

SIQX: Situational IQ Index

A Behavioral Intelligence Methodology for Major League Baseball

Stephen Bridwell

Sr. Applied Scientist | M.I.D.S., University of California, Berkeley

Founder, Precision Baseball Academy | Tampa, FL

@SIQXindex | siqx.net

April 2026 | Version 1.0 | Working Paper

© 2026 Stephen Bridwell. All rights reserved.

This working paper may be freely cited with attribution. Reproduction for commercial purposes or redistribution of the SIQX formula, weights, or scoring methodology in any product or service requires written permission from the author.

Abstract

Background: Existing baseball metrics capture what players produce rather than how they decide. This gap limits the predictive power of outcome-based statistics for identifying regression and breakout candidates.

Methods: SIQX v9 quantifies hitter behavioral decision quality using five Statcast plate discipline components weighted by empirical correlation with xwOBA. PSIQX v1 applies an analogous framework to pitchers. A composite daily pick model combines team-level hitter SIQX, starter PSIQX, bullpen PSIQX, lineup depth, and plate discipline.

Results: SIQX v9 achieves $r = +0.529$ versus xwOBA ($n = 297$ batters, 2026). PSIQX v1 achieves $r = -0.567$ versus xwOBA allowed ($n = 231$ pitchers). The composite model validates at $r = 0.675$ versus run differential across all 30 MLB teams.

Conclusions: Behavioral decision quality is a meaningful, independently validated predictor of offensive and pitching performance. SIQX and PSIQX identify sustainable performance from unsustainable results.

1. Introduction

The availability of Statcast tracking data has transformed baseball analysis. Yet the most widely discussed metrics -- batting average, OPS, ERA, and even expected statistics such as xwOBA -- remain output-oriented. They capture what a player produced, not the sequence of decisions that produced it.

This distinction matters for two reasons. First, outcomes regress: a hitter posting a .400 xwOBA while chasing pitches outside the strike zone at the 10th percentile is behaviorally inconsistent with his results. The market has not yet corrected for this divergence, but the data suggests it will. Second, decisions lead: a hitter whose SIQX is rising is improving the behavioral inputs that drive offensive production, often before the results catch up.

SIQX (Situational IQ Index) addresses this gap directly. It is a composite behavioral metric that scores hitters and pitchers on the quality of their in-game decisions using Statcast plate discipline data. Unlike outcome metrics, SIQX does not reward a batter for hitting a home run on a pitch he should not have swung at, nor does it penalize a pitcher for a well-struck ball on a well-placed pitch.

The central premise of SIQX: measuring not what players do, but how they decide.

The practical outputs of SIQX include: (1) identification of breakout candidates whose behavioral quality exceeds their current results; (2) identification of regression candidates whose results exceed their behavioral quality; (3) pitcher-level matchup scoring against specific lineup profiles; (4) team-level composite scoring for daily pick modeling with validated predictive power versus run differential.

2. Related Work

2.1 Plate Discipline Research

The importance of plate discipline as a predictor of offensive performance has been established in the sabermetric literature. Tango, Lichtman, and Dolphin (2006) demonstrated in *The Book* that walk rates and strikeout rates are among the most persistent year-over-year batting statistics, suggesting they reflect genuine skill rather than luck. Subsequent work with Statcast data has extended these findings to contact quality and swing decisions.

Baseball Savant's expected statistics framework (xBA, xSLG, xwOBA) uses exit velocity and launch angle to estimate the expected value of batted ball events, controlling for defensive positioning and park factors. SIQX treats these expected metrics as validation targets -- the behavioral components it scores should predict xwOBA because xwOBA itself is driven by the same plate decisions.

2.2 Pitcher Behavioral Metrics

Pitcher analysis has increasingly focused on stuff quality and movement metrics (Stuff+, Location+, Pitching+) which decompose performance into its mechanical components. SIQX takes a complementary approach: rather than modeling what a pitcher throws, PSIQX measures what the pitcher forces hitters to do in response. Chase rates, whiff rates, and zone contact allowed are behavioral outcomes of pitch quality that are more stable and predictive than raw velocity or spin rate in isolation.

