Comprehension of gambling odds

May 2022

THE BEHAVIOURAL INSIGHTS TEAM

PREDICTIV

THE GAMBLING POLICY & RESEARCH UNIT

Executive Summary

1. BIT ran an online experiment with a sample of 5,311 UK adults, 80% of whom were gamblers, to test how i) **differing presentations of gambling odds,** and ii) gambling **promotions, affected comprehension of odds and gambling behaviour**.

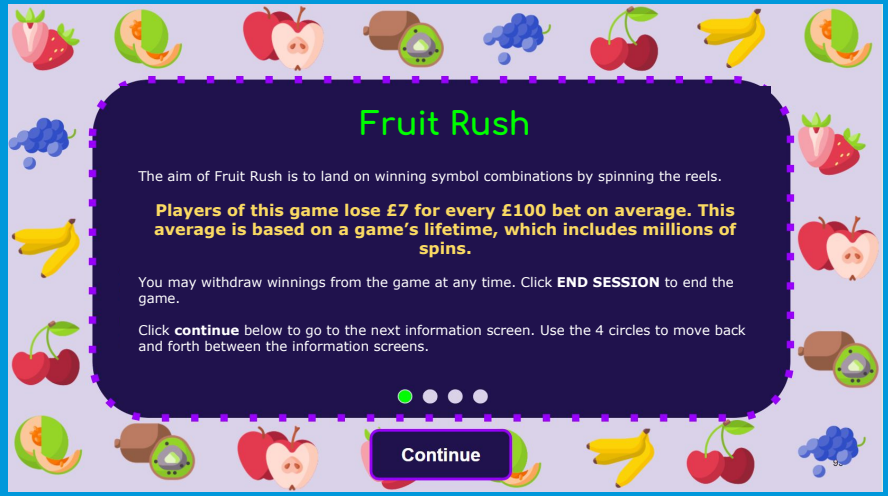
2. A '**simplified loss-volatility' framing** that was made salient (see image) saw a 3pp **increase in participants answering all objective comprehension questions correctly** (from 11% to 14%), and a 7pp **decrease in participants playing the slot game** (from 75% to 68%).

3. **The common industry format**[1] – 'return-to-player' (RTP) – **reduced comprehension of odds** when it was displayed discreetly, as is typical, or made salient. For example, when the RTP was salient, fewer participants who decided not to play understood they would likely finish the game with less money than when they started (from 68% to 58%).

4. A **promotion** offering free spins **increased the willingness to play** by 5pp (from 70% to 75%).

5. **Problem gamblers** (4+ short-form PGSI) **demonstrated significantly lower objective comprehension** compared to non-problem gamblers. Only 2% of problem gamblers answered all objective comprehension questions correctly (vs. 13% for non-problem gamblers).

The best performing arm was odds information that was salient, used natural frequencies (£s), highlighted the potential loss for players and emphasised the volatility of wins/losses.



[1] Newall et al (2020) found 98% of online roulette games use RTP format (n = 363 games across 26 major UK operators), with the majority displaying this information in the smallest font size and lowest level of boldness.

Recommendations for policymakers

Our results build on existing evidence on what works to increase odds comprehension.[1] Taking the wealth of evidence into consideration, we recommend UK policymakers:

Remove return-to-player statements as a permitted format by amending the remote technical standards 3 (RTS 3)[2], which outline how odds information should be displayed.

Embed natural frequencies, information of the volatility of wins and loss framing into the RTS 3; this would be best implemented by mandating all operators to present odds in the same way. Inconsistent application risks undermining the impact at a market level (e.g. substitution to games with less clear odds information would be minimised through mandation). Equivalent regulation may also need to be considered for other types of gambling.

Mandate slot games' odds information should be salient[3], e.g. presented ahead of all other game information, and formatted so that it is distinct from other information on the screen. Currently the RTS 3's language is too vague, (*"[...] must be easily available before the customer commits to gamble"*), meaning odds information is often displayed in a way that is easy to miss ahead of gambling.

[1] Newall, P. W., Byrne, C. A., Russell, A. M., & Rockloff, M. J. (2022). House-edge information and a volatility warning lead to reduced gambling expenditure: potential improvements to return-to-player percentages. Addictive Behaviors, 107308; Newall, P. W., Walasek, L., Hassanniakalager, A., Russell, A. M., Ludvig, E. A., & Browne, M. (2020). Statistical risk warnings in gambling. Behavioural Public Policy, 1-21; Newall, P., Walasek, L., Ludvig, E., & Rockloff, M. (2020). Nudge versus sludge in gambling warning labels.

[2] Gambling Commission. (2021). *Remote gambling and software technical standards (RTS) guidance*. Available at: https://www.gamblingcommission.gov.uk/licensees-and-businesses/guide/remote-gambling-and-software-technical-standards

[3] In this experiment, the odds information was made salient by presenting it on the first screen that all participants saw, and formatted in bold text in a different colour.

Priorities for future research

Specific follow-on RQs for BIT

RQ1: What impact would further iterations to the wording of the 'simplified loss-volatility' framing have on overall comprehension?

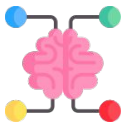
Despite 'simplified loss-volatility' framing improving overall comprehension, it increased misunderstanding that there is a maximum loss that participants can incur in the game. Further testing of wording variations should aim to resolve this misconception.

RQ2: Would additional information increase understanding that free spins do not affect a game's odds, or a person's likelihood of winning?

We found free spin promotions increased willingness to play the game by increasing subjective perceptions of winning, partially counteracting the positive effect of simplified information – explaining that free spins do not affect a game's odds may mitigate this.

RQ3: Does coupling simplified odds information with complementary tools (such as loss limits) reduce gambling-related harm?

