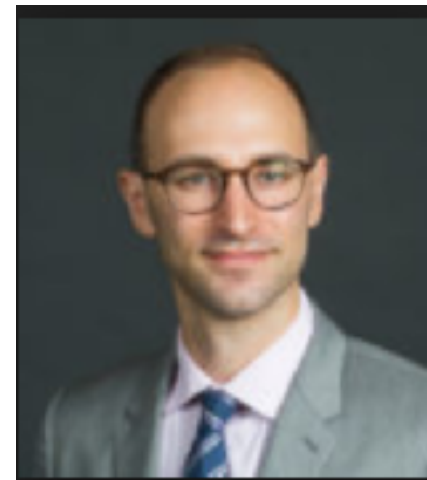# Personal Bests as Reference Points

Ashton Anderson
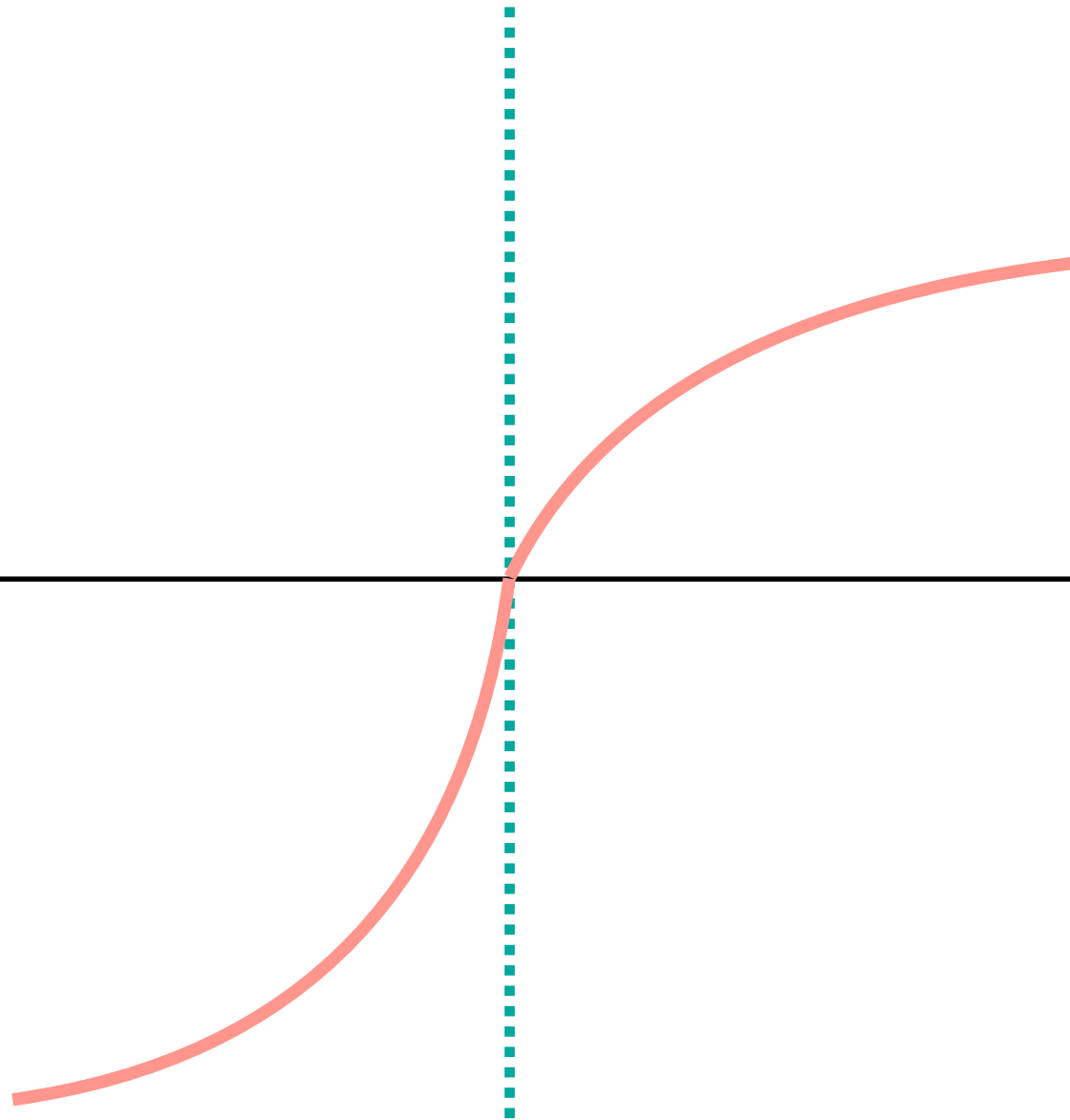**University of Toronto**