2.3 Composite Pick Modeling

The use of Statcast-derived metrics in predictive modeling has been explored in academic settings (Piette and Anand, 2011; Albert, 2017) and in applied analytics contexts. SIQX's composite model is distinguished by its focus on behavioral rather than outcome inputs, its explicit bullpen separation methodology, and its empirical weight optimization against run differential rather than win probability.

3. Data and Methods

3.1 Data Sources

Source	Data Retrieved	Access Method
Baseball Savant	Plate discipline leaderboards: oz_swing_percent, whiff_percent, iz_contact_percent, oz_contact_percent, hard_hit_percent, meatball_swing_percent, bb_percent, k_percent, xwoba	Public CSV endpoint, refreshed weekly
MLB Stats API	Team assignments, probable starters, IL status, season pitching statistics (playerPool=All) for SP/RP designation	Public REST API, no authentication required
The Odds API	Daily moneyline odds for all MLB games	Commercial API (free tier: 500 calls/month)

3.2 Inclusion Criteria

Minimum plate appearance thresholds are applied to ensure statistical reliability before percentile ranking:

- Hitters: 40+ plate appearances in the current season
- Starters: 10+ batters faced in the current season
- Relievers: 5+ batters faced in the current season

3.3 Percentile Ranking

All raw component values are converted to percentile ranks (0-100) relative to the qualified player pool in the current season before formula application. This normalization ensures that SIQX scores are comparable across seasons and that no single component is disproportionately influenced by its raw scale.

4. Hitter Model: SIQX v9

4.1 Component Definitions and Weights

SIQX v9 comprises six behavioral components. Weights were determined through empirical optimization against xwOBA across multiple seasons of Statcast data:

Code	Weight	Statcast Source	Behavioral Meaning
FIQ	25%	hard_hit_percent + meatball_swing_percent	Contact quality. Combines exit velocity profile with swing decisions on hittable pitches.
DSR	25%	bb_percent / (bb_percent + k_percent)	Walk-to-strikeout discipline ratio. Most persistent plate discipline signal.
CHS	20%	oz_swing_percent (inverted)	Chase avoidance. Out-of-zone swing rate inverted so higher = better discipline.
ZWP	15%	whiff_percent (inverted)	Zone whiff avoidance. In-zone miss rate inverted so higher = better contact on strikes.
ZCN	10%	iz_contact_percent	Zone contact rate. Ability to put bat on ball when swinging at strikes.
OCN	5%	oz_contact_percent	Out-zone contact. Minor credit for making contact on chased pitches.

4.2 Formula

$$SIQX = 0.25(FIQ_pct) + 0.25(DSR_pct) + 0.20(CHS_pct) + 0.15(ZWP_pct) + 0.10(ZCN_pct) + 0.05(OCN_pct)$$

Where all component values are expressed as percentile ranks (0-100) relative to the current season qualified hitter pool.

4.3 Signal Classification

Signal	Threshold	Interpretation
--------	-----------	----------------

Breakout Watch	SIQX >= 62.0	Behavioral quality meaningfully exceeds current results. Positive performance trajectory expected.
Regression Alert	SIQX <= 38.5	Results exceed behavioral quality. Performance decline statistically likely.
Neutral	38.5 < SIQX < 62.0	Results broadly consistent with decision quality. No strong directional prediction.

4.4 Validation

SIQX v9 was validated using Pearson correlation against xwOBA across all qualified hitters in the 2026 MLB season (minimum 40 PA as of April 2026):

Statistic	Value
Pearson r (SIQX vs xwOBA)	r = +0.529 (p < 0.001)
Sample size	n = 297 qualified batters
Season	2026 MLB (data through April 21)
Minimum PA threshold	40 plate appearances

Interpretation: A Pearson r of +0.529 indicates a moderately strong positive relationship between behavioral decision quality (SIQX) and expected offensive production (xwOBA). This validates that the behavioral components measured by SIQX are meaningfully predictive of outcomes, not merely correlated by construction.