Objective comprehension among problem gamblers was particularly low, even within treatment groups, suggesting information-based remedies alone are insufficient. Combining with other gambling management tools may therefore generate the size of impact needed to reduce experienced harm.



RQ4: How can we improve objective comprehension for problem gamblers?

Our results indicated that objective comprehension was poor for problem gamblers; other research also shows that problem gamblers can exhibit specific erroneous beliefs regarding the independence of random events.[1] Furthermore, the different framings may have decreased problem gambler's objective comprehension further. Problem gamblers may therefore require a different approach to increase their comprehension.

Broader RQs for the research community

[1] Turner, N. E., Maas, M. V. D., Shi, J., Liu, E., Zangeneh, M., Cool, S., ... & Marshall, T. E. (2022). Knowledge of random events and chance in people with gambling problems: an item analysis. *International Gambling Studies*, 1-20.

Background

Information stating a game's odds can help inform gambling decisions, yet existing formats may hinder comprehension.

Gambling losses are the main driver of harm and the likelihood of loss (i.e. a game's odds) varies greatly across different gambling products. Mandatory statements outlining a game's odds are therefore a promising policy tool.

The Gambling Commission (GC) currently requires information to be given in one of four formats: description of how prizes are allocated; 'house edge'; 'return-to-player' (RTP); or probability of payout. Most operators use the RTP format.[1] **However, evidence suggests the RTP format is ineffective at delivering comprehension of game outcomes and its associated risk;[1] we therefore hypothesise improving understanding of odds – using alternative formats – will enable customers to make more informed gambling choices, and reduce associated harm.**

This study aimed to build on existing evidence, to test whether behaviourally informed presentations of odds information could reduce potential harms through increasing comprehension of odds information. The study investigated the following research questions in the context of online slot games, given that people lose more money using them than other online gambling products[2]:

1. What impact does the presentation of odds have on people's comprehension of the odds and their confidence of comprehension?
2. Does comprehension of odds affect betting behaviour in online slot games?
3. Does the presence of an offer affect comprehension of odds, and in turn does this affect betting behaviour in online slot games?

[1] Newall, P. W., Byrne, C. A., Russell, A. M., & Rockloff, M. J. (2022). House-edge information and a volatility warning lead to reduced gambling expenditure: potential improvements to return-to-player percentages. *Addictive Behaviors,* 107308; Newall, P. W., Walasek, L., Hassanniakalager, A., Russell, A. M., Ludvig, E. A., & Browne, M. (2020). Statistical risk warnings in gambling. *Behavioural Public Policy,* 1-21; Newall, P., Walasek, L., Ludvig, E., & Rockloff, M. (2020). Nudge versus sludge in gambling warning labels.

[2] The Gambling Commission. (2021). *Gambling Commission announces package of changes which make online games safer by design*. Available at: https://www.gamblingcommission.gov.uk/news/article/gambling-commission-announces-package-of-changes-which-make-online-games

Methodology

We recruited a sample of 5,311 UK adults; we oversampled for people who gamble (or had done within the past 12 months).

The Behavioural Insight Team's (BIT's) Predictiv team, and the Gambling Policy & Research Unit (GPRU), worked together to test different ways of presenting gambling odds on comprehension and behaviour, with an online representative sample of 5,311 UK adults **– over representative of gamblers –** between 14 March - 6 April 2022.

NOTE ON INTERPRETING RESULTS

1. The sample doesn't capture the digitally excluded, or people not inclined to complete online surveys.
2. Just because people say they would do something in an online experiment, this doesn't mean they always will in real life. We therefore interpret stated intent as a likely upper bound of real behaviour.
3. When we examine differences by subgroups (e.g. gender, ethnicity), we only do so when the sample size remains large enough to draw robust inferences from.

Gambled within the last 12 months	
Yes	80%

Gambling risk (% of gamblers)	
Non-risk*	61%
Lower risk*	13%
Moderate risk*	14%
Problem gambler*	13%

Region	
South & East	29%
North	23%
Midlands	19%
Scot/NI/Wales	14%
London	14%

Gender	
Women	50%

Ethnicity	
White	90%
Asian	5%
Black	3%
Mixed / other	3%

Age		
18-24	25-54	55+
8%	61%	31%

*PGSI score: 0 No-risk; 1 Lower risk; 2-3 Moderate risk; 4+ Problem gambler.
Compared to other GPRU experiments, the % of non-risk gamblers was higher for two reasons: 1) We used the short form PGSI which we found categorises people as slightly lower risk than the full version 2) We used an addiction screener, which filtered out many problem gamblers.

Also collected data for all respondents for education, income, urbanicity, gambling spend and type, risk literacy and disposable income. Median time spent completing survey: 10m 20s