Etan Green
Wharton

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

Online Chess

Solution

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
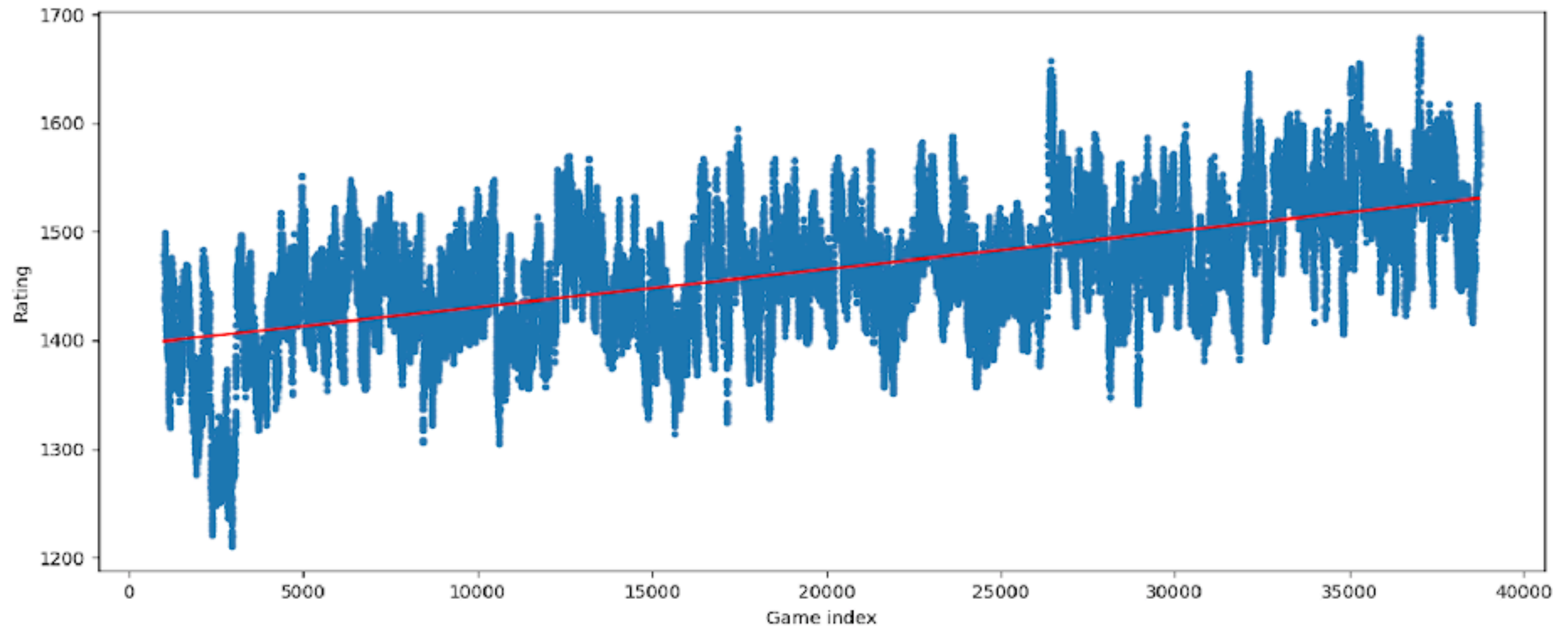
Player Profile

	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

Number of observations

2e+06

1e+06

5e+05

0e+00

−200   −150   −100   −50   0

Rating after game − Personal best
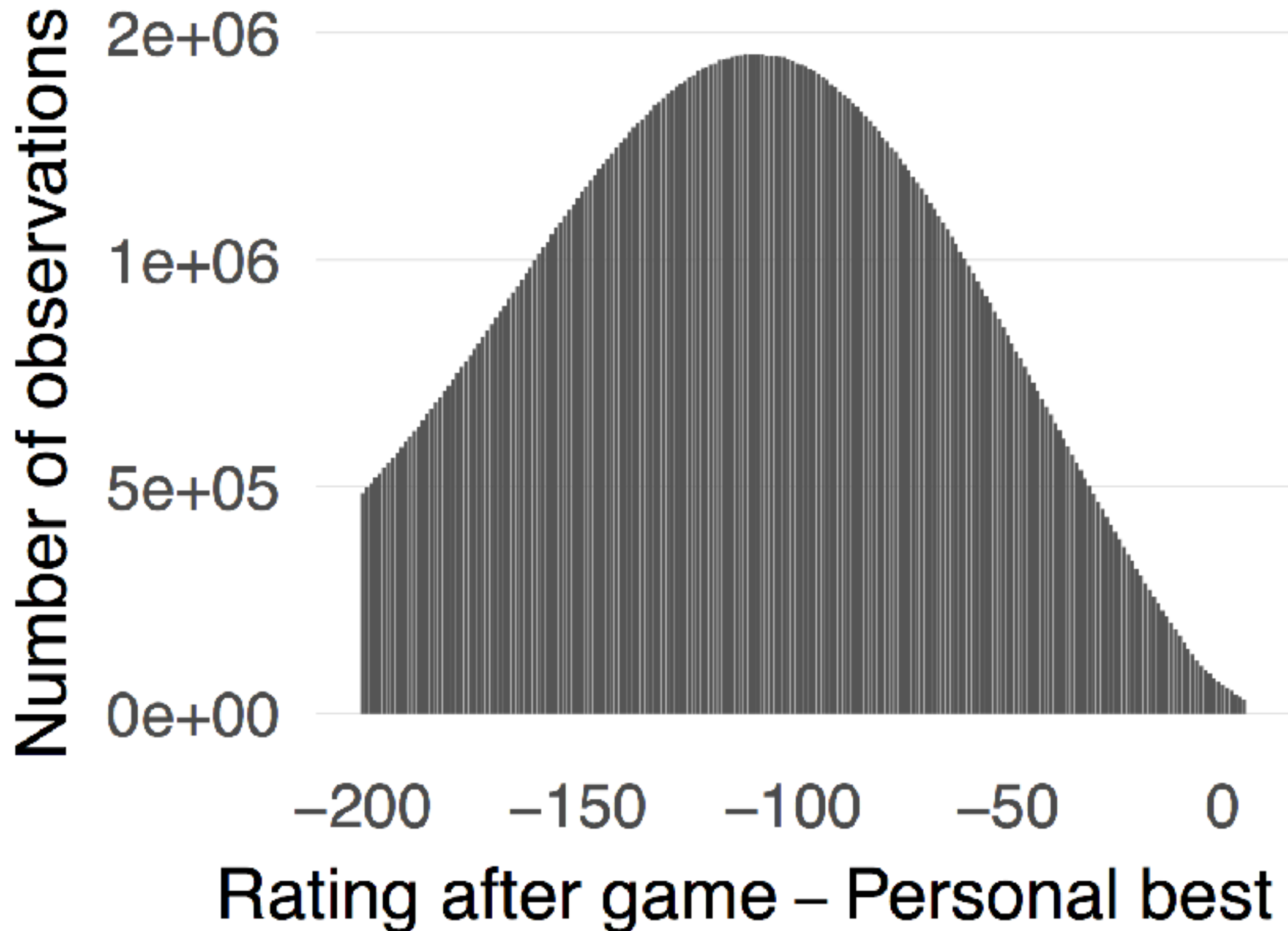
Distribution of Ratings