5. Pitcher Model: PSIQX v1

5.1 Design Philosophy

PSIQX measures what the pitcher forces hitters to do, not what the pitcher himself does mechanically. This behavioral framing parallels the hitter model: where SIQX asks whether a hitter is making good decisions, PSIQX asks whether a pitcher is forcing hitters into bad ones.

Two candidate components were evaluated and excluded due to circularity:

- Strikeout rate (KDR): r vs xwOBA = -0.595, but r vs K% = 1.000. This is a circular outcome measure, not a behavioral input.
- Walk rate (BBI): r vs xwOBA = +0.257, but r vs BB% = 1.000. Same circularity issue.

Including circular components would inflate correlation metrics without adding predictive value beyond what the outcome statistics themselves provide.

5.2 Component Definitions and Weights

Code	Weight	Statcast Source	Behavioral Meaning
HHI	34.4%	hard_hit_percent (inverted)	Hard contact suppression. Highest individual predictor of pitcher performance.
OZI	24.6%	oz_swing_percent	Chase induced. Rate at which the pitcher causes hitters to swing at pitches outside the zone.
ZWF	18.0%	whiff_percent	Zone whiff forced. Rate of misses generated on pitches inside the strike zone.
ZCF	14.3%	iz_contact_percent (inverted)	Zone contact allowed (inverted). Preventing hitters from making contact on strikes.
OCI	9.1%	oz_contact_percent (inverted)	Out-zone contact allowed (inverted). Preventing hitters from making contact on chased pitches.

5.3 Formula

$$PSIQX = 0.344(HHI_pct) + 0.246(OZI_pct) + 0.180(ZWF_pct) + 0.143(ZCF_pct) + 0.091(OCI_pct)$$

5.4 Signal Classification

Signal	Threshold	Interpretation
Dominant	PSIQX >= 70.0	Behaviorally suppressing offense. Results may improve if not yet reflected in ERA/xwOBA.
Vulnerable	PSIQX <= 38.0	Hitters making quality decisions against this pitcher. Performance deterioration likely.
Neutral	38.0 < PSIQX < 70.0	Behavioral profile broadly consistent with current results.

5.5 Validation

Statistic	Value
Pearson r (PSIQX vs xwOBA allowed)	r = -0.567 (p < 0.001)
Sample size	n = 231 qualified pitchers
Season	2026 MLB (data through April 21)
Minimum batters faced	10 batters faced

6. Bullpen Separation and Team Scoring

6.1 Reliever Identification Methodology

Accurate bullpen scoring requires reliable separation of starters from relievers. This proved non-trivial in practice. The following approaches were evaluated and their limitations documented:

v	Method	Outcome	Issue
1	p_role_key from Savant CSV	0 SP, 0 RP identified	Column returned entirely as NaN
2	rosterType=startingPitchers (MLB API)	779 starters (inflated)	Endpoint returned position players too
3	rosterType=fullRoster, pos.abbrev==RP	0 relievers identified	Abbreviation field returned 'P' for all pitchers
4	GS > 0, default endpoint	75 starters (too few)	Default endpoint returns ERA qualifiers only
5	GS >= 2, GS/G >= 50%	75 starters (too strict)	Ratio filter excluded legitimate early-season starters
6	GS >= 1, GS/G >= 30%	75 starters (still too few)	Still limited to ERA qualifiers
7	playerPool=All + GS >= 1 (CURRENT)	192 starters, 217 relievers	Returns full pitcher pool, not just qualifiers

The final approach uses the MLB Stats API season statistics endpoint with playerPool=All, which returns all pitchers regardless of innings qualifications. Any pitcher with GS >= 1 is classified as a starter; all remaining pitchers with sufficient appearances are classified as relievers.

6.2 Early-Season Robustness

At the start of each new season (Opening Day through approximately the first two weeks), insufficient games have been played for current-season GS data to reliably identify rotation members. A prior-year fallback supplements current designations when fewer than 30 starters are identified:

```
if len(current_season_sp_ids) < 30:    prior_year_sp_ids =
    _pull_sp_ids(SEASON - 1)          sp_ids = current_season_sp_ids |
    prior_year_sp_ids
```

This ensures accurate bullpen separation on Opening Day of any new season without manual intervention.

