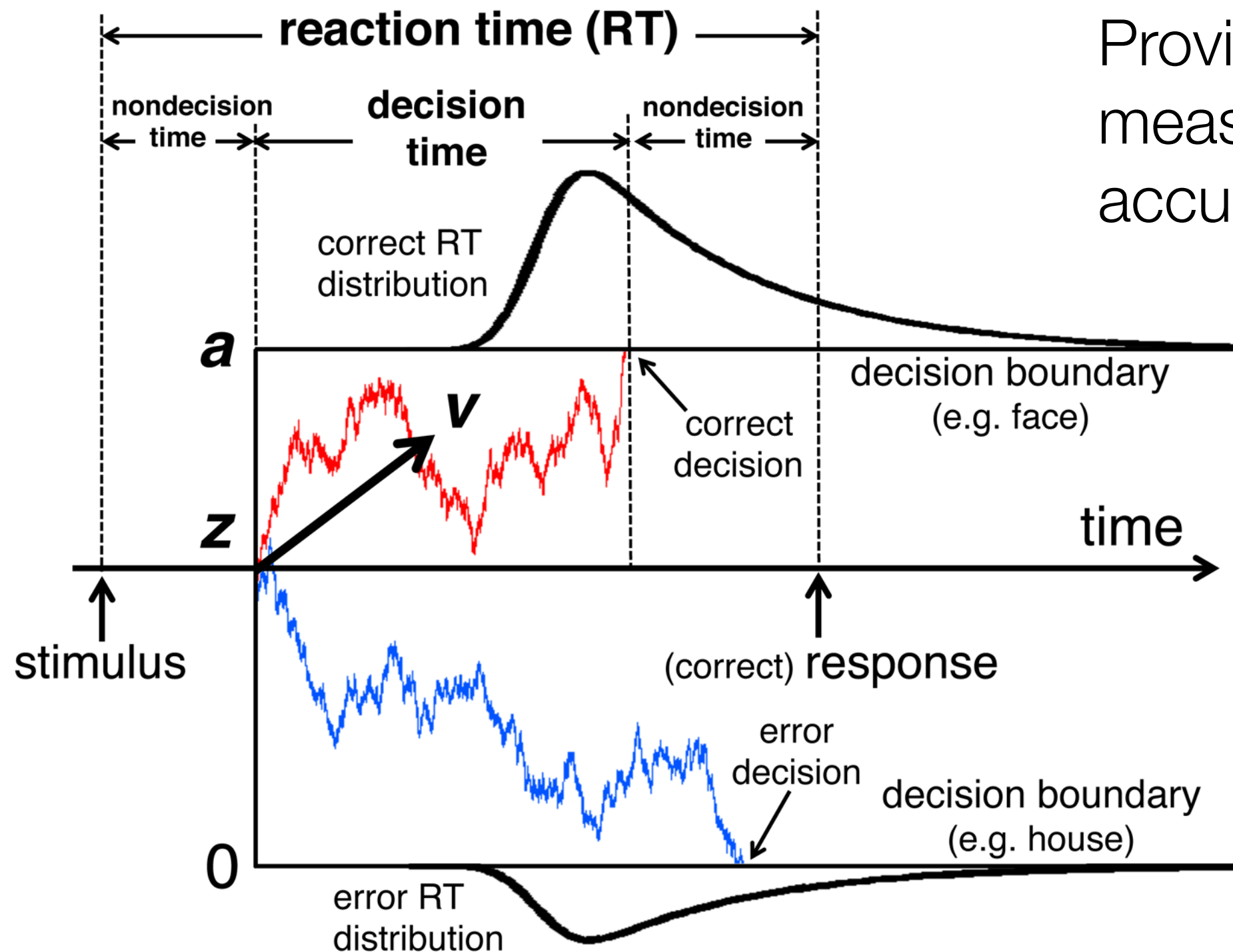
Initial data analyses

- Factor analysis and item response theory analyses ongoing
- Multidimensional IRT
 - Takes all 508 survey items regardless of source
 - Model selection suggests 4-6 factors
 - Tested across range from 1-8 factors
 - Needs to be run on full dataset to be believable



