

# Personal Bests as Reference Points

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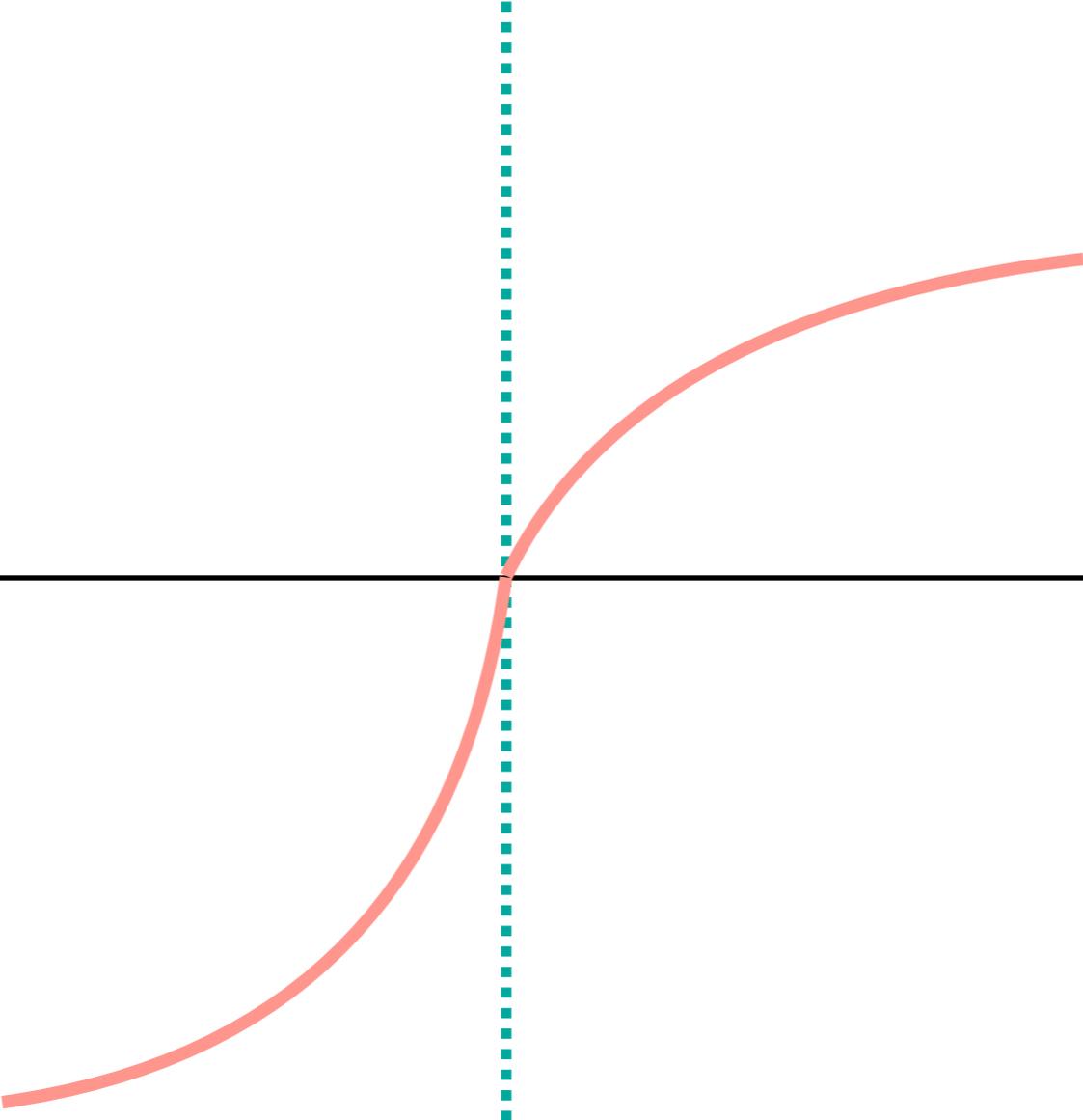


BEAR Research Retreat 2018  
Toronto

**Losses**



**Gains**



**Reference Point**

**Where do reference points come from?**

# Prior Work

## Where do reference points come from?

- Goals provide reference points [Heath, Larrick, Wu, 1999]
- Goals tend to be externally generated (e.g. round numbers [Pope & Simonsohn, 2010])
- Reference points can be internally generated (e.g. expectations [Mellers et al., 1997])

# **This Work**

**Personal bests are an internally generated goal**

# This Work

**Personal bests are an internally generated goal**

**More effort when just short of a personal best**

**Less motivation after setting a new personal best**

# Personal Bests

- Athletes and fastest times or best statistics
- Students and test scores
- Teachers and course evaluations
- Real estate agents and commissions
- Salespeople and monthly records
- Traders and portfolio valuations



# Personal Bests

“There is nothing noble in being superior to your fellow man; true nobility is being superior to your former self.”

— Ernest Hemingway

# Difficulties

**Personal bests** cannot be randomly assigned

# Difficulties

Personal bests are necessarily rare

# Solution

The screenshot displays the BabasChess interface. The main window shows a chessboard with pieces and a move list. The move list includes:

- 1. e4 e5
- 2. Qf3 d6
- 3. d4 cxd4
- 4. Qxd4 Qf6
- 5. Qc3 a6
- 6. Ag5 e6
- 7. f4 Ae7
- 8. Wf3 Wc7
- 9. O-O-O Qb7
- 10. Qb1 b5
- 11. Ad3 d7
- 12. Ehel g4
- 13. Dec Qc5
- 14. g4 Qf6
- 15. We1 Qe7
- 16. f3 g5
- 17. Rxd3 e5
- 18. Qf5 O-O
- 19. Qeg3 Wf8
- 20. Qh5 Ae8
- 21. Wh3 e4
- 22. Rb3 Rxc8
- 23. Re1 d5
- 24. Wh4 d4
- 25. Qf6+ gxf6
- 26. Eh5 h6
- 27. Qxh6+ Axh6
- 28. Wxh6 d3
- 29. Wh8#

The console window shows the following chat messages:

```
-----  
FICS web page: http://www.freechess.org - add a link to FICS from your page  
-----  
Index of new news items:  
1465 (Mon, Dec 12) Support a research project  
1469 (Sat, Mar 8) SR sought to maintain the interfaces webpage  
1471 (Sun, Mar 11) 10th DESC Open Team Tournament (E mail)  
1473 (Tue, Mar 18) Relay Operators Wanted! Here's an opportunity to help out on FICS!  
1474 (Sun, Apr 15) xboard 4.6.1 released  
1475 (Sun, Apr 22) YaFi 0.6.25 for Android - Released.  
1477 (Wed, May 16) STC Bunch May Mania Rd3 Delayed  
1478 (Mon, May 28) ficsgames.com is Ficsgames.org now  
1479 (Mon, Jun 4) STCBunch Changes Website Address  
1480 (Tue, Jun 11) FICS 2012 FICS Championship 2012  
-----  
Present company includes: hafo.  
You have 6 adjourned games.  
1 player, who has an adjourned game with you, is online:  
kaupermond  
You are no longer examining game 27.  
Game 27: NoPawnPlease goes forward 999 moves.  
Game 27: Black checkmated 1-0  
:wamer(TD) t-shouts: 1 0 r SS\9 tourney: "td join 46" to join.
```