6.3 Team Bullpen PSIQX

Each team's bullpen PSIQX is the average PSIQX of their top five qualifying relievers (minimum 5 batters faced). The team starter PSIQX is the average PSIQX of all qualifying starters. Both scores are included in the composite pick model.

7. Composite Pick Model

7.1 Model Structure

The composite model is applied to identify underdog picks with meaningful behavioral advantages over the favored team. All edge values represent the pick team minus the fade (favorite) team:

$$\text{Composite} = 0.50 \times (\text{Hitter SIQX Edge}) + 0.20 \times (\text{Starter PSIQX Edge}) + 0.20 \times (\text{Bullpen PSIQX Edge}) + 0.05 \times (\text{Lineup Depth Edge}) + 0.05 \times (\text{Plate Discipline Edge})$$

7.2 Weight Optimization

Weights were optimized empirically against run differential across all 30 MLB teams in April 2026. The optimization grid searched across hitter, starter, bullpen, park, depth, and discipline weights in 5-10 percentage point increments:

Model Version	r vs Run Diff	Key Change
v1: 50% hit / 50% SP	0.618	Baseline two-component model
v2: 40% hit / 60% SP	0.629	SP overweighted, marginal gain
v3: 50/20/20/5/5 (current)	0.675	Bullpen PSIQX (+2.72 pts), plate discipline (+2.96 pts) added

7.3 Individual Feature Contributions

Feature	Individual r	Contribution to Composite
Plate discipline edge	+0.555	+2.96 correlation points
Bullpen PSIQX edge	+0.551	+2.72 correlation points
Starter PSIQX edge	+0.515	Already in baseline model
Hitter SIQX edge	+0.409	Already in baseline model
Lineup depth edge	-0.078	+0.38 correlation points
Park factors	-0.196	+0.35 points (pending activation)

7.4 Posting Rules and Signal Classification

A pick is posted only when all four conditions are met simultaneously:

1. Pick team is the moneyline underdog (positive American odds)
2. Hitter SIQX edge is ≥ 5.0 points
3. Composite score is ≥ 5.0
4. Signal is Confirmed or Clean (mixed signal picks are never posted)

Signal classification is based on combined pitching edge ($0.5 \times \text{starter edge} + 0.5 \times \text{bullpen edge}$): $> +5 = \text{Confirmed}$; $< -5 = \text{Mixed}$; otherwise = Clean. Mixed signal picks appear in the Other Games section of the daily card for transparency but are excluded from the official pick record.

8. Feature Roadmap

The following features are implemented and active in the pipeline but currently serve as display context only. Each will be evaluated for composite inclusion when the sample reaches 150+ plate appearances per hitter (estimated mid-May 2026):

Feature	Current r	Status	Activation Condition
Rolling 14-day SIQX	0.085	Collecting	Revalidate at 150+ PA -- form signal too weak in April
Platoon splits (L/R)	No data	Collecting	4+ weeks of split data needed for meaningful validation
IL check	Qualitative	Active now	Flags probable starters on the 10-day IL
Weather adjustment	Qualitative	Active now	Wind $> 15\text{mph}$ at wind-sensitive parks (CHC, BOS, SF, COL, CLE)
Matchup score	0.320	Collecting	$r > 0.40$ required at 150+ PA per hitter
Park factors	+0.35 pts	Collecting	Mid-May revalidation with full weight optimization

9. Threats to Validity and Limitations

9.1 Internal Validity

- Sample size: Early-season data (40-75 PA per hitter) introduces noise. Behavioral profiles stabilize as the season progresses. The $r = 0.529$ validation was conducted with April 2026 data and may shift as sample sizes increase.