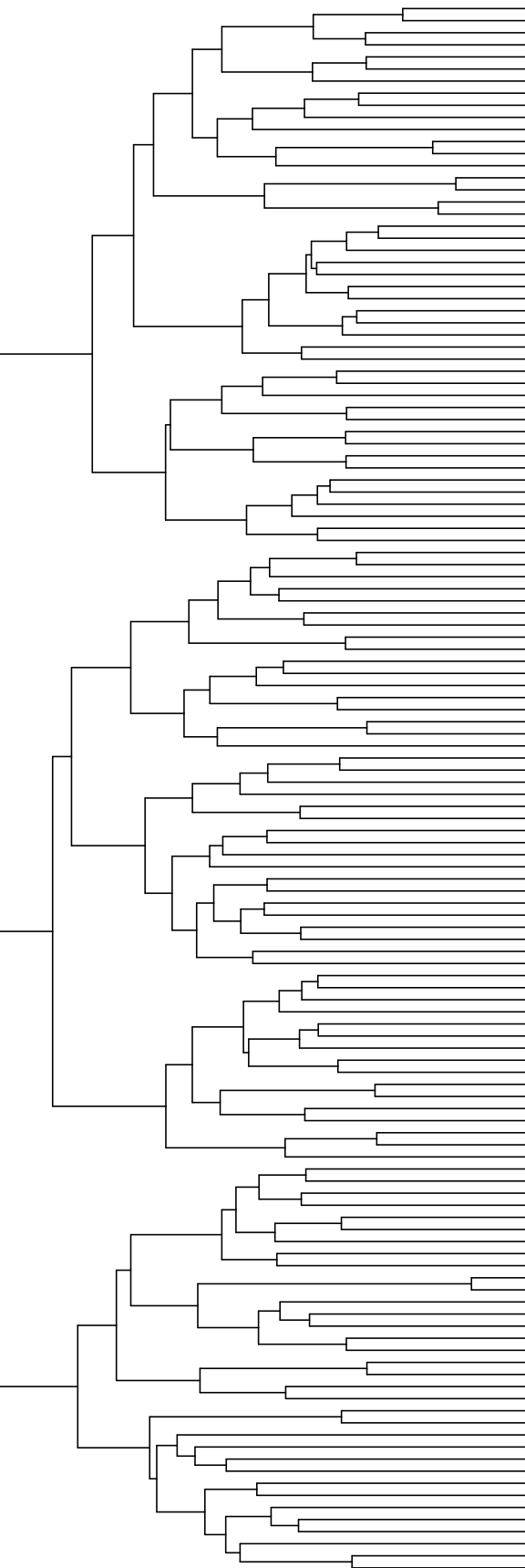


Task modeling: Drift diffusion model



Provides interpretable measures combining accuracy and RT

Task data



processing speed
working memory
discounting

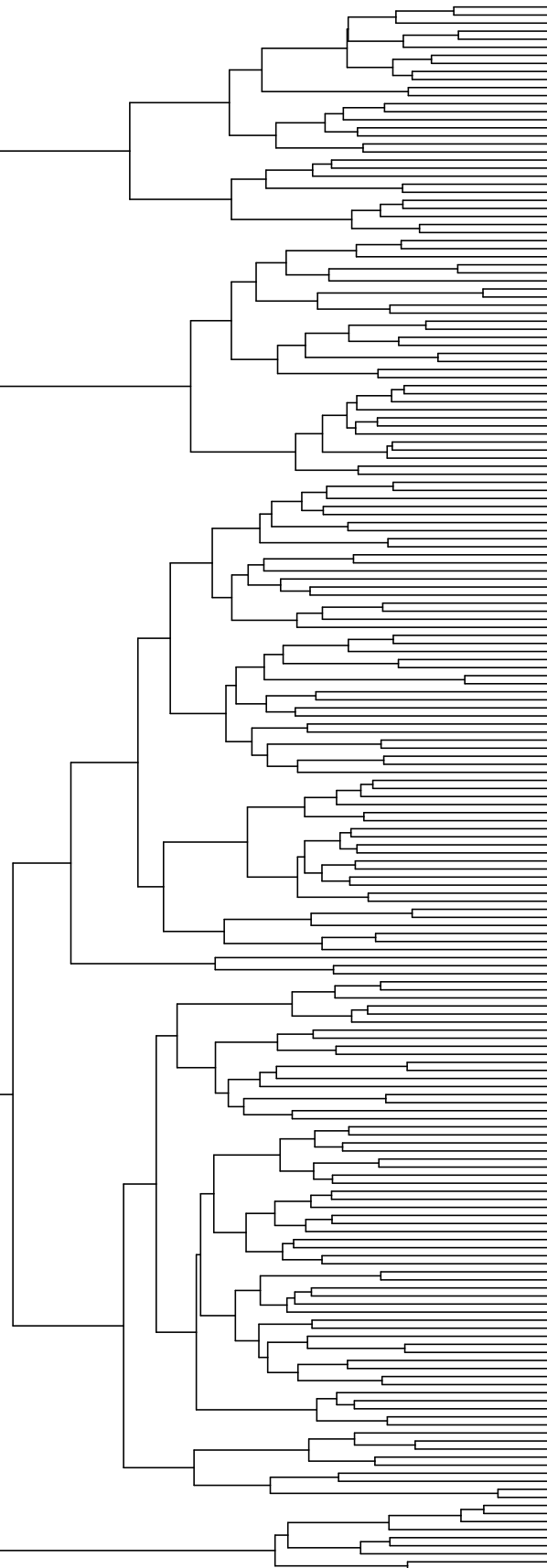
conflict
switch cost

nondecision time

threshold
reward sensitivity

adaptive_n_back.mean_load
adaptive_n_back.EZ_drift
spatial_span.reverse_span
spatial_span.forward_span
threebytwo.EZ_drift_cue_stay
ravens.score
hierarchical_rule.score
digit_span.reverse_span
digit_span.forward_span
keep_track.score
directed_forgetting.proactive_interference_EZ_thresh
discount_titrate.percent_patient
kirby.percent_patient
two_stage_decision.model_free
information_sampling_task.Fixed_Win_P_correct
information_sampling_task.Fixed_Win_boxes_opened
information_sampling_task.Decreasing_Win_P_correct
information_sampling_task.Decreasing_Win_boxes_opened
motor_selective_stop_signal.EZ_drift
stop_signal.EZ_drift
stim_selective_stop_signal.EZ_drift
dot_pattern_expectancy.dprime
attention_network_task.EZ_drift_neutral
directed_forgetting.EZ_drift_pos
recent_probes.EZ_drift_xrec
choice_reaction_time.EZ_drift
dot_pattern_expectancy.EZ_drift_AX
simon.EZ_drift_congruent
stroop.EZ_drift_congruent
stroop.stroop_EZ_thresh
tower_of_london.num_optimal_solutions
tower_of_london.num_correct
local_global_letter.EZ_drift_neutral
angling_risk_task.always_sunny.keep_score
angling_risk_task.always_sunny.release_score
columbia_card_task.cold.information_use
columbia_card_task.hot.information_use
columbia_card_task.hot.gain_sensitivity
columbia_card_task.cold.gain_sensitivity
stim_selective_stop_signal.SSRT
stop_signal.SSRT_high
motor_selective_stop_signal.SSRT
