The GRAVITY Specification

Game-Rate Adjusted Value, Impact, Talent, and Yield

Technical Document · Version 3 · The Gravity Report

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Abstract

This document is the complete, citable specification of GRAVITY, the player-value system behind "The 644" rankings and every numbered research note published at `thegravityreport.com`. It defines all inputs, transformations, weights, adjustments, and boundary rules; the retrospective variant used for historical series; the rookie module; and the version history. Everything here is sufficient to reproduce the published numbers given the underlying data. Nothing here is a black box: where the system makes a judgment call (an exponent, a shrinkage constant, an injury discount), the call is stated, and the annual Forecast Audit grades what those calls produce.

1 What GRAVITY measures

GRAVITY asks two questions about every player. *How good is he per minute on the floor?* — estimated from box-score impact, scoring efficiency relative to offensive burden, creation, defensive activity, rebounding, rim pressure, and garbage-time-filtered lineup impact. *And how much of that ability does a team actually receive?* — estimated from games played, sustained role size, and documented injury status. The two multiply. GRAVITY is therefore a rating of *delivered value*, not pure talent: a per-minute star who cannot stay on the floor ranks below his talent, on purpose, by a stated amount.

In plain terms: GRAVITY = (how good per minute) × (how reliably he's on the floor), graded against the whole league by the same formula. The scale: 50 = an average NBA minute, 60+ = a quality starter, 80+ = a franchise engine. The 2025–26 maximum is Nikola Jokić at 97.8.

2 Notation and standardization

Let season y have qualifying player set $\mathcal{P}_y$, with player i playing m_i minutes. For any input statistic $x_k(i)$, define minutes-weighted moments and a clipped z-score:

$$\mu_k = \frac{\sum_{i\in\mathcal{P}_y} m_i\, x_k(i)}{\sum_i m_i}, \qquad \sigma_k = \left(\frac{\sum_i m_i (x_k(i)-\mu_k)^2}{\sum_i m_i}\right)^{1/2}, \qquad z_k(i) = \operatorname{clip}\left(\frac{x_k(i)-\mu_k}{\sigma_k},\ \pm 4\right). \tag{1}$$

Weighting by minutes means $z = 0$ is the *average NBA minute*, not the average roster spot; replacement level sits near -1.9. All standardizations are within-season, so a $+1\sigma$ season in 2020 and in 2026 mean the same thing relative to their leagues.

3 Component constructions

Seven constructed inputs feed the skill blend, each standardized via (1):

$$\begin{aligned}
\text{eff}(i) &= \big(\text{TS}(i) - \mu_{\text{TS}}\big) \times 100 \times \big(\text{clip}(\text{USG}(i), 8, 36)/20\big)^{0.7} && \text{efficiency under load,} && (2)\\
\text{creation}(i) &= \text{AST\%}(i) - 0.55\,\text{TOV\%}(i) && \text{playmaking net of waste,} && (3)\\
\text{load}(i) &= \text{USG}(i) + 0.4\,\text{AST\%}(i) && \text{shot + playmaking burden,} && (4)\\
\text{stocks}(i) &= 2.0\,\text{STL\%}(i) + 1.2\,\text{BLK\%}(i) && \text{defensive events,} && (5)\\
\text{rim}(i) &= 100 \cdot \text{FTr}(i) + 200 \cdot \text{dunk share}(i) && \text{rim pressure,} && (6)\\
\text{vol}(i) &= \text{points per 100 possessions} && \text{scoring volume,} && (7)\\
\text{reb}(i) &= \text{TRB\%}(i) && \text{rebounding.} && (8)
\end{aligned}$$

The exponent $0.7 > 0.5$ in (2) is a deliberate design choice: efficiency on a 34% usage burden is worth more than square-root usage curves grant, and empty-calorie efficiency at 14% usage correspondingly less.