Distribution of Ratings

1 in 750 obs. are new personal bests
Still 285K of them in our data

Number of observations

5e+05
4e+05
3e+05
2e+05
1e+05
0e+00

−30   −20   −10   0

Rating after game − Personal best
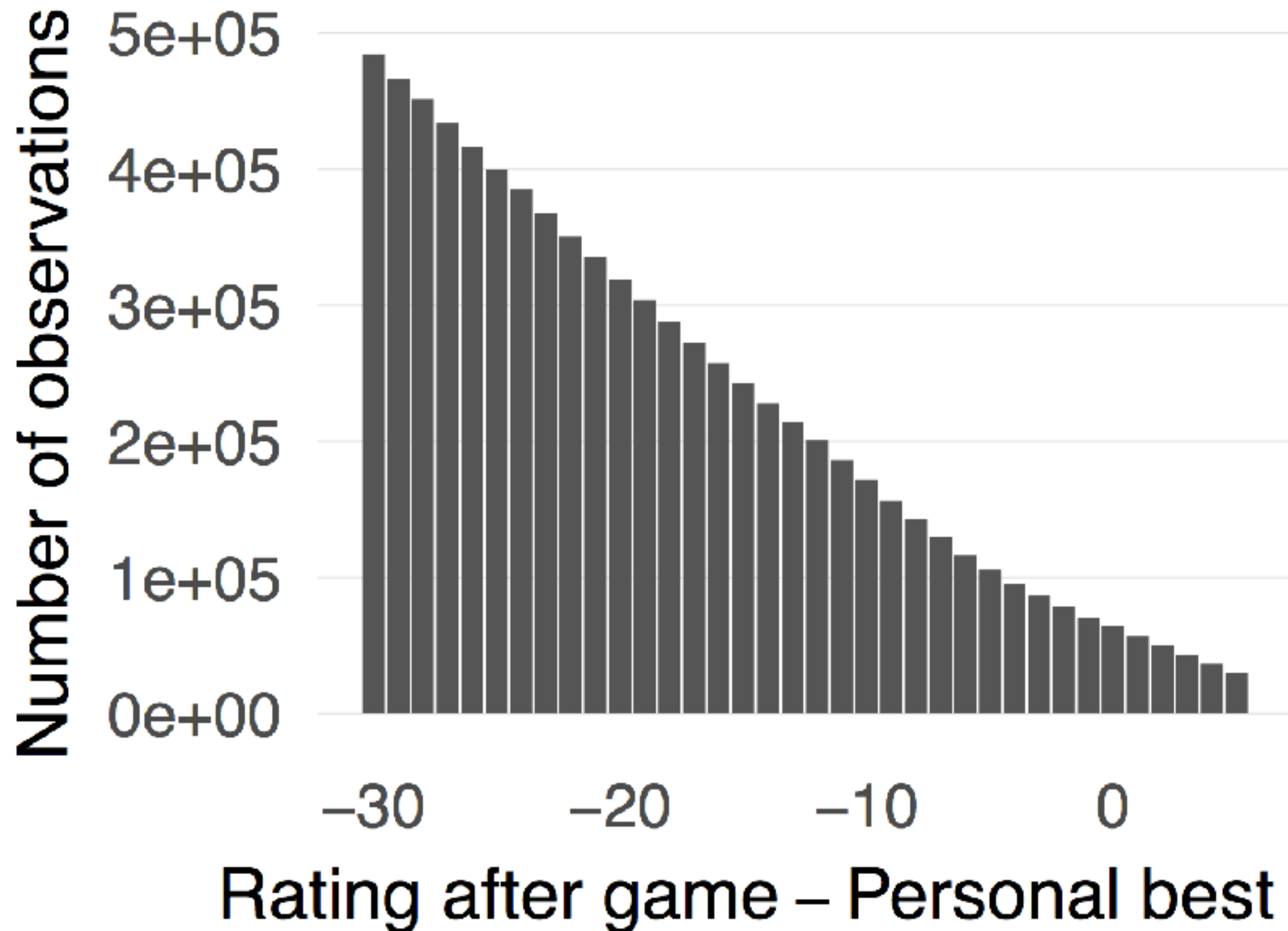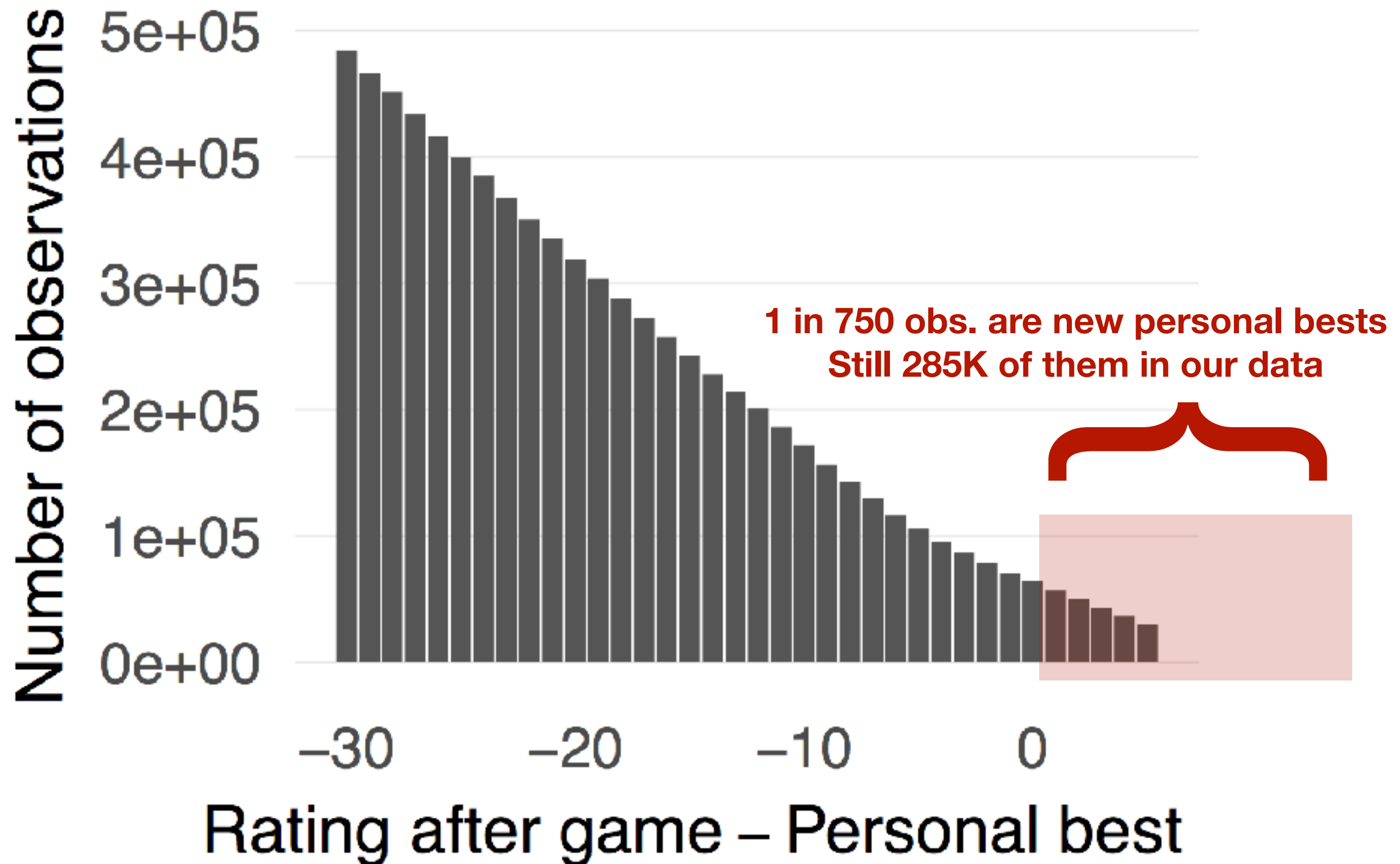
Predictions