The info window shows a table of players:

#	White rat..	White name	Black rat..	Black name	Time	Type
1	---	Najdorf	---	Nunn	0 0	unrated untimed (examine)
2	++++	GuestYWFP	++++	GuestTR/N	2 12	unrated blitz
3	1113	stroms	1180	kbourne	6 0	rated blitz
4	++++	JFMU	++++	GuestHEH	10 0	unrated blitz
5	2133	bistrometh	1580	diproditz	15 15	rated standard
6	1555	nobledictat	1435	diaoyuches	15 0	rated standard
7	++++	GuestWCVC	++++	GuestKMYB	30 5	unrated standard

Online Chess

# Solution

The screenshot displays the BabasChess interface during a game. The main window shows a 15x8 chessboard with pieces. The game title is "NoPawnPlease vs. kropolsky [27]". The player "kropolsky (1903)" is shown with a timer of 10:09 and a lag indicator. The player "NoPawnPlease (1982)" is shown with a timer of 8:26 and a lag indicator. The console window shows a list of moves, with the 21st move highlighted: "21. ♖h3 e4". The info window shows a list of players and their ratings.

Console (connected)

```
-----  
FICS web page: http://www.freechess.org - add a link to FICS from your page  
-----  
Index of new news items:  
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1469 (Sat, Mar 8) SR sought to maintain the interfaces webpage  
1471 (Sun, Mar 11) 13th DESC Open Team Tournament (E-mail)  
1473 (Tue, Mar 13) Relay Operators Wanted! Here's an opportunity to help out on FICS!  
1474 (Sun, Apr 15) xboard 4.6.1 released  
1475 (Sun, Apr 22) YaFi 0.6.25 for Android - Released.  
1477 (Wed, May 16) STC Bunch May Mania Rd3 Delayed  
1478 (Mon, May 28) ficsgames.com is ficsgames.org now  
1479 (Mon, Jun 4) STCBunch Changes Website Address  
1485 (Fri, Sep 14) FICS Lightning Championship 2012  
("news <n>" will display item number 'n')  
  
You have 8 messages (8 unread).  
Use "messages u" to view unread messages and "clearmessages *" to clear all.  
  
Present company includes: hajjo.  
  
You have 6 adjourned games.  