- Endogeneity: Some components (DSR, ZWP) may correlate with general athletic ability rather than isolating pure decision quality. Future work should control for physical capability proxies.
- Percentile ranking: SIQX is a relative metric. A player's score will change as the qualified pool changes, even if their raw plate discipline statistics remain constant.

9.2 External Validity

- Season generalization: The composite model was validated against April 2026 data only. Results may differ during playoff-caliber scheduling, pitcher injury periods, or roster expansion in September.
- Lineup construction: The model uses team average SIQX. Actual batting order weighting (positions 1-3 carrying more weight) is implemented but not yet validated for composite inclusion.
- Bullpen sample: Early-season bullpen PSIQX scores for some teams may run elevated due to limited reliever appearances. This is expected to normalize by mid-May as PA accumulates.

9.3 Construct Validity

- Behavioral vs. physical: SIQX measures decisions, not outcomes. A hitter with low hard contact quality (FIQ) may have a physical limitation rather than a decision failure. The model does not currently distinguish between these cases.
- Pitcher facing adjustment: PSIQX does not adjust for the quality of opposing lineups faced. A pitcher who generates high chase rates against weak lineups will score similarly to one who does so against elite lineups.

10. Live Pick Record

All picks and exclusions since composite model activation are documented below. The official record excludes mixed signal picks, a rule formalized after April 15, 2026 and applied retroactively:

Date	Pick	Signal	Composite	Result	Notes
Apr 15	MIN +114	Mixed	n/a	L	Excluded retroactively -- mixed signal rule
Apr 17	TOR +108	Confirmed	n/a	L	Official pick -- posted
Apr 18	No pick	--	< 5.0	--	No game cleared edge minimum
Apr 19	DET +113	Clean	n/a	W	Official pick -- posted
Apr 20 AM	DET +116	Mixed	2.6	L	Excluded -- mixed signal and below threshold
Apr 20 PM	No pick	--	< 5.0	--	Below composite threshold

Apr 21	No pick	Mixed	-5.95	--	MIN: SP PSIQX 16.4 (Woods Richardson) inverts composite
--------	---------	-------	-------	----	---

Official record (mixed signal excluded): 1 Win, 1 Loss

Full record (all posted picks): 1 Win, 3 Losses

Note: Small sample. Composite model validation ($r = 0.675$) reflects team-level correlation, not individual pick win rate.

11. References

Albert, J. (2017). A Bayesian analysis of a hitter's ability to hit for power. *Journal of Quantitative Analysis in Sports*, 13(1), 1-11.

Baseball Savant / Statcast. (2026). Custom leaderboard: plate discipline. Retrieved from baseballsavant.mlb.com.

MLB Stats API. (2026). Sports API documentation. Retrieved from statsapi.mlb.com.

Piette, J., and Anand, S. (2011). Hitting it out of the park: Economic and statistical analysis of baseball scoring. *Journal of Quantitative Analysis in Sports*, 7(4).

Tango, T., Lichtman, M., and Dolphin, A. (2006). *The Book: Playing the Percentages in Baseball*. Potomac Books.

12. About the Author

Stephen Bridwell is a Sr. Applied Scientist specializing in behavioral analytics, machine learning, and large-scale pattern detection systems. He holds a Master of Information and Data Science from the University of California, Berkeley, and a Master of Business Administration from the University of South Florida. SIQX is his applied research project at the intersection of behavioral science and baseball analytics.

He is the founder of Precision Baseball Academy in Tampa, FL, a player development program that applies data-driven methods to athlete development. His professional background in building behavioral detection systems at scale is the direct foundation of the SIQX methodology. The full SIQX methodology, validation statistics, and live pick record are documented in this paper and available at siqx.net.

Twitter / X	@SIQXindex
Website	siqx.net Methodology PDF available for download

Academy	precision-baseball-academy.com
LinkedIn	linkedin.com/in/stephenbridwell-a5b3b483

Version 1.0 -- April 2026. This is a living document updated as the model evolves through the 2026 season. Citation: Bridwell, S. (2026). SIQX: Situational IQ Index -- A Behavioral Intelligence Methodology for Major League Baseball. Working paper. siqx.net.