stop_signal.SSRT_low
directed_forgetting.EZ_non_decision_pos
recent_probes.EZ_non_decision_xrec
motor_selective_stop_signal.EZ_thresh
motor_selective_stop_signal.selective_proactive_control
shift_task.learning_rate
go_nogo.dprime
attention_network_task.conflict_EZ_drift
local_global_letter.conflict_EZ_drift
local_global_letter.switch_cost_EZ_non_decision
threebytwo.cue_switch_cost_EZ_thresh
threebytwo.task_switch_cost_EZ_non_decision
directed_forgetting.proactive_interference_EZ_drift
directed_forgetting.EZ_thresh
local_global_letter.conflict_EZ_non_decision
recent_probes.proactive_interference_EZ_drift
recent_probes.proactive_interference_EZ_non_decision
dot_pattern_expectancy.AY.BY_EZ_thresh
dot_pattern_expectancy.BX.BY_EZ_thresh
attention_network_task.conflict_EZ_thresh
dot_pattern_expectancy.BX.BY_EZ_drift
dot_pattern_expectancy.BX.BY_EZ_non_decision
dot_pattern_expectancy.AY.BY_EZ_drift
dot_pattern_expectancy.AY.BY_EZ_non_decision
probabilistic_selection.reg_positive_learning_bias
probabilistic_selection.reg_value_learning_bias
local_global_letter.switch_cost_EZ_drift
local_global_letter.switch_cost_EZ_thresh
threebytwo.task_switch_cost_EZ_drift
simon.simon_EZ_thresh
stop_signal.proactive_slowing
local_global_letter.conflict_EZ_thresh
writing_task.positive_probability
threebytwo.task_inhibition
dietary_decision.health_sensitivity
writing_task.neutral_probability
motor_selective_stop_signal.reactive_control
recent_probes.proactive_interference_EZ_thresh
stroop.EZ_non_decision_congruent
dot_pattern_expectancy.EZ_non_decision_AY
motor_selective_stop_signal.EZ_non_decision
attention_network_task.EZ_non_decision_neutral
threebytwo.EZ_non_decision_cue_stay