1 player, who has an adjourned game with you, is online:  
kaupermond  
You are no longer examining game 27.  
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Info window

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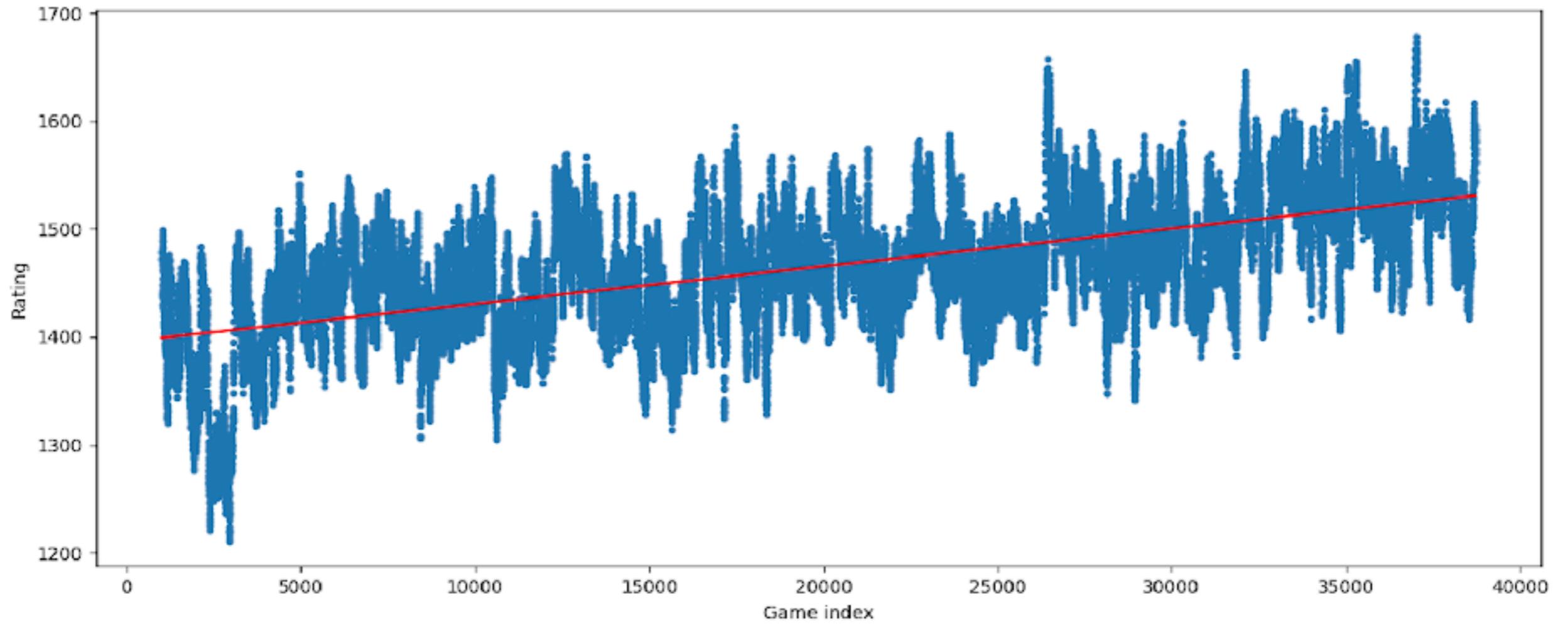
# Online Chess

**We study behaviour around 133 million chess games played by 70,000 players over a 15-year period**

**Chess ratings measure a player's ability**

**Examine motivation near personal best ratings**

# One Player



# Player Profile

	rating	RD	win	loss	draw	total	best
Blitz	1464	41.3	5638	7092	747	13477	1573 (12-Nov-2016)
Standard	1723	193.8	142	116	19	277	1740 (16-Aug-2012)
Lightning	1469	77.1	17	66	4	87	1484 (07-Dec-2016)

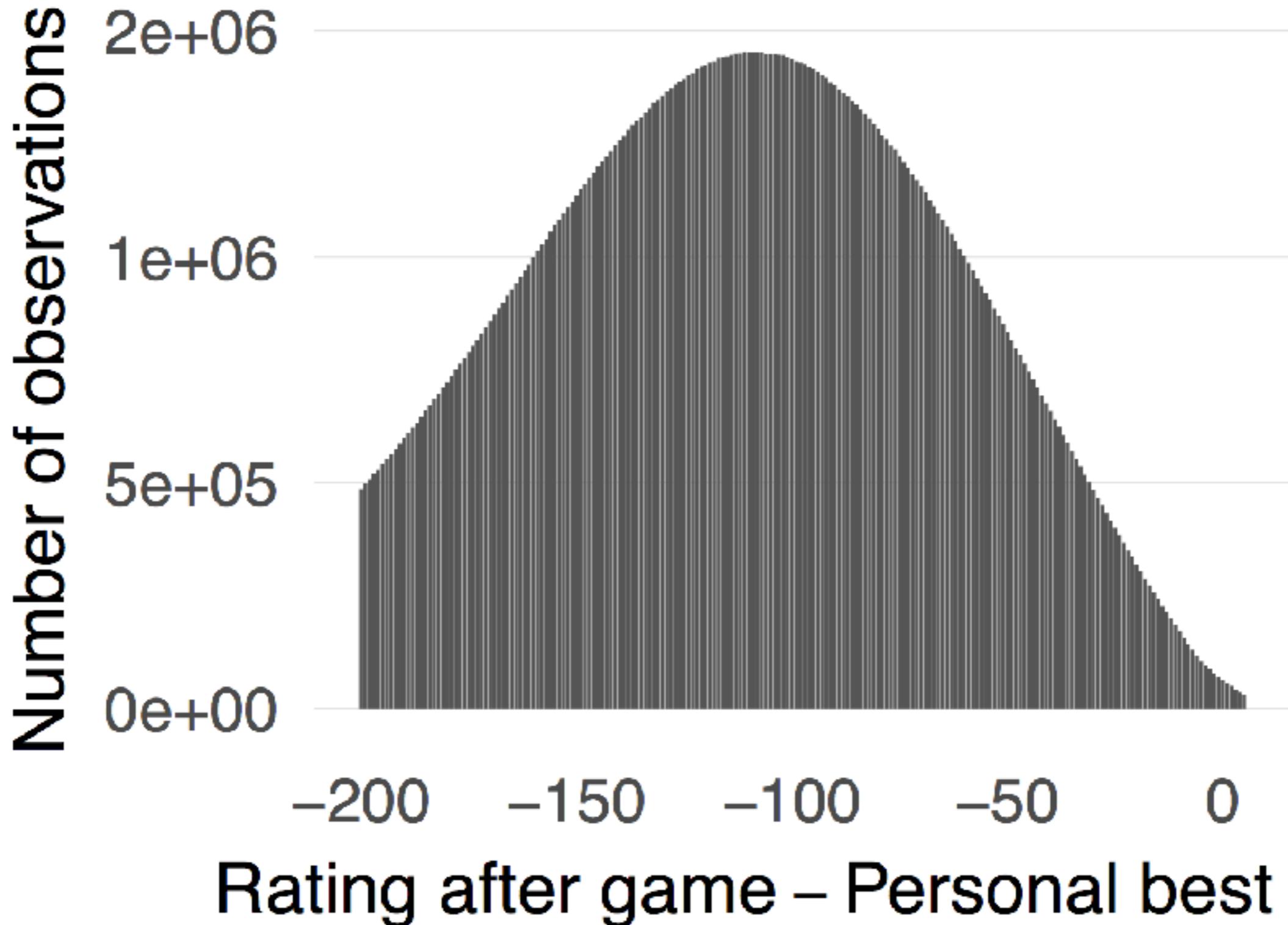
# Player Profile

	rating	RD	win	loss	draw	total	best
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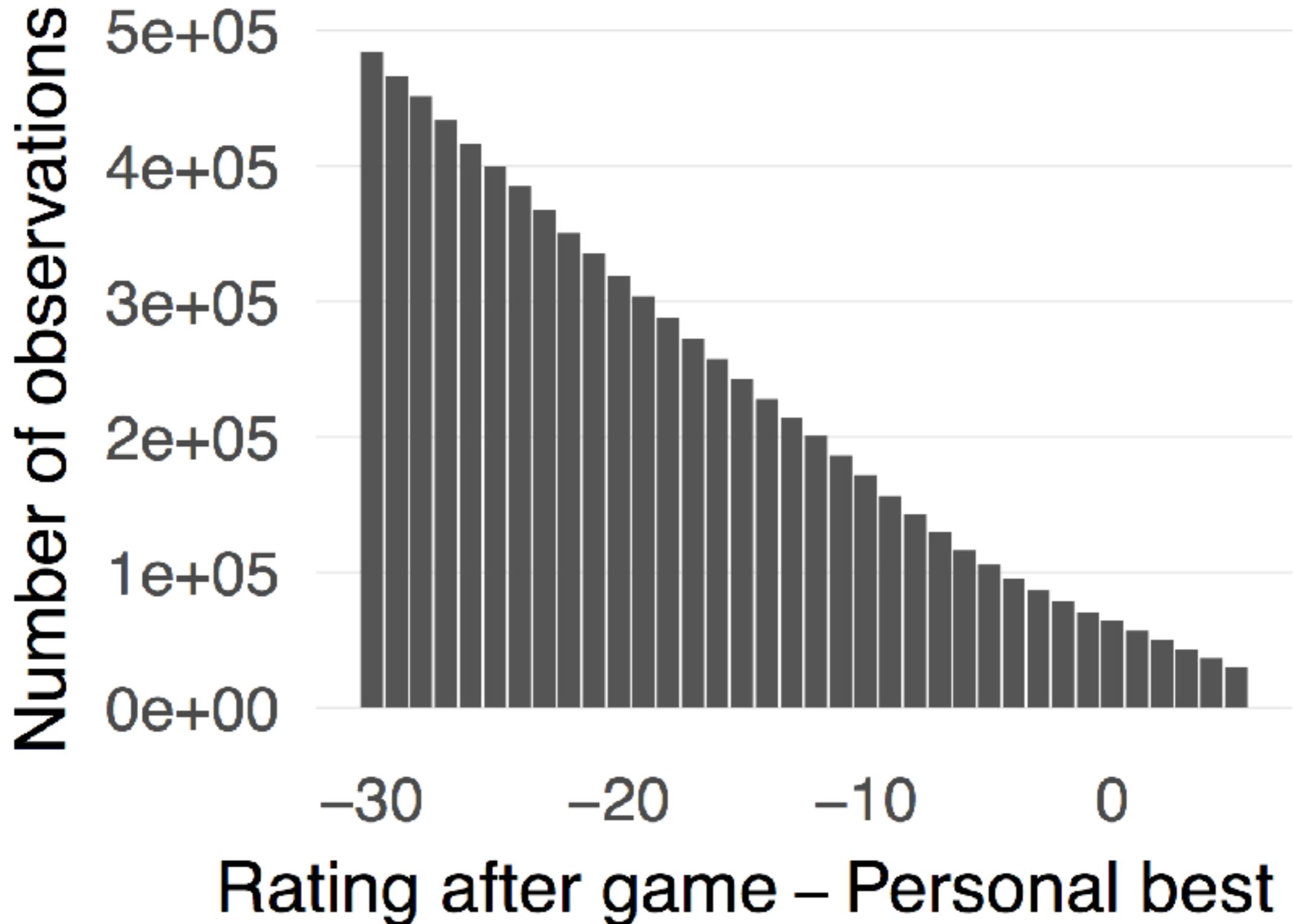
$$1464 - 1573 = -91$$