Experiment set-up

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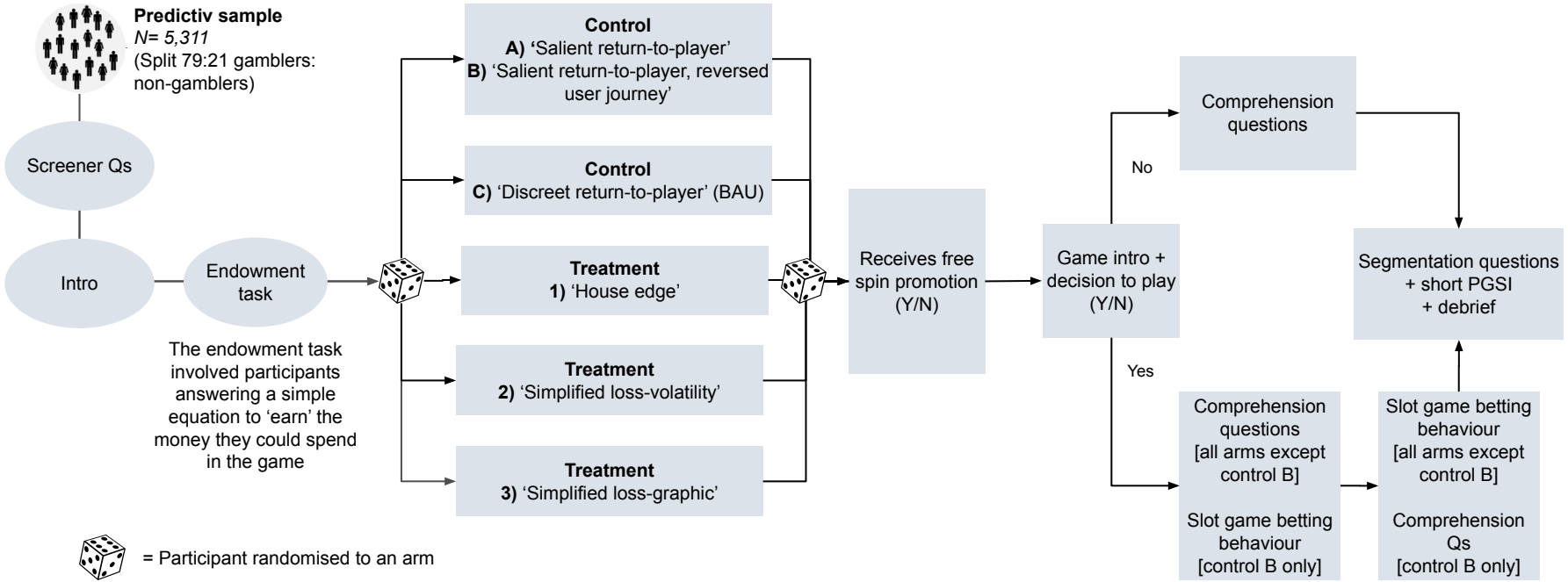
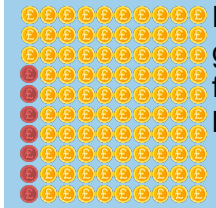
Methodology: experiment flow

Participants were randomly shown 1 of 5 versions of a slot game's description, and then randomly assigned to either receive a free spins promotion or not. Participants then chose whether or not to play the slot game, and answered questions about the game's information.



Methodology: what we tested

Each participant was shown odds information in 1 of 5 formats. The probability of winning itself was not changed between groups, only the presentation of the odds.

Arm	Control A+B[1]	Control C	Treatment 1	Treatment 2	Treatment 3
Copy	The theoretical average return to player for this game is 93%.		This game keeps 7% of all money bet on average.	Players of this game lose £7 for every £100 bet on average.[2] This average is based on a game's lifetime, which includes millions of spins.	 Players of this game lose £7 for every £100 bet on average.
Format description + arm rationale	**'Salient return-to-player'** Makes the industry standard more salient, to enable more precise estimates of the impact of the treatment arms.	**'Discreet return-to-player'** Reflects the most common way that industry presents odds information – subtly displayed, in RTP format.	**'House edge'** This format is currently permitted in RTS 3; previous studies show it increases odds comprehension and reduces spend.	**'Simplified loss-volatility'** Converts the house edge % information to a more relatable format (£), and corrects a common misconception of how odds are calculated.	**'Simplified loss-graphic'** Uses the simplified, house-edge copy with a graphic predicted to further aid comprehension of statistical risk.
N =	A = 893, B = 861	898	880	907	872

[1] Control B was the same format as Control A, but the sequence of the experiment was changed to assess potential ordering effects of answering comprehension questions ahead of playing the slot game. Participants in this arm therefore played the slot game before answering the comprehension questions. They did not answer the subjective comprehension questions as these were redundant after playing.

[2] The Financial Conduct Authority have similarly advocated for the use of natural frequencies (i.e. using £ values), rather than percentages when marketing financial products. They suggest natural frequencies can increase consumer understanding and avert misleading advertising. Source: FCA. (2017). From advert to action: behavioural insights into the advertising of financial products. Available at: https://www.fca.org.uk/publication/occasional-papers/op17-26.pdf

Methodology: what we tested

Example from the ‘simplified loss-volatility’ framing of how the odds information was displayed to participants, within the slot game’s information screens.

Fruit Rush’s odds information (with an equivalent RTP of 93%). For those who received 10 free spins promotion, the details were also listed here.

Other game information was listed on the next 3 screens (e.g. the pay table, paylines and how to play). Those in control B arm were shown the odds information on the final screen.

Methodology: what we measured

Objective comprehension: participants answered three questions to measure their understanding of the odds of winning.

We measured how well participants understood the game's outcomes from the information provided, using a knowledge score (max score is 3, 1 point for each question **correctly answered**):

1. Which one of the following statements do you think is true?

- **a.** **For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game**
- **b.** If a player bets £1 on this game, they are guaranteed to win 93p and lose 7p
- **c.** 93% of people who play this game will win something, and 7% will lose something
- **d.** This game will give out a prize 9.3 times in 10, and give out nothing 0.7 times in 10
- **e.** Not sure

2. And what does the information you have read mean for you?

- **a.** **I am not guaranteed any wins while I play**
- **b.** This information does not tell me anything about how likely I am to win or lose
- **c.** I am guaranteed to win 93p for every bet I make
- **d.** For every 100 bets I place, I will win on 93 of them
- **e.** For every £100 I bet, I will lose no more than £7
- **f.** Not sure

3. Do you think the choices you make while playing influence whether you win or lose in the next bet you make? (Your choices could be how much you bet, how long you take to bet, or how many times you bet before in the session)

- **a.** Yes
- **b.** **No**
- **c.** Not sure

Methodology: what we measured

Subjective comprehension: participants answered two questions to measure their understanding and confidence in what the odds information meant for them.