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

↑ **Effort**   ↓ **Motivation**

Rating
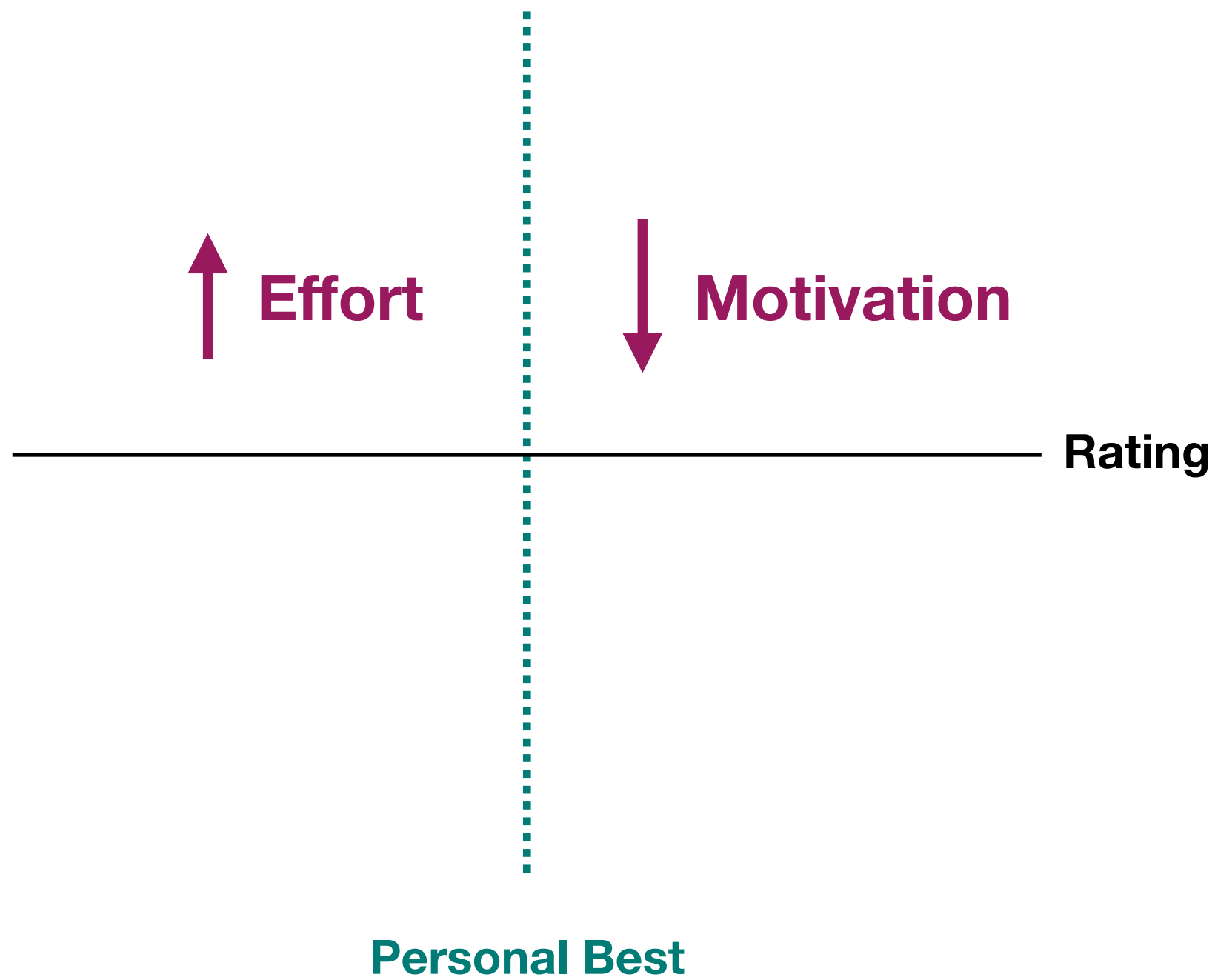
Personal Best
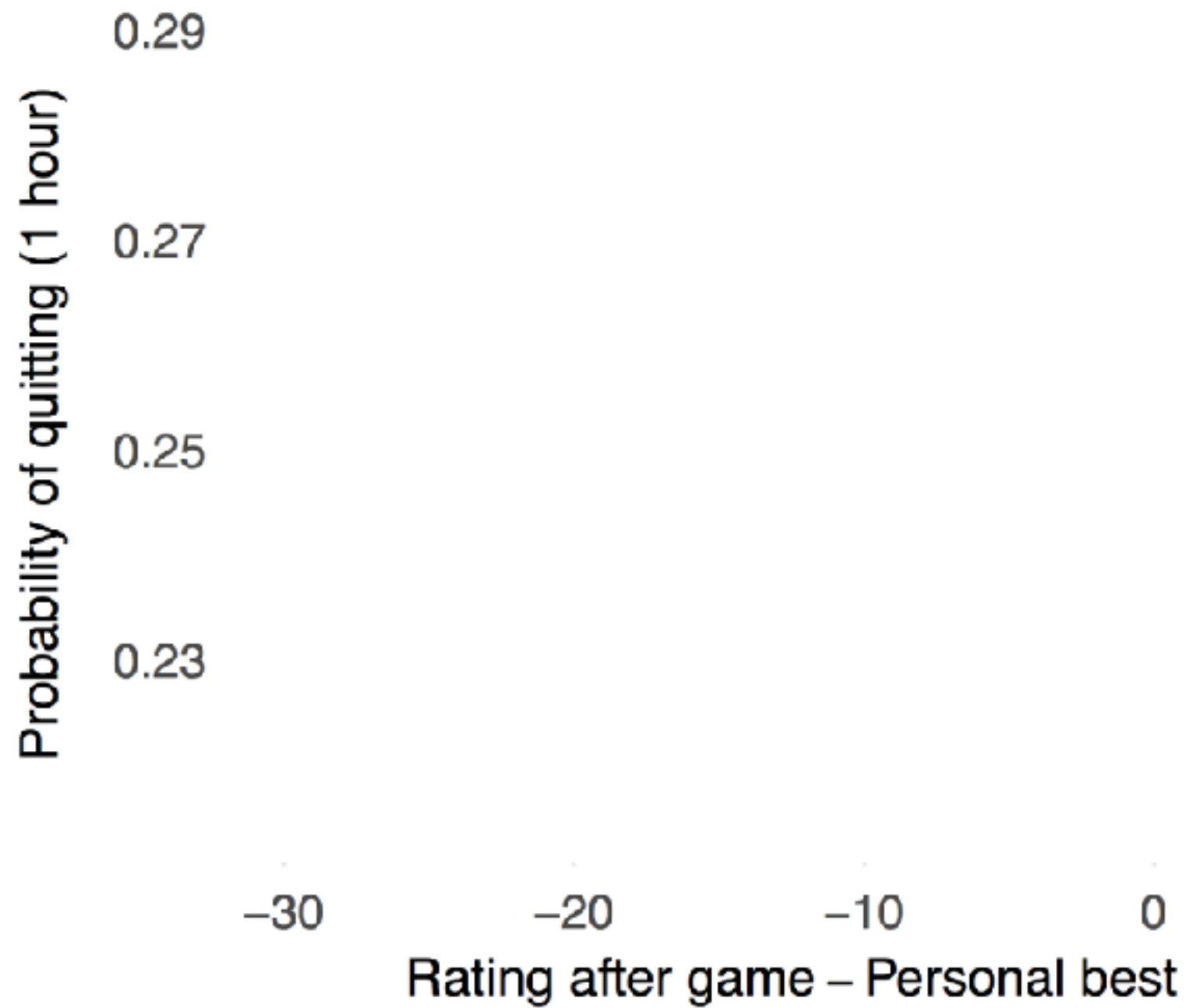
1. Quitting