4 Season impact

The skill blend and the season impact for the current season are

$$S(i) = 0.27\,z_{\text{vol}} + 0.19\,z_{\text{eff}} + 0.22\,z_{\text{crea}} + 0.09\,z_{\text{load}} + 0.10\,z_{\text{stk}} + 0.05\,z_{\text{reb}} + 0.08\,z_{\text{rim}}, \tag{9}$$

$$I_y(i) = \Big[0.44\,z_{\text{BPM}} + 0.12\,z_{\text{WS/48}} + 0.14\,z\big(\Delta_{\text{on/off}} \cdot \min(1, m_i/2400)\big) + 0.30\,S(i)\Big] \cdot \sqrt{\min(1, m_i/800)}, \tag{10}$$

where $\Delta_{\text{on/off}}$ is the garbage-time-filtered on/off differential (Cleaning the Glass), regressed by minutes before standardization. The trailing factor is a *within-season* shrink: a scorching 300-minute stretch regresses toward league average before it can move a ranking. Research Note №2 measured the year-to-year reliability of filtered on/off at $r = 0.317$ ($n = 184$ players with 1,000+ minutes in consecutive seasons) — which is why the term carries only 14% weight and a minutes regression.

5 Two-year blend and credibility

Two seasons blend with minute-proportional weights favoring the recent year, then shrink toward replacement $\rho = -1.9$ with credibility from actual two-year minutes:

$$w = \frac{0.75\,m_y}{0.75\,m_y + 0.25\,m_{y-1}}, \qquad R(i) = w\,I_y(i) + (1-w)\,I_{y-1}(i), \tag{11}$$

$$\tilde{R}(i) = c\,R(i) + (1-c)\,\rho, \qquad c = \sqrt{\min(m_y + m_{y-1},\ 2200)/2200}. \tag{12}$$

An established star with a short injury season keeps his track record; a 300-minute two-way contract is pulled firmly toward replacement.

6 Adjustments

6.1 Playoff evidence and age

$$\pi(i) = \mathrm{clip}\Big(0.12\,(\mathrm{BPM}^{po} - \mathrm{BPM}^{rs}) \cdot \min(1, m^{po}/300)/2.6,\ \pm 0.30\Big), \tag{13}$$

$$\alpha(i) = \mathrm{clip}\big(0.055\,(24 - \mathrm{age})\,[\mathrm{age} \le 23] - 0.045\,(\mathrm{age} - 30)\,[\mathrm{age} \ge 31],\ -0.30,\ +0.25\big). \tag{14}$$

6.2 Reliability multipliers

$$A(i) = 0.78 + 0.22\ \min\big(1,\ (0.7g_y + 0.3g_{y-1})/55\big) \qquad \text{availability,} \tag{15}$$

$$\Phi(i) = 0.62 + 0.38\ \min\big(1,\ \max(\mathrm{mpg}_y,\ 0.85\,\mathrm{mpg}_{y-1})/32\big) \qquad \text{role size,} \tag{16}$$

$$J(i) \in [0.78,\ 1.00] \qquad \text{documented injury override.} \tag{17}$$

Injury overrides are manual, sparse, and published. Table 1 lists every override active in v3.

Table 1: All injury overrides in v3 (July 2026). Nothing else is hand-adjusted.

Player	Documented reason	J
Damian Lillard	Achilles tear Apr 2025; missed all 2025–26; age 36	0.78
Donte DiVincenzo	Achilles tear 2026 playoffs; out most of 2026–27	0.80
Jimmy Butler	ACL tear Jan 19, 2026; out until ∼Feb 2027	0.80
Tyrese Haliburton	Achilles tear Jun 2025; missed all 2025–26	0.82
Kyrie Irving	ACL tear Mar 2025; missed all 2025–26	0.88
Fred VanVleet	ACL tear 2025 offseason; missed all 2025–26	0.88
Bradley Beal	hip surgery ended 2025–26 after 6 games	0.90
Dejounte Murray	Achilles rehab; 14 games in 2025–26	0.90
Jayson Tatum	Achilles return Mar 2026; strong 16-game sample	0.95
Ja Morant	injury-marred 20-game 2025–26 (elbow UCL)	0.95
Joel Embiid	chronic knee management; 38 games	0.97

7 The final scale and tiers

$$G(i) = 50 + 15\Big[\rho + \big(\tilde{R} + \pi + \alpha - \rho\big) \cdot A \cdot \Phi \cdot J\Big]. \tag{18}$$

Table 2: Tier definitions (fixed score cuts, not fixed counts).