We measured how individual's applied their objective understanding of the game's outcomes to predict their own experience of play by asking:

1. What do you think your choices of winning are?
   a. I'll [definitely/ probably] finish playing the game with [more/ less] money than I started with
   b. I'm not sure how much money I'll finish playing the game with

2. How confident are you in your chances of winning this game?
   a. Not at all confident, Not confident, Confident, Very confident

Those who chose not to play the slot game were asked the same question with adjusted wording: "*If you had played the slot game shown, what do you think your chances of winning were?*" and "*How confident are you in your chances of winning if you did play this game?*".

Participants in control B were not asked these questions as they answered questions after play the slot game, meaning these prediction-style questions were no longer relevant.

Methodology: what we measured

Gambling behaviour: was measured using an in-house online slots game (“fruit rush”). We tested whether participants decided to play the game and, if so, the total amount they lost.

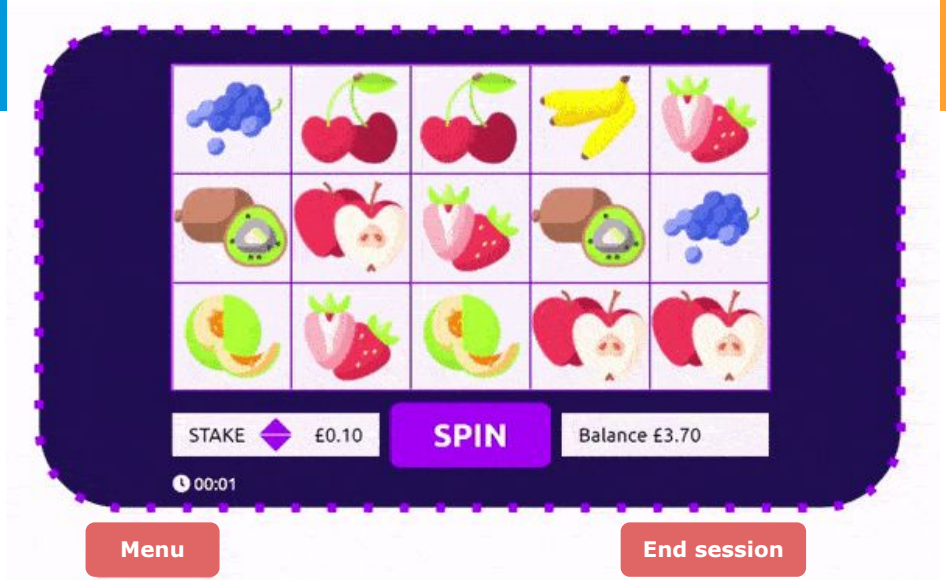
Primary behavioural outcome measures

Decision to play

After reading the game’s information screens, participants were given the option to play the slot game.

Total amount lost

After spinning, the slot game would highlight if any symbols were repeated 3x,4x or 5x times in adjacent reels, and award them the respective reward.
If participants didn’t win anything during the spin, the stake size was subtracted from their balance.



The game automatically ended after 5 min or when participant’s balance reached £0.

Fruit repetitions in adjacent reels reward the following:
(A) 3x: a bonus spin; (B) 4x: 3x of the stake; (C) 5x: 18x of the stake.

Exploratory behavioural outcome measures

Final balance

The amount a participant had remaining when they decided to end the session.

Average stake size

The stake size started at £0.10, and participants could choose to increase/decrease the stake size for each spin in increments of 5p

Number of spins

Participants could decide to end the session at any point of the game by clicking ‘end session’.

Time between spins

There was a mandatory 2.5s delay.

Main findings

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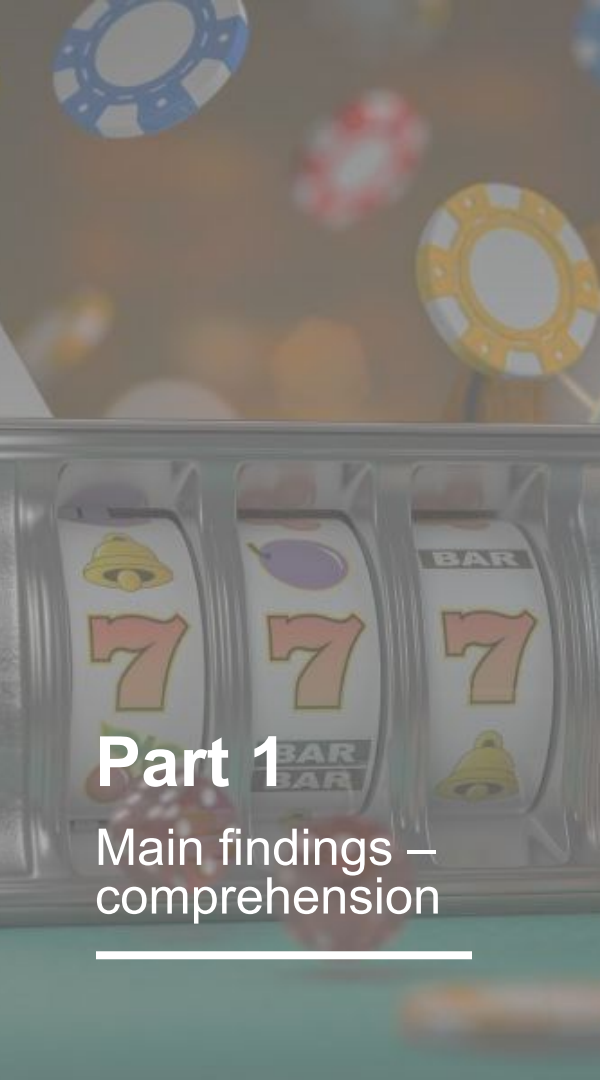


Part 1

Main findings – comprehension

What effect did odds framings have on comprehension?