1. Quitting
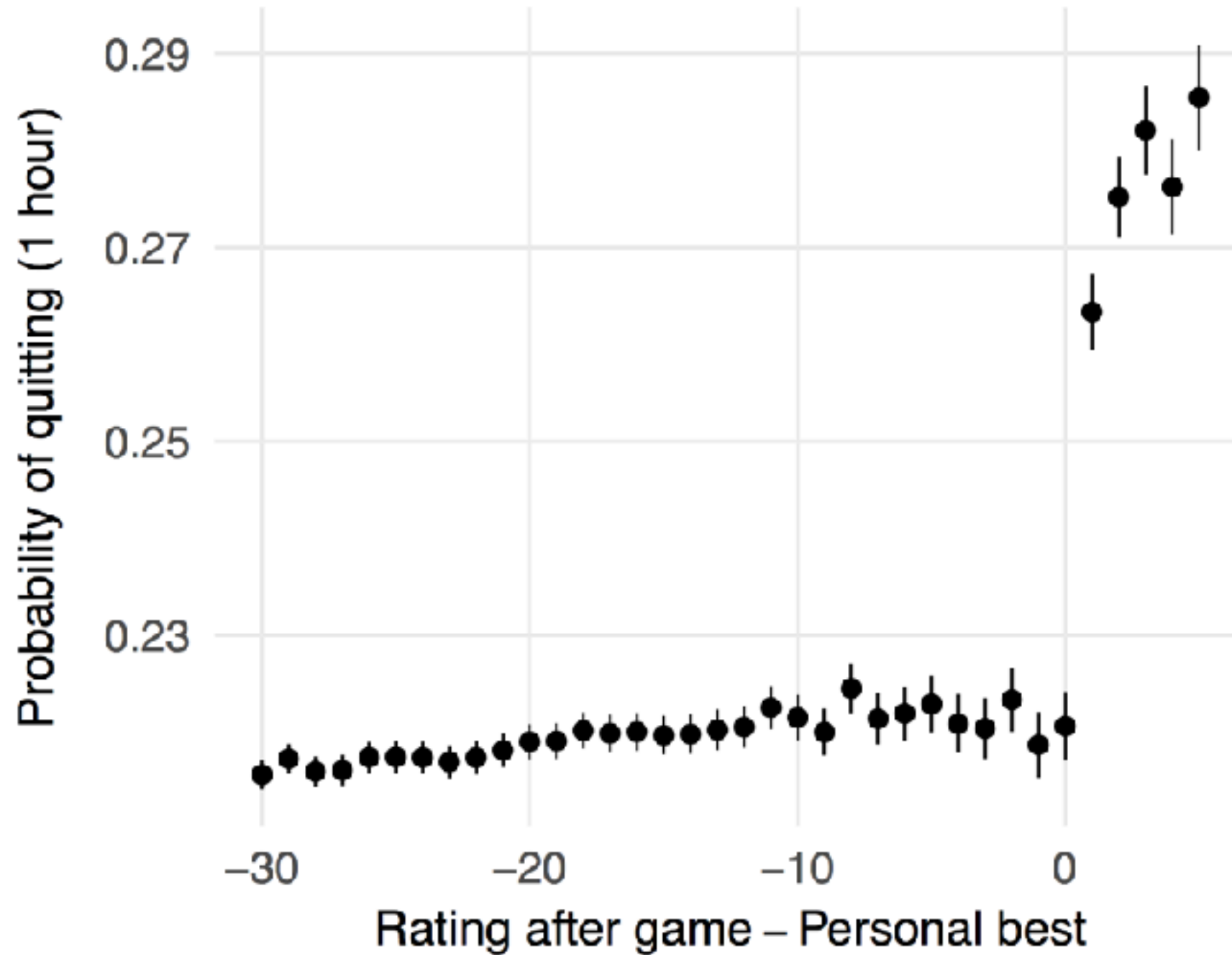
discontinuous jump after setting a personal best

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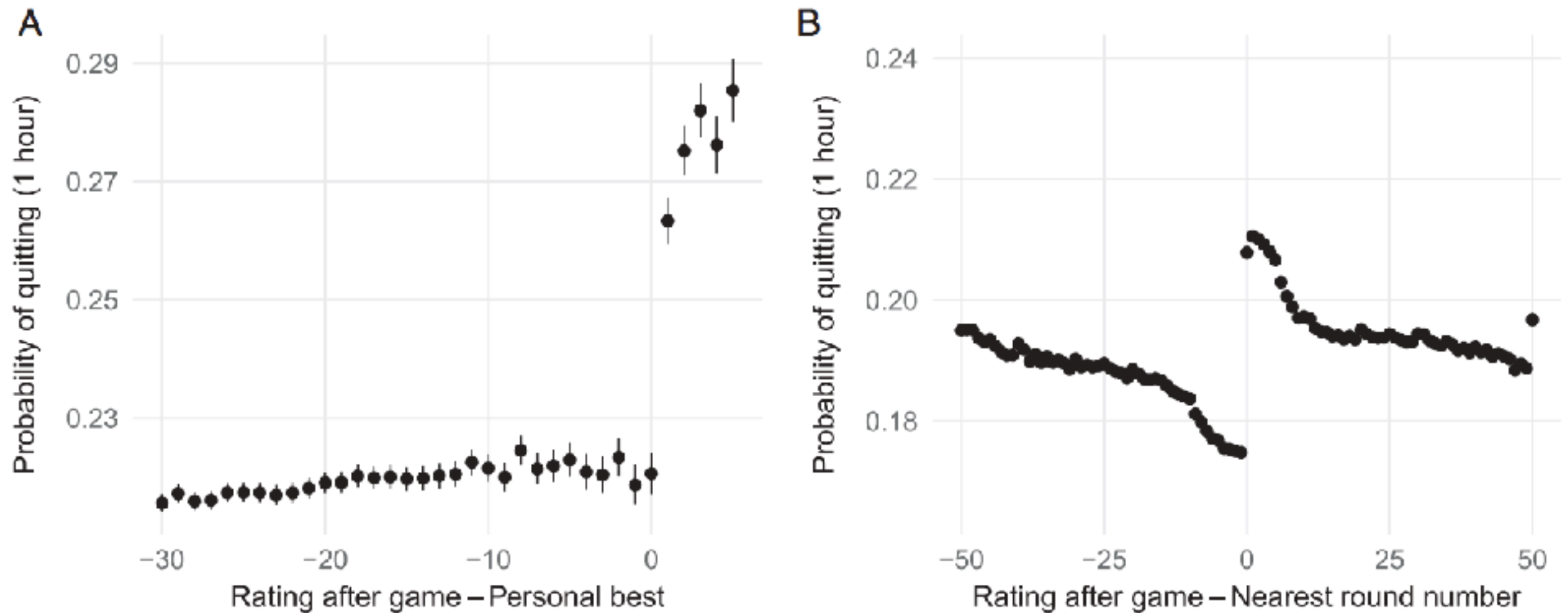
Fig. 3. Probability of quitting for at least 1 h around personal bests (A) and round numbers (B), with 95% confidence intervals.