**At any one time, your current rating is a certain distance away from your personal best**

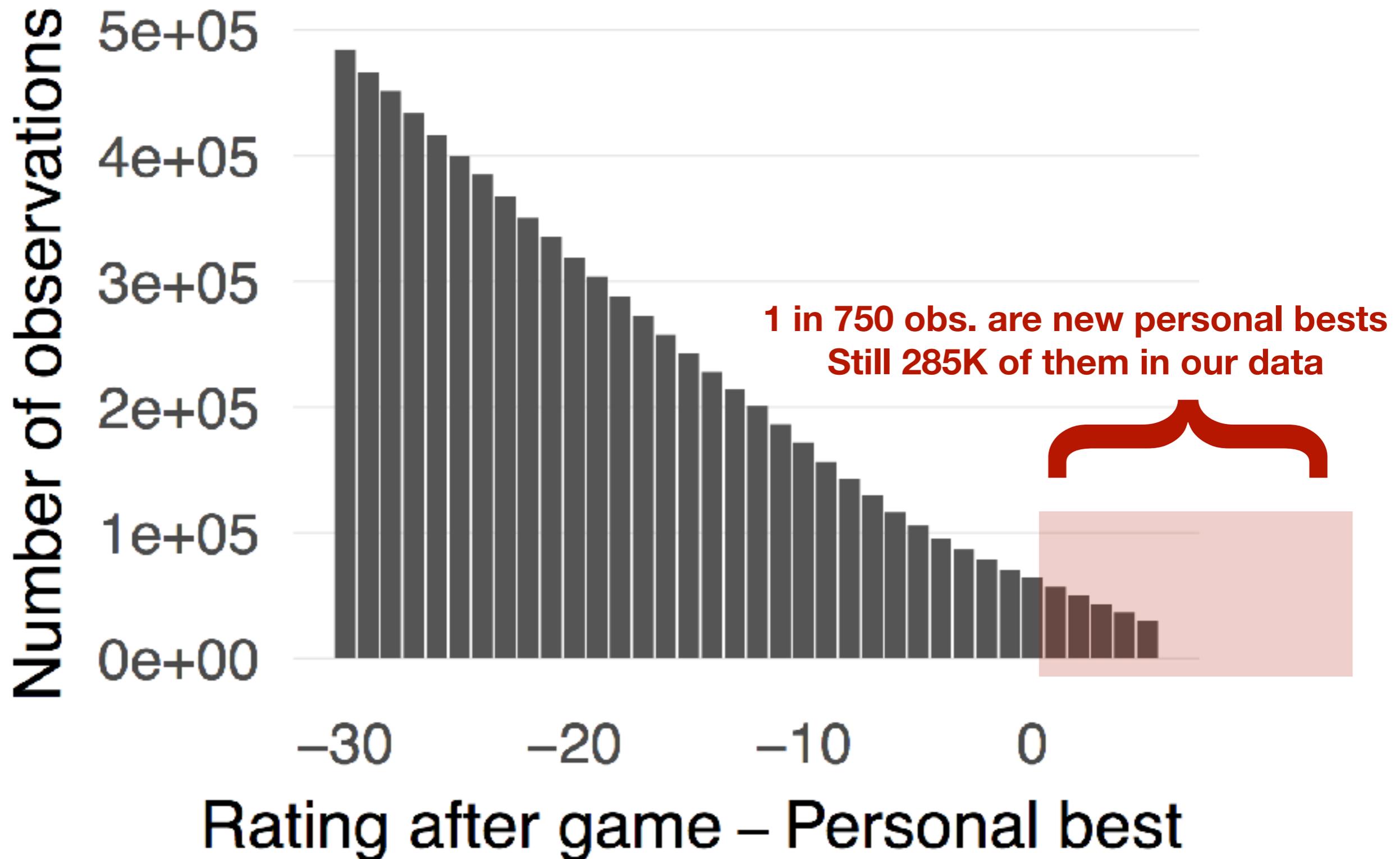
# Distribution of Ratings



# Distribution of Ratings



# Distribution of Ratings



# Predictions

**What should we expect if players treat their personal best as a reference point?**

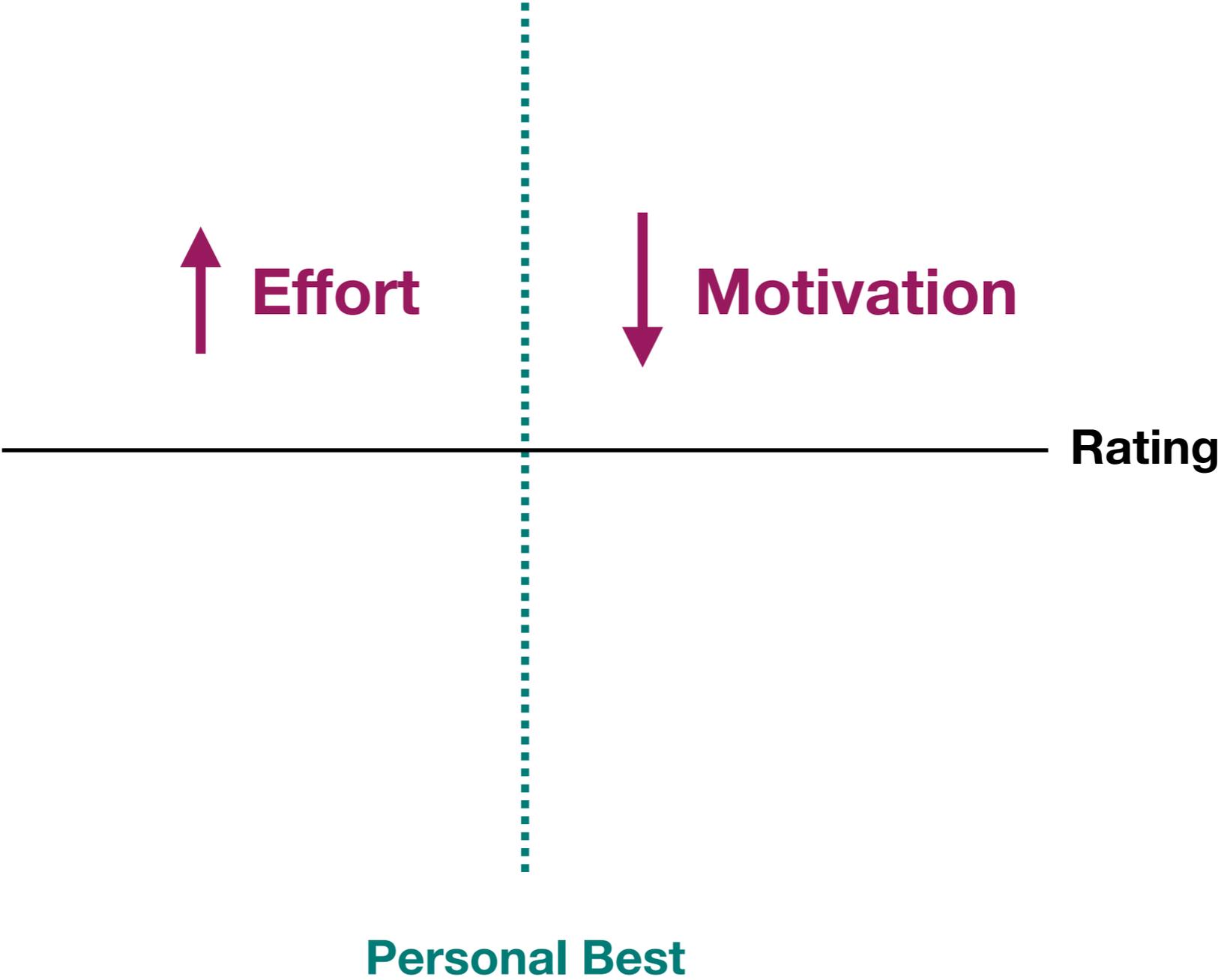
# Predictions

**Our simple prospect theory utility model predicts:**

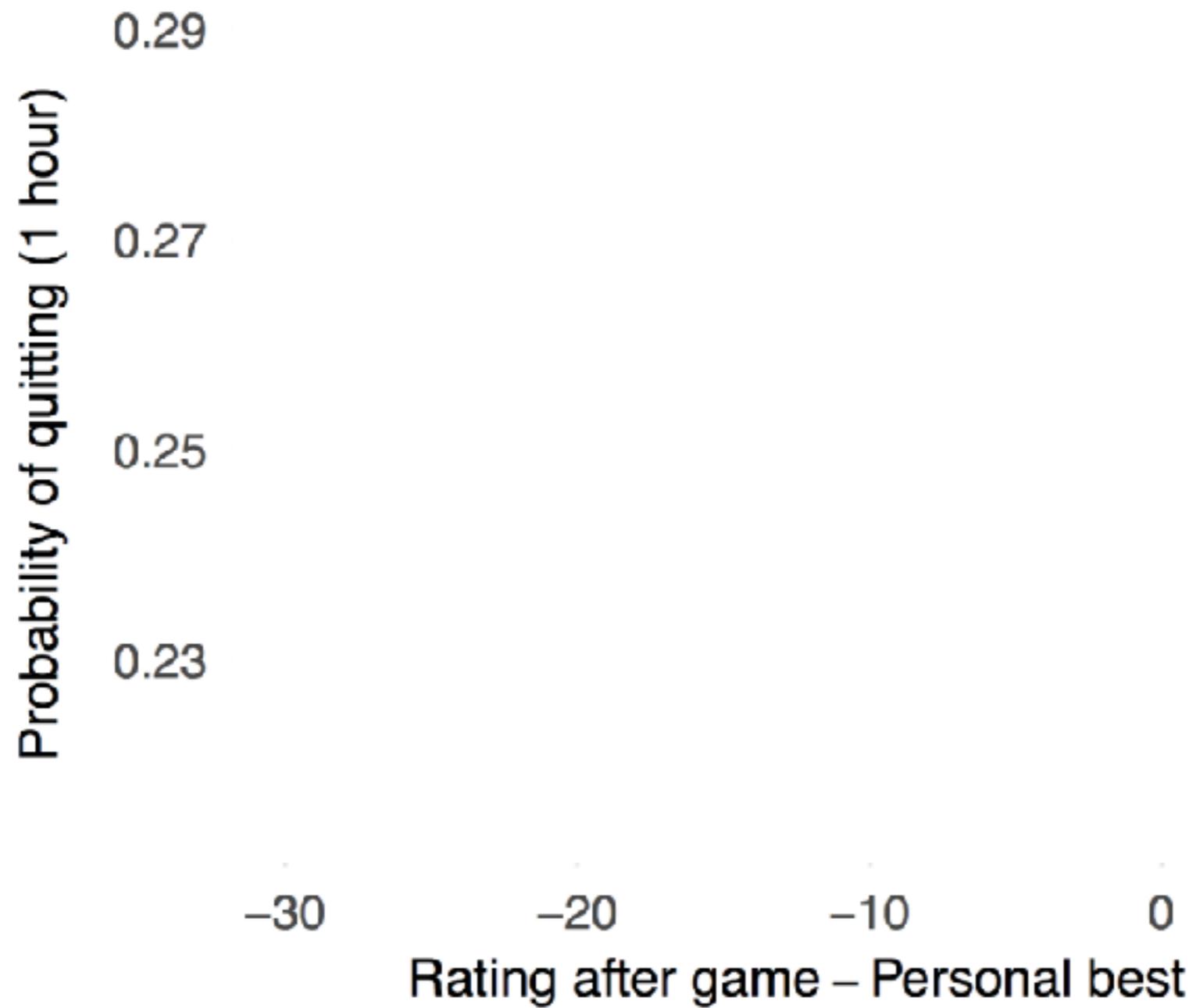
**1. Less motivation after personal best:**

discontinuous jump in leaving after setting a personal best

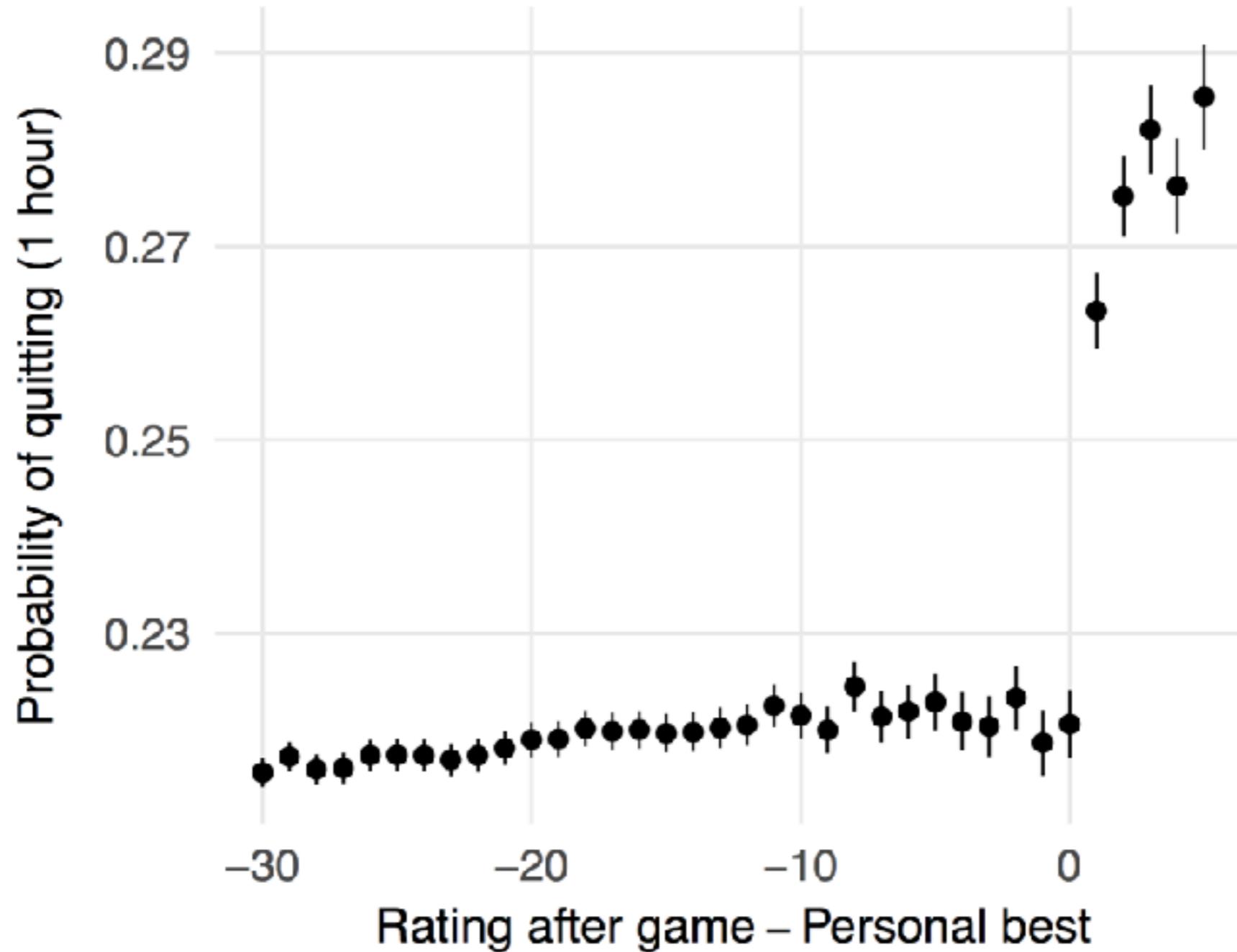
**2. More effort before personal best:** in-game effort increases as players approach a personal best



# 1. Quitting



# 1. Quitting



**discontinuous jump after setting a personal best**

# 1. Quitting

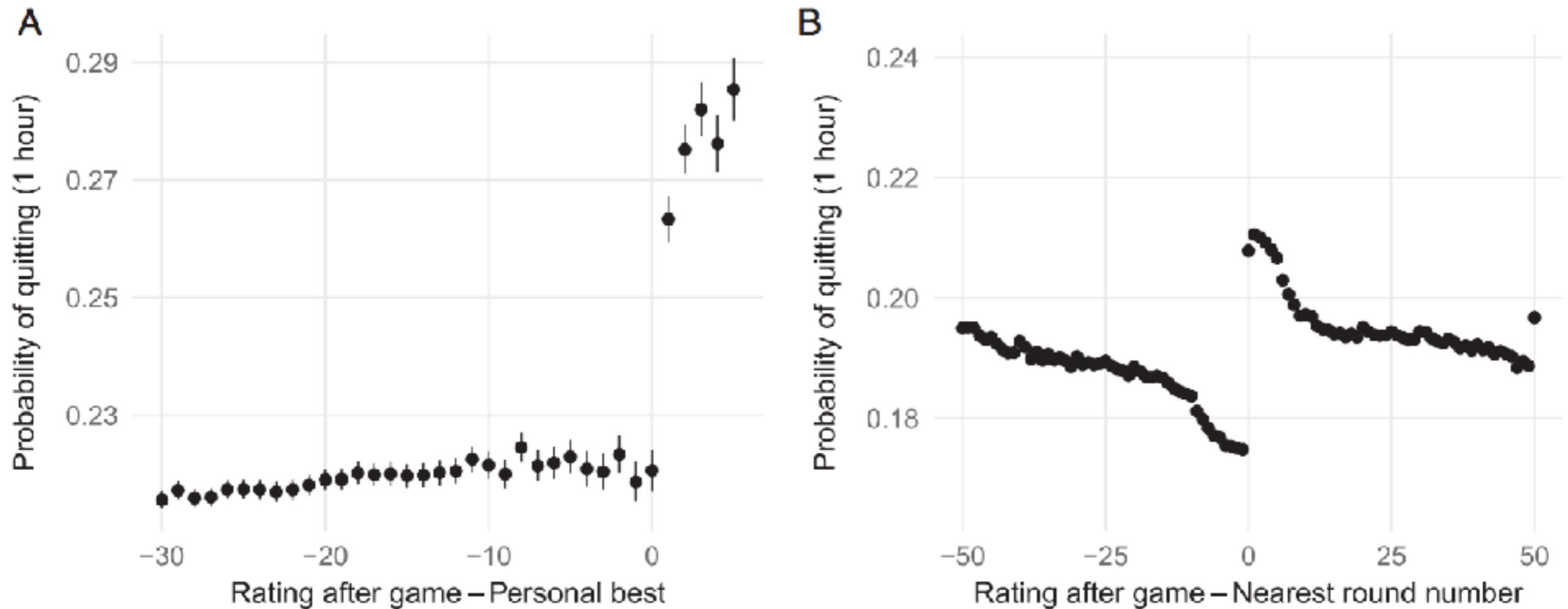
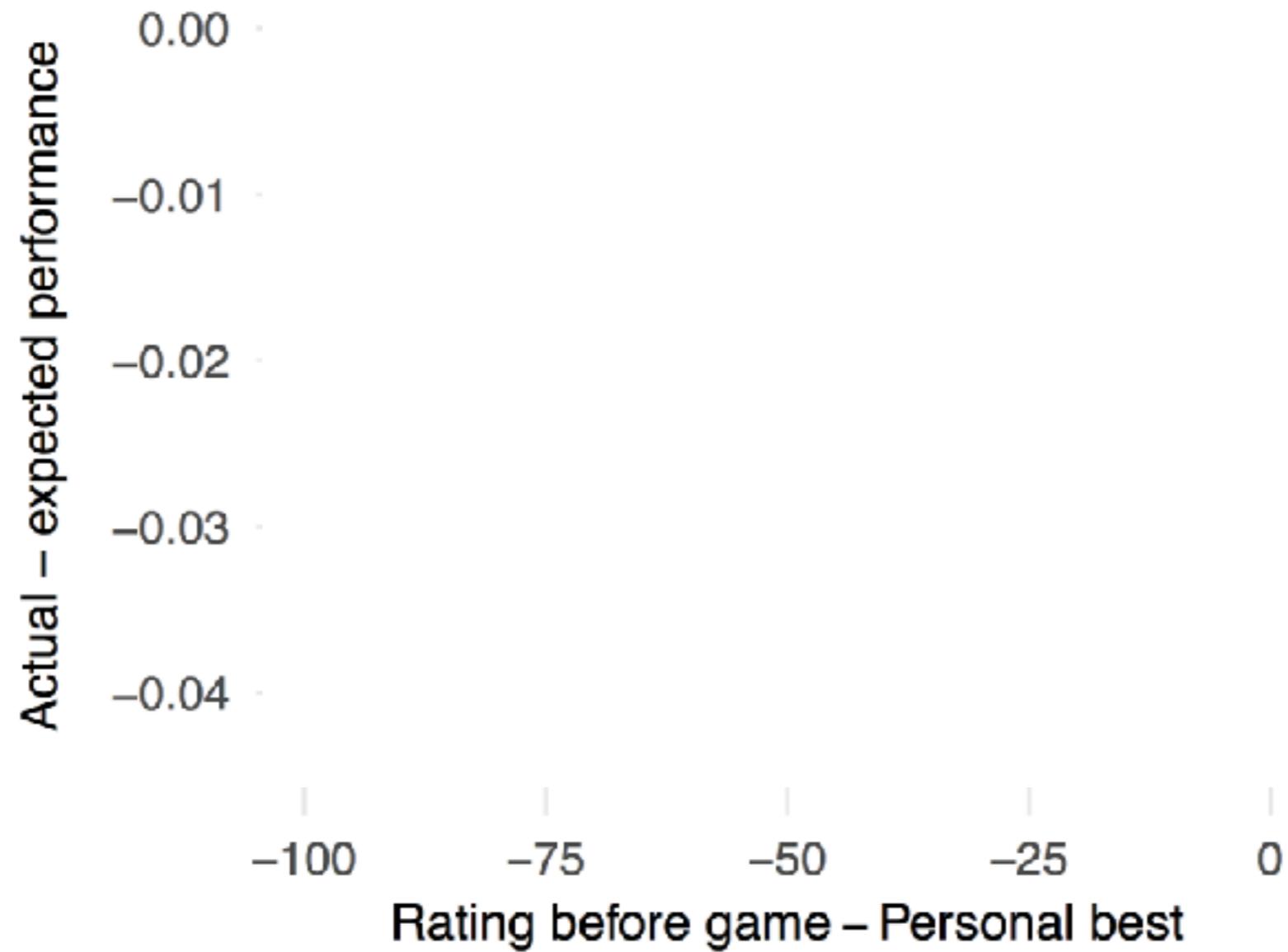


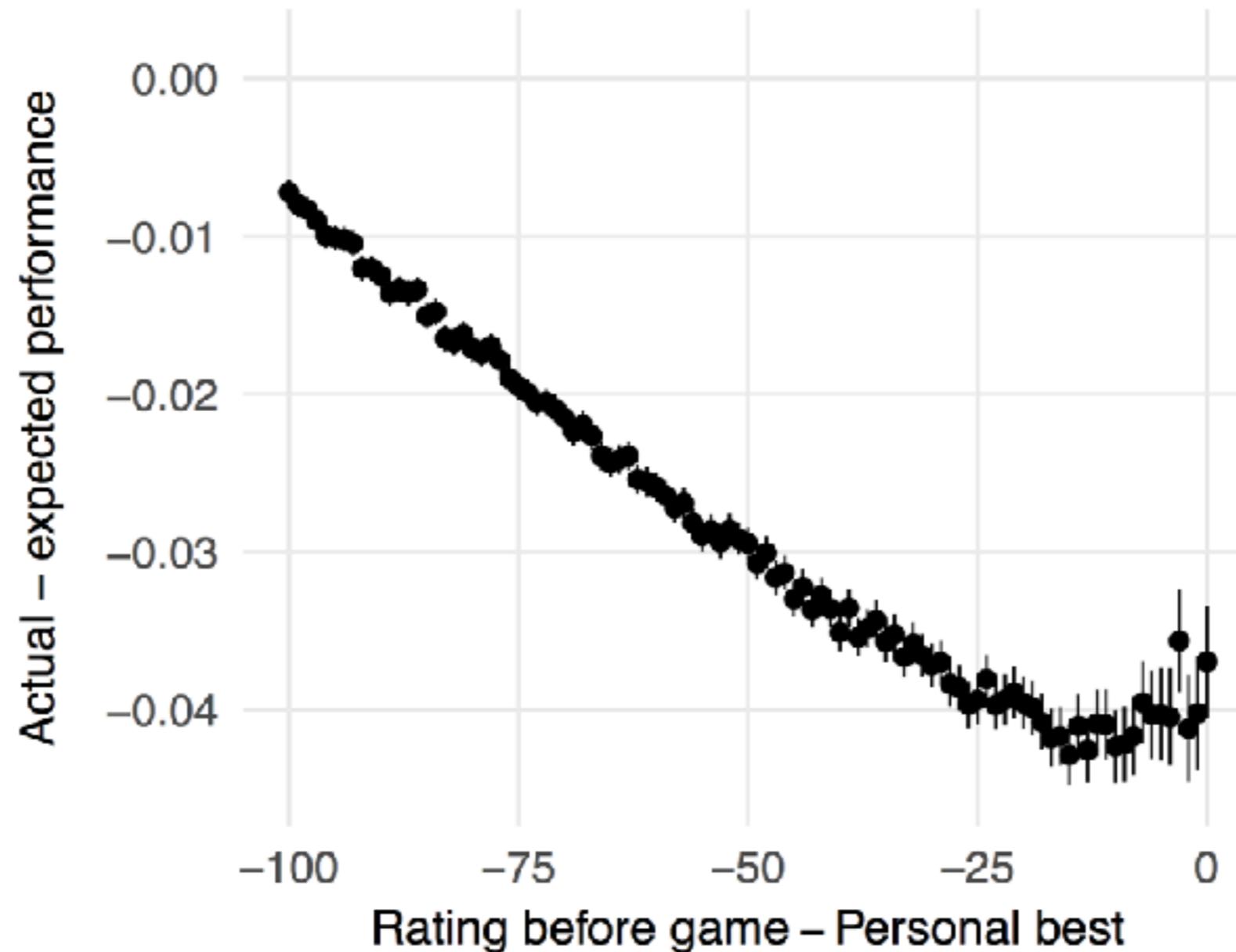