Research questions addressed in this section:

- **RQ1** What impact does the presentation of odds have on people's i) objective comprehension and ii) subjective comprehension?

Relevant outcome measures covered in this section:

- Objective comprehension (knowledge score)
- Subjective comprehension (perceived chances of winning)

Main findings: objective comprehension

The ‘simplified loss-volatility’ frame was most effective at improving comprehension of odds, by increasing understanding of the ratio of wins to losses.

	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
Combined score: out of three questions…					
Answered all correctly (%)	11%	10%	11%	14%*	12%
Average score	1.17	1.08+	1.17	1.35**	1.26*
Individual score: % of participants who correctly identified that…					
Q1 For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game	27%	27%	33%*	52%**	49%**
Q2 They are not guaranteed any wins while they play	47%	44%+	44%	43%*	43%*
Q3 The choices they make while playing do not influence whether they win or lose in the next bet they make	42%	37%*	41%	41%	35%**

Significantly fewer participants in the ‘salient RTP + reversed’ arm answered all objective comprehension questions correctly (8%).

+ p < 0.10, * p < 0.05, ** p < 0.01

Data collected by BIT on 14 March - 6 April 2022.

Green shading indicates significant change in outcomes in the positive direction compared to Salient RTP
Red shading indicates significant change in outcomes in the negative direction compared to Salient RTP

Main findings: subjective comprehension

The 'simplified loss-volatility' frame performed consistently best at increasing subjective comprehension. Participants who saw this frame were less confident they would win, and those who decided not to play were less confident than those who did (didn't play = 3% vs. played = 40%).

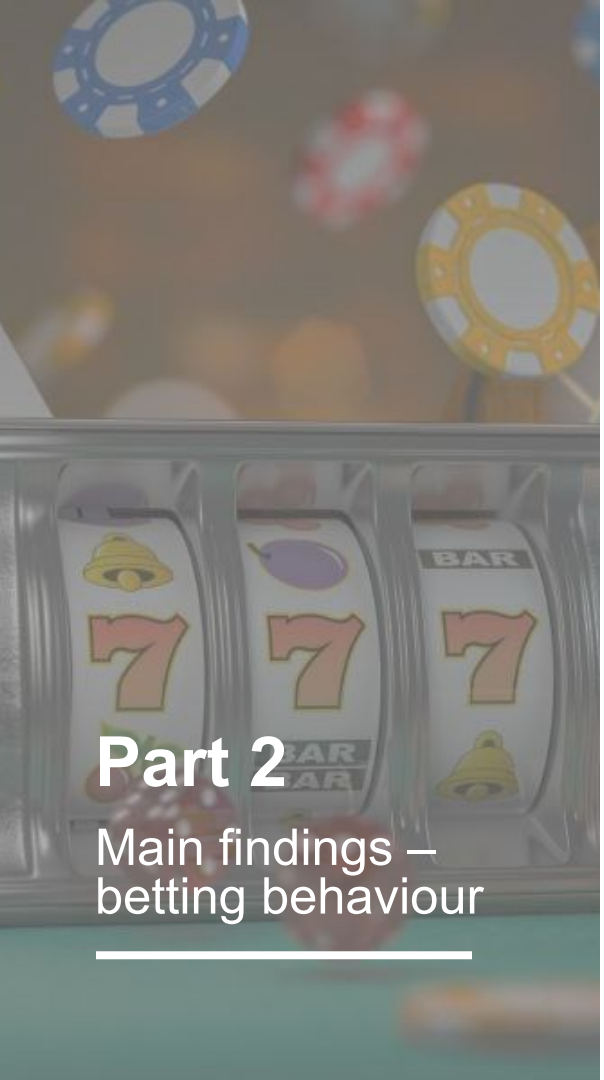
% of participants who responded that they…		Controls		Treatments		
		Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
Decided to play (n = 3,421)	Are confident about their chances of winning [i]	45%	42%	43%	40%+	41%
	Will finish playing the game with less money than they started with [ii]	30%	34%	30%	38%**	32%
Decided not to play (n = 1,352)	Are confident about their chances of winning [i]	9%	7%	7%	3%**	7%
	Will finish playing the game with less money than they started with [ii]	58%	68%*	64%	69%*	67%*

This suggests a backfire in the 'salient RTP' for those who decided not to play, whereby seeing the RTP odds format decreases the perception that participants will lose money.

[i] *Confident or very confident responses*
[ii] *Definitely or probably responses*

Data collected by BIT on 14 March - 6 April 2022.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction compared to Salient RTP
Red shading indicates significant change in outcomes in the negative direction compared to Salient RTP
Participants in the 'Salient RTP + Reversed arm were not asked these questions



Part 2

Main findings – betting behaviour

What effect did odds information have on betting behaviour?

Research questions addressed in this section:

- **RQ2** Does comprehension of odds affect betting behaviour in online slot games?

Relevant outcome measures covered in this section:

- Decision to play
- Total amount lost
- Final balance
- Average stake size
- Number of spins
- Time between spins

Main findings: gambling behaviour

Loss framings reduced the proportion who decided to play the game by ~9pp. There were no substantive differences of in-game behaviours across trial arms.