Tier	Name	GRAVITY score
T1	Franchise engines	≥ 80
T2	All-NBA core	66–80
T3	All-Star tier	60–66
T4	Plus starters	56–60
T5	Solid starters	53–56
T6	High-leverage rotation	50–53
T7	Rotation	46–50
T8	Fringe & developmental	40–46
T9	Deep bench, two-ways & stashes	< 40

8 The retrospective variant (GRAVITY-RS)

Filtered on/off is not uniformly available for early seasons, so historical series (career arcs, comparables engines) use GRAVITY-RS: delete the on/off term from (10) and renormalize,

$$I_y^{RS}(i) = \left[0.533\, z_{\mathrm{BPM}} + 0.133\, z_{\mathrm{WS/48}} + 0.333\, S'(i)\right] \cdot \sqrt{\min(1, m_i/800)}, \tag{19}$$

with S' using prior-season skill weights (0.28/0.21/0.22/0.09/0.10/0.06/0.04; rim term reduced to free-throw rate only).

9 The rookie module

Draftees with no NBA minutes enter via a draft-slot prior mapped onto the current veteran score distribution, adjusted by college production:

$$\mathrm{prod} = 0.5\, z^c_{\mathrm{BPM}} + 0.2\, z^c_{\mathrm{TS}} + 0.15\, z^c_{\mathrm{USG}} + 0.15\, z^c_{\mathrm{WS/40}}, \qquad \Delta_{\mathrm{pct}} = \mathrm{clip}(5\,\mathrm{prod},\ \pm 8), \tag{20}$$

where z^c standardizes within the draft-class cohort. Slot priors (league percentile): pick 1 → 84; 2–3 → 78; 4–7 → 66; 8–14 → 56; 15–22 → 46; 23–30 → 38; 31–45 → 28; 46–60 → 20; minus 0.06 per pick as a tie-break.

Known deficiency, scheduled for v4: Research Note №1 showed the production blend (20) would have graded 2019-prospect Ja Morant as ordinary while his college assist rate sat $+3.5\sigma$ above the 2026 cohort — creation is the one skill his collapse never touched. A creation term enters the rookie blend at the next model revision, before the All-Star 2027 edition.

10 Version history and edition calendar

Table 3: Versions are model changes; editions are publications. Old editions are never revised.

	Date	Change
v1.0	Jul 10, 2026	Initial specification; The 644 computed (644 players).
v2	Jul 10, 2026	Butler injury override added after fact-check (ACL Jan 19, 2026); his rank moved #13 → #58. Correction published same day.
v3	Jul 10, 2026	CTG garbage-time-filtered on/off integrated for both blend years (matched 278 of 279 players with 1,000+ minutes); bbref raw on/off retained as fallback below the match threshold.
Edition calendar: Jul 2026 (FINAL) → All-Star Break Feb 2027 → End of Season Apr 2027 → Post-Playoffs Jun 2027 + Forecast Audit №1 (grades the registered Queta forecast).		

11 Data sources and reproducibility

Season inputs: Basketball-Reference league tables (advanced, per-100-possession, play-by-play, shooting; regular season and playoffs), 2019–20 through 2025–26. Lineup inputs: Cleaning the Glass subscriber database (filtered on/off; licensed, not redistributable — published outputs are derived values). College inputs: Sports-Reference CBB. Each edition of The 644 publishes its full

output table as CSV alongside the interactive database. No external player rankings, projections, or draft boards are consulted at any stage of the pipeline.

Known limitations. Box-score composites undervalue tracking-invisible defense (the Draymond Green problem, flagged in every affected placement); filtered on/off is two-thirds noise year-over-year and is weighted accordingly; rookie placements are priors, not measurements; availability and role discounts are stated choices, and a pure talent ranking would order some players differently.

Citation

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`https://thegravityreport.com`