Fig. 3. Probability of quitting for at least 1 h around personal bests (A) and round numbers (B), with 95% confidence intervals.

Personal bests motivate as powerfully as round numbers

## 2. Effort (Performance relative to expectations)

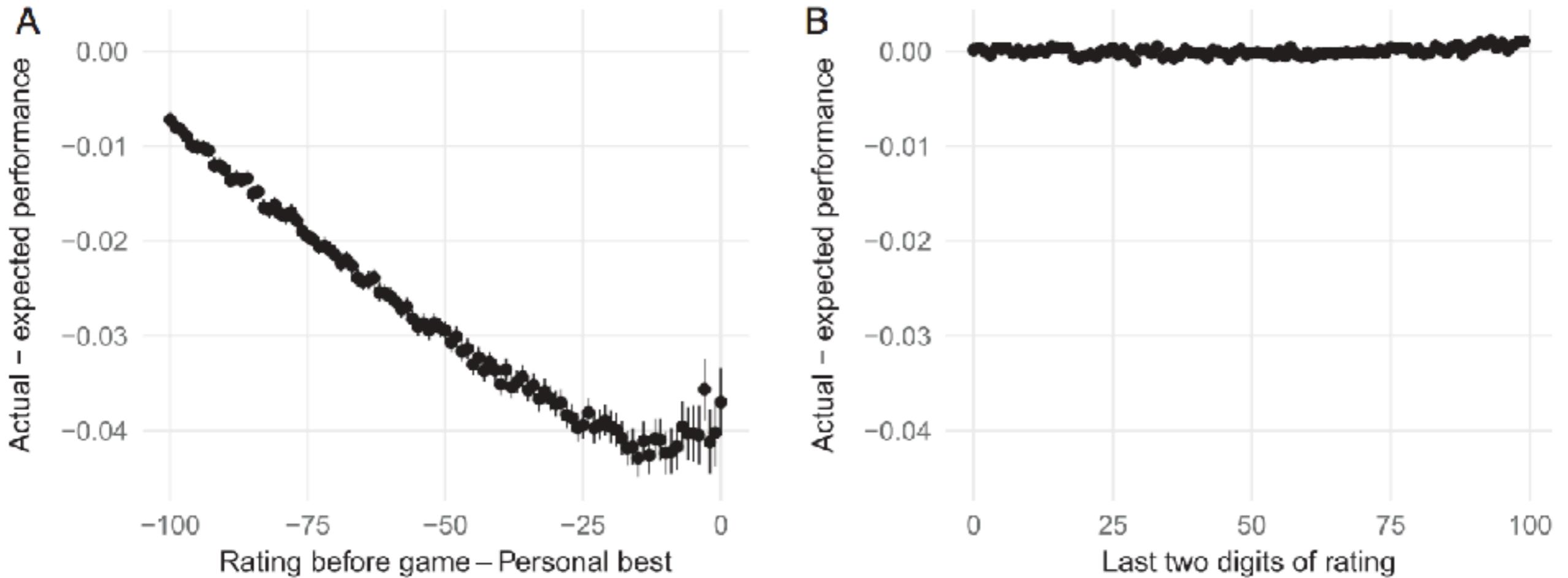


## 2. Effort (Performance relative to expectations)



**in-game effort increases as players approach a personal best**

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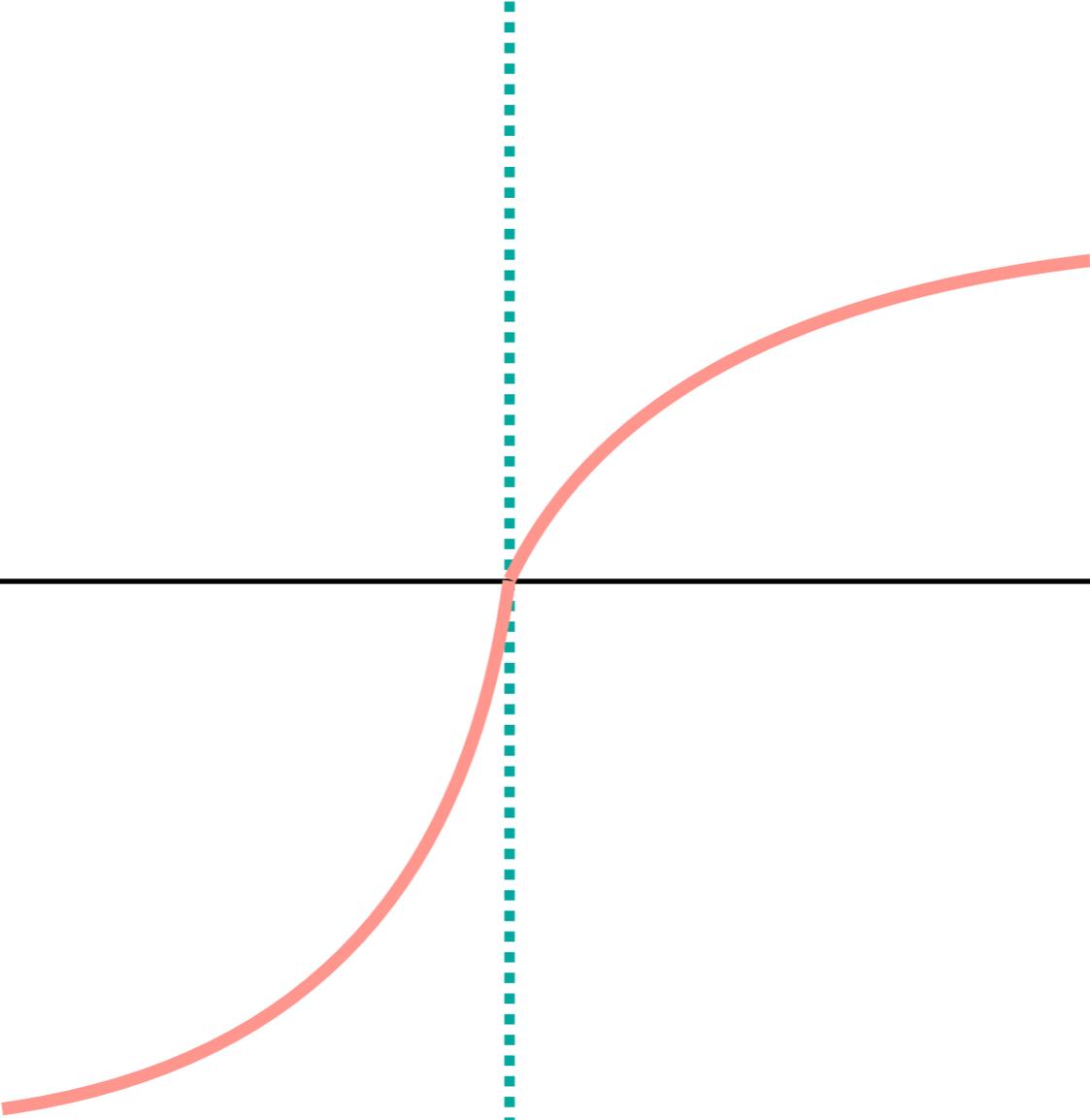
**Fig. 4.** Performance short of personal bests (A) and round numbers (B), with 95% confidence intervals.

**Personal bests motivate much more than round numbers**

**Losses**



**Gains**



**Personal Best**

# Personal Bests

**Measurement of performance is proliferating:**

Step counters, calorie tracking, weight loss

Test scores, course reviews

Finances, monthly spending

**These advances may motivate people  
to try to be their best selves**