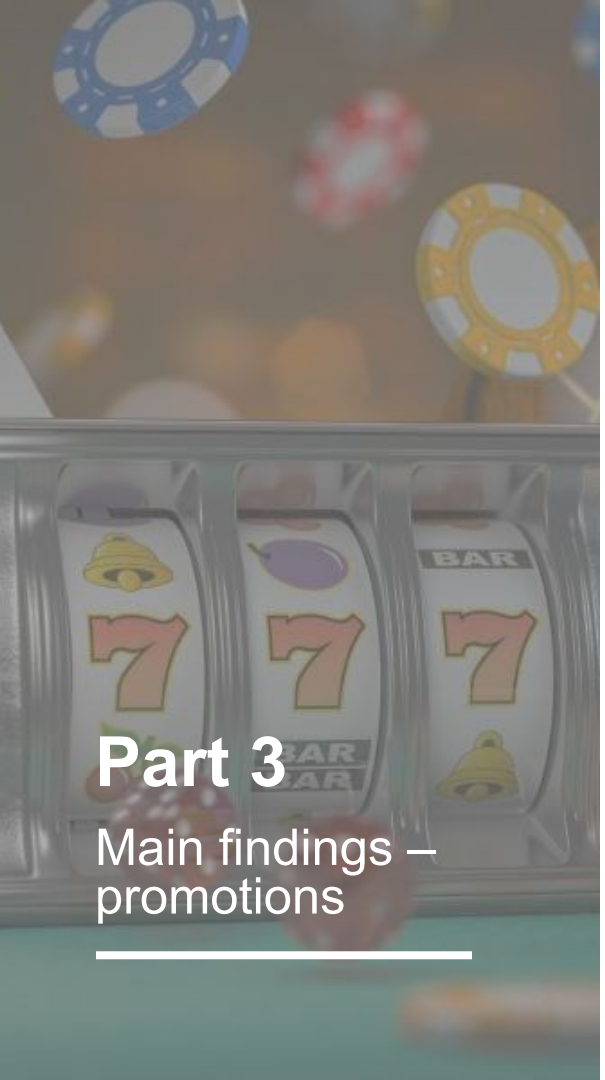
	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss- graphic
% of participants who decide to play	**75%**	**76%**	**74%**	**68%****	**64%****
Of those who decided to play, average… (n = 3842)					
Final balance	£1.25	£1.31	£1.33^{+}	£1.26	£1.35^{+}
Total amount lost	-£1.33	-£1.21	-£1.22	-£1.31	-£1.21
Number of spins	22.63	21.8	22.11	22.79	22.17
Average stake size	£0.14	£0.14	£0.14	£0.14	£0.13
Time between spins	4.76s	5.47s	5.53s	5.03s	4.66s

The game's starting stake size was 10p. All participants increased their stake size by 3-4p on average, and this was similar across trial arms.

Data collected by BIT on 14 March - 6 April 2022.

Values in this slide only include participants who decided to play the slot game

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction



Part 3

Main findings – promotions

What are the effects of free spin promotions?

Research questions addressed in this section:

- **RQ3** Does the presence of an offer affect comprehension of odds?

Relevant outcome measures covered in this section:

- Objective comprehension (knowledge score)
- Subjective comprehension (perceived chances of winning)

Main findings: objective comprehension + gambling behaviour

The free spins promotion did not influence understanding of the game's odds. It did however increase the willingness to play, but decreased total losses – most likely due to participants making fewer spins with their own money (promotion = average 12 paid spins; no promotion = average 22 paid spins).

	No promotion (baseline) (n = 2703)	Promotion (n = 2608)
Objective comprehension		
All correct	11%	11%
Average % of correct answers	40%	40%
Gambling Behaviour		
% of participants who decide to play	70%	75%**
Final balance	£1.17	£1.41**
Total amount lost[1]	-£1.62	-£0.93**
Number of spins[2]	22.44	12.27
Average stake size[3]	£0.16	£0.15**
Time between spins	5.19s	5.08s

1. Sum of all losses, not including free spins (as the user does not lose any credit during these spins).
2. Excludes free spins.
3. Excludes free spins and participants in the promotion group who only used free spins.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

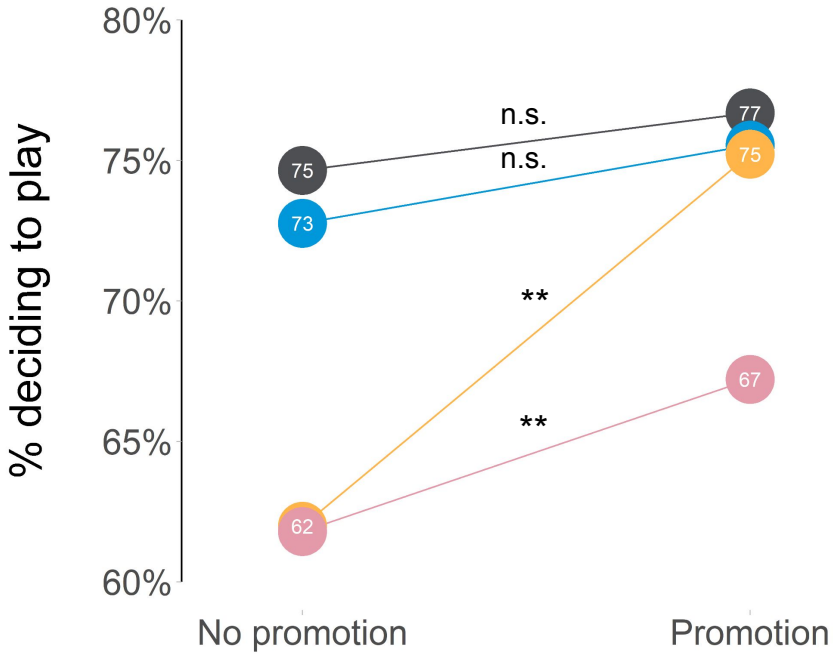
Green shading indicates significant change in outcomes in the positive direction

Red shading indicates significant change in outcomes in the negative direction

Data collected by BIT on 14 March - 6 April 2022.

Main findings: promotions & gambling behaviour

The free spins promotion partially counteracted the effectiveness of the ‘simplified loss-volatility’ frame in reducing the proportion who decided to play. This was not seen in the other treatment or control arms.