choice_reaction_time.EZ_non_decision
simon.EZ_non_decision_congruent
stop_signal.EZ_non_decision
stim_selective_stop_signal.EZ_non_decision
columbia_card_task.cold.avg_cards_chosen
columbia_card_task.hot.avg_cards_chosen
local_global_letter.EZ_non_decision_neutral
adaptive_n_back.EZ_non_decision
information_sampling_task.Fixed_Win_motivation
information_sampling_task.Decreasing_Win_motivation
tower_of_london.total_moves
threebytwo.EZ_thresh_cue_stay
adaptive_n_back.EZ_thresh
local_global_letter.EZ_thresh_neutral
simon.simon_EZ_drift
stop_signal.EZ_thresh
stim_selective_stop_signal.EZ_thresh
stroop.stroop_EZ_drift
dot_pattern_expectancy.EZ_thresh_AX
recent_probes.EZ_thresh_xrec
psychological_refractory_period_two_choices.PRP_slow
psychological_refractory_period_two_choices.PRP_slope
simon.EZ_thresh_congruent
choice_reaction_time.EZ_thresh
attention_network_task.EZ_thresh_neutral
stroop.stroop_EZ_non_decision
angling_risk_task.always_sunny.release_loss_percent
angling_risk_task.always_sunny.keep_loss_percent
tower_of_london.planning_time
tower_of_london.avg_move_time
threebytwo.cue_switch_cost_EZ_non_decision
threebytwo.task_switch_cost_EZ_thresh
threebytwo.cue_switch_cost_EZ_drift
probabilistic_selection.reg_value_sensitivity
simon.simon_EZ_non_decision
two_stage_decision.model_based
attention_network_task.conflict_EZ_non_decision
stop_signal.proactive_SSRT_speeding
directed_forgetting.proactive_interference_EZ_non_decision
columbia_card_task.hot.probability_sensitivity
columbia_card_task.cold.probability_sensitivity
dietary_decision.taste_sensitivity
columbia_card_task.hot.loss_sensitivity
columbia_card_task.cold.loss_sensitivity