# Personal Bests

In seminal work [Locke & Latham], **specific** and **difficult** goals motivate more than vaguely saying “do your best”

Here we find that your **personal best** is a specific and individually calibrated goal  
...and it motivates as a reference point

# Thanks

People exert more effort to achieve personal bests  
and quit while they're ahead

PNAS PNAS

## Personal bests as reference points

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**Personal bests act as reference points. Examining 133 million chess games, we find that players exert effort to set new personal best ratings and quit once they have done so. Although specific and difficult goals have been shown to inspire greater motivation than vague pronouncements to “do your best,” doing one’s best can be a specific and difficult goal—and, as we show, motivates in a manner predicted by loss aversion.**

reference points | personal bests | loss aversion | motivation | goals

There is nothing noble in being superior to your fellow man; true nobility is being superior to your former self.

Attributed to Ernest Hemingway

duct comparable tests for round-numbered ratings. Whereas personal bests influence both decisions over whether to play and how much effort to exert during games, round numbers only influence decisions over whether to play.

The literature on goal setting concludes that specific and appropriately difficult goals inspire greater motivation than vague pronouncements to “do your best” (14, 15). Yet, when performance is quantifiable, doing one’s best is a specific goal. It is also calibrated to be appropriately difficult (cf. ref. 16)—rarely impossible, and, if too easy, quickly surpassed and reset. We show that people exert effort to do their best and quit once they have done so, consistent with loss aversion around personal best reference points.

<http://www.pnas.org/content/115/8/1772>

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