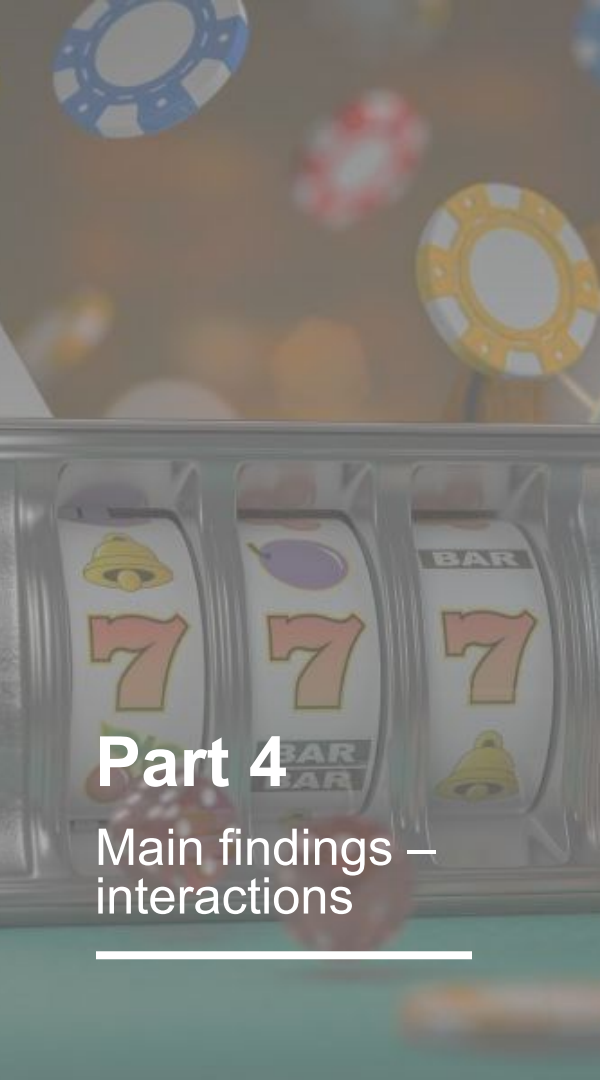
The difference between promotion and no promotion arms is statistically greater in the case of ‘simplified loss-volatility’ framing versus control framings.

We didn’t find any significant differences in reactions to treatments, depending on promotion, on any other outcomes.

- Control framings
- House edge
- Simplified loss-volatility
- Simplified loss-graphic

+ p < 0.10, * p < 0.05, ** p < 0.01
n.s. = not significant, p > 0.10

Data collected by BIT on 14 March - 6 April 2022.



Part 4

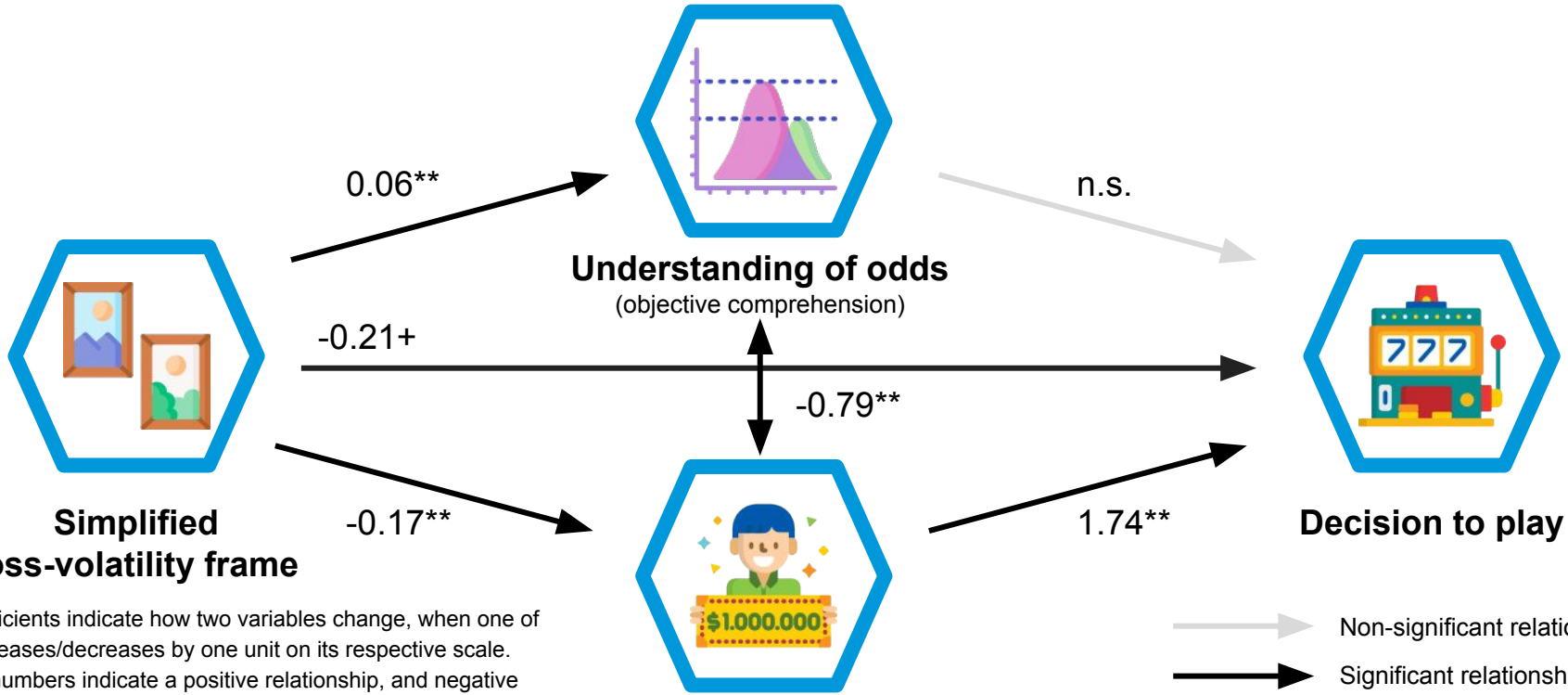
Main findings – interactions

How does odds framing affect decisions to play?