Task + survey data



conscientiousness
dysfunctional impulsivity

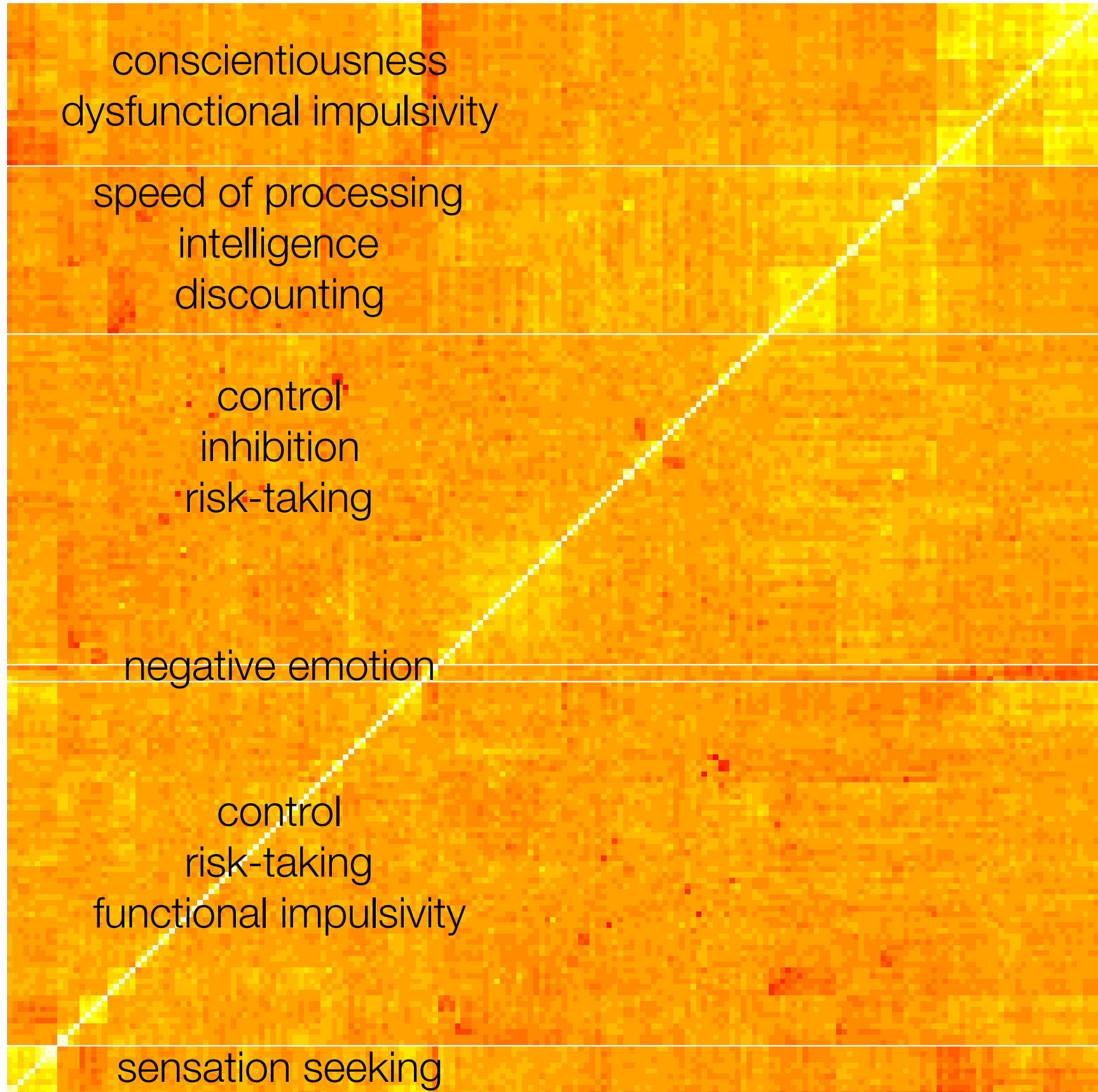
speed of processing
intelligence
discounting

- control
- inhibition
- risk-taking

negative emotion

control
risk-taking
functional impulsivity

sensation seeking

[illegible]