Personal bests motivate as powerfully as round numbers

2. Effort (Performance relative to expectations)
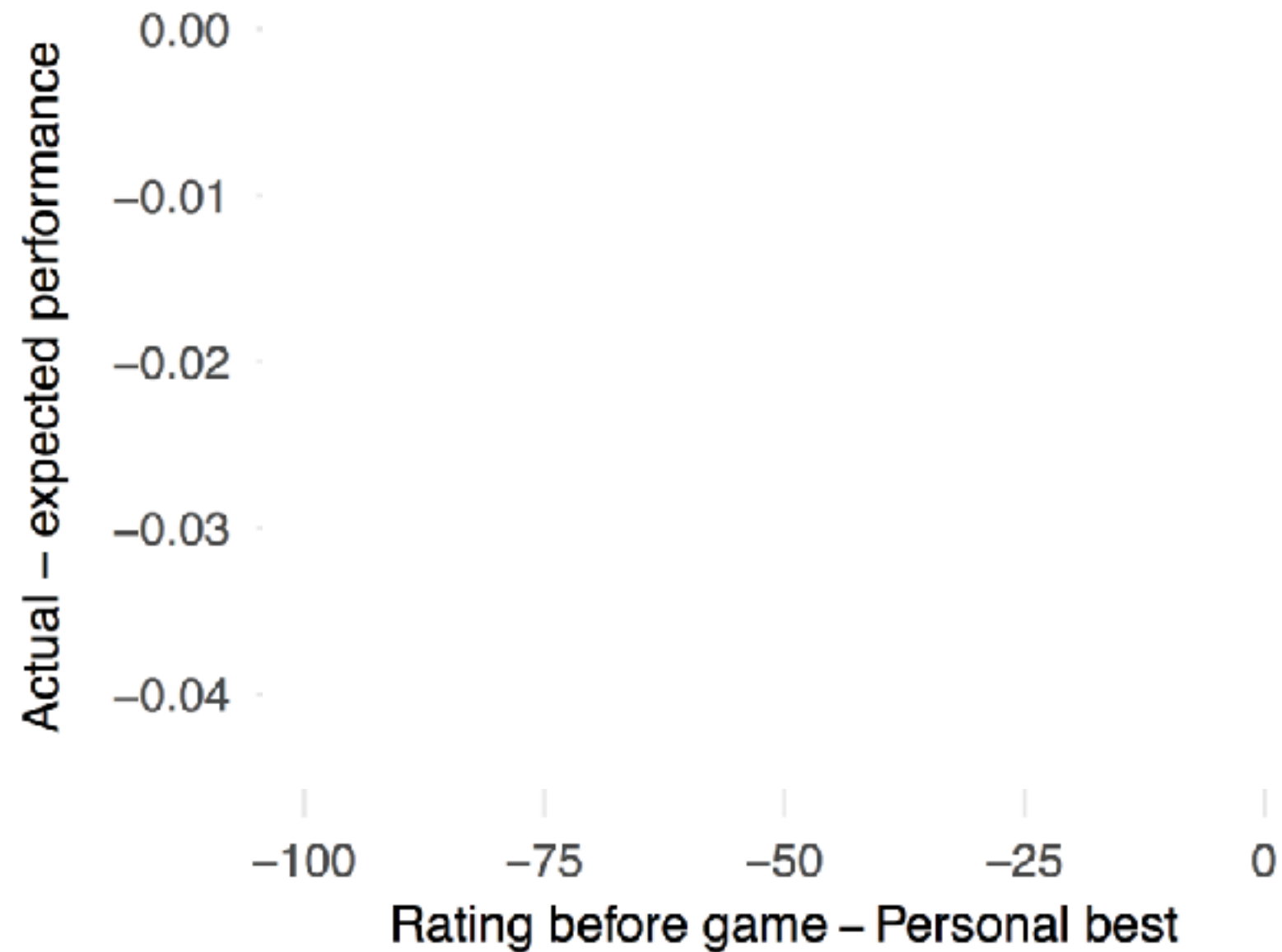
2. Effort (Performance relative to expectations)
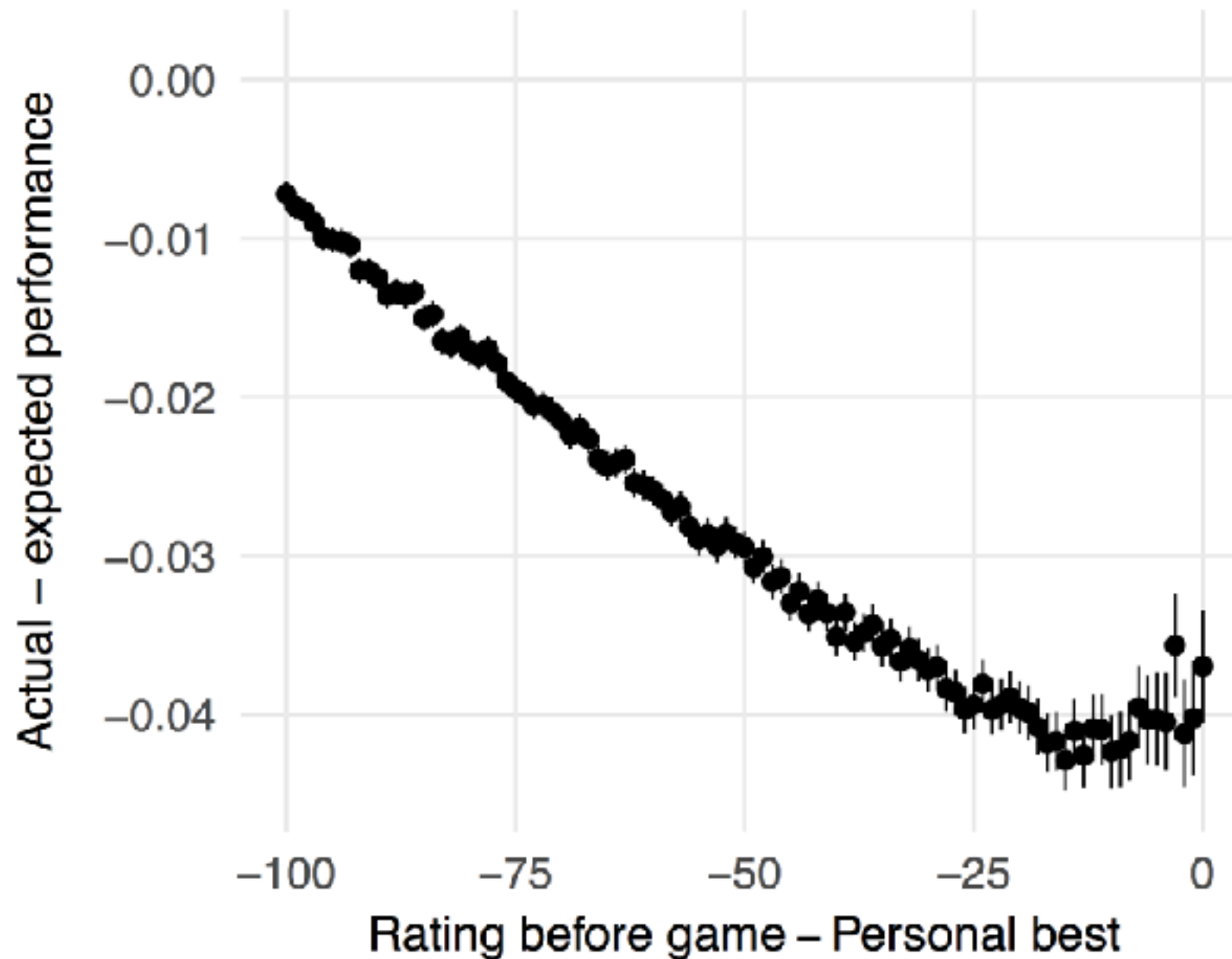
in-game effort increases as players approach a personal best

2. Effort (Performance relative to expectations)
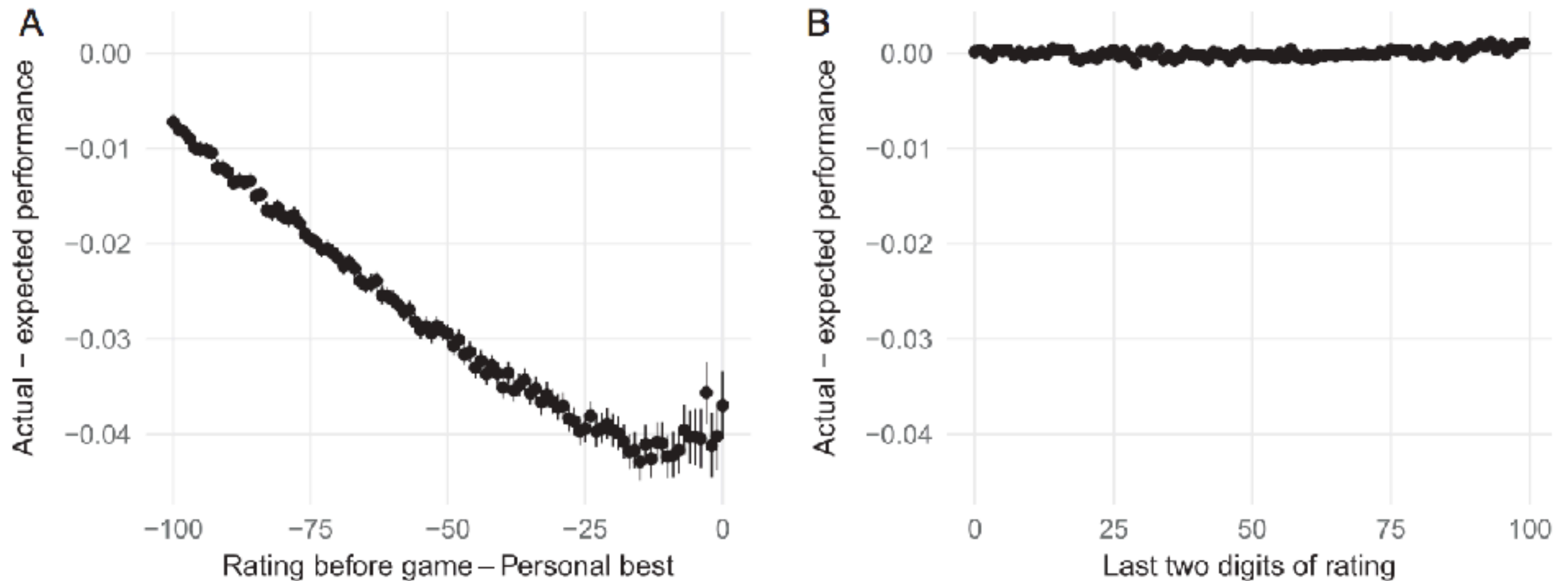
Fig. 4. Performance short of personal bests (A) and round numbers (B), with 95% confidence intervals.

Personal bests motivate much more than round numbers

Losses   Gains

Personal Best
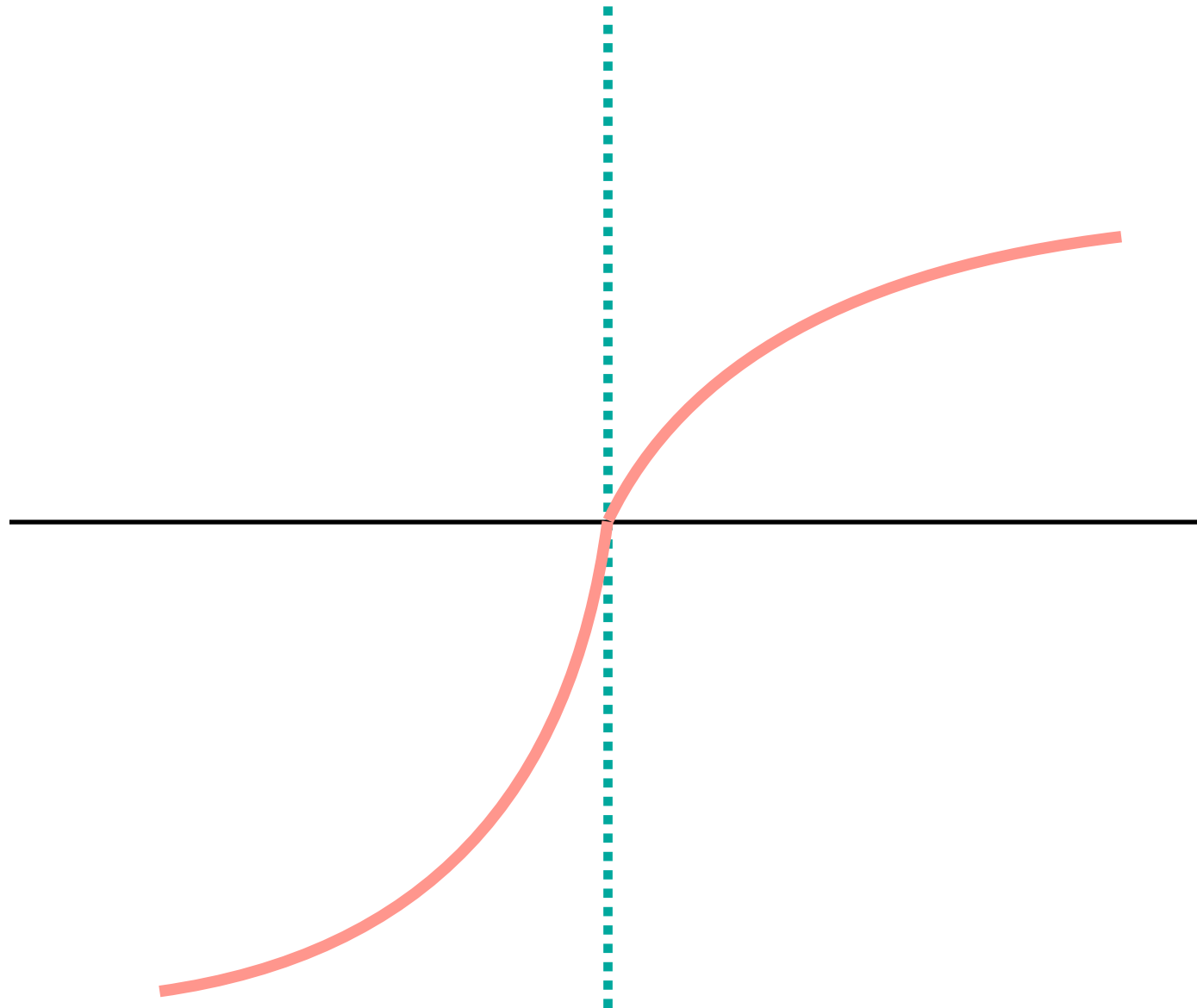
Personal Bests

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

Personal bests as reference points

Ashton Anderson[a,b,1,2] and Etan A. Green[b,c,3]

[a]Department of Computer Science, University of Toronto, Toronto, ON, Canada M5S 3G8; [b]Microsoft Research New York City, New York, NY 10011; and [c]Department of Operations, Information and Decisions, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

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

ashton@cs.toronto.edu