This subsection outlines which mechanism(s) – i.e. understanding of odds, and/or subjective perceptions of winnings – explain how presentation of odds affects decisions to play.

Relevance to the study's research questions: this section is exploratory in nature – it adds to our understanding of the findings, but doesn't answer the research questions directly.

The 'simplified loss-volatility' framing reduces decision to play through decreasing subjective perception of winning, and indirectly through increasing understanding of odds. However, this only partially explains the effect of this information on decision to play – suggesting existence of other mechanisms.

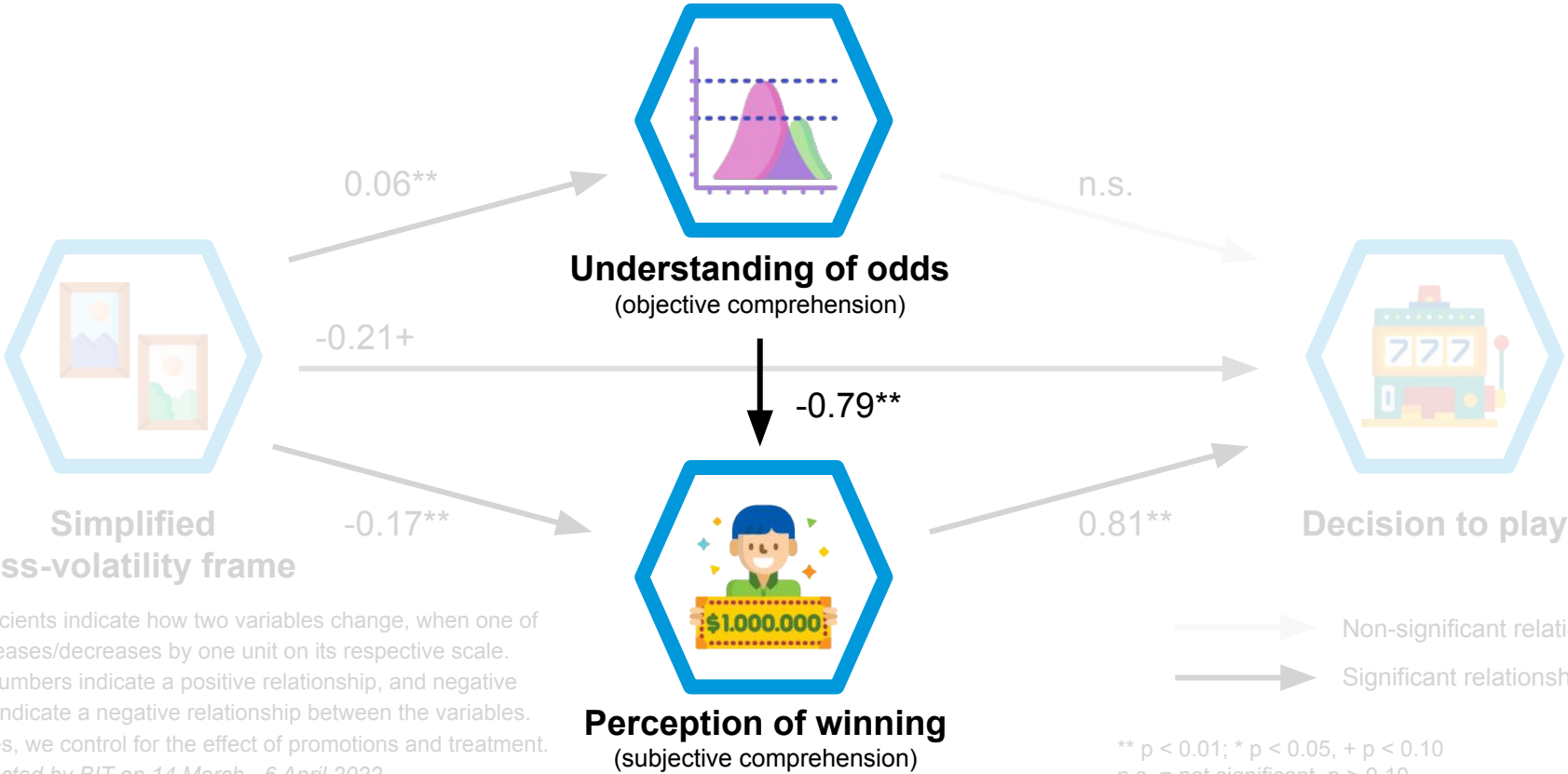


The coefficients indicate how two variables change, when one of them increases/decreases by one unit on its respective scale. Positive numbers indicate a positive relationship, and negative numbers indicate a negative relationship between the variables. In all cases, we control for the effect of promotions and treatment.
Data collected by BIT on 14 March - 6 April 2022.

** p < 0.01; * p < 0.05, + p < 0.10
n.s. = not significant, p > 0.10

Exploratory analysis: gambling behaviour ('simplified loss-volatility' arm)

To understand how odds comprehension indirectly affects decision to play, we investigated what components of odds understanding influence perception of winning (see next slide).



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Data collected by BIT on 14 March - 6 April 2022.

** p < 0.01; * p < 0.05, + p < 0.10
n.s. = not significant, p > 0.10

Across all arms, we find answering each objective comprehension question correctly is associated with decreased perception of winning. Understanding that player choices have no influence over outcomes was the largest driver of decreased perception of winning.

Answered correctly

For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game

-0.08*

They are not guaranteed any wins while they play

-0.25**

The choices they make while playing do not influence whether they win or lose in the next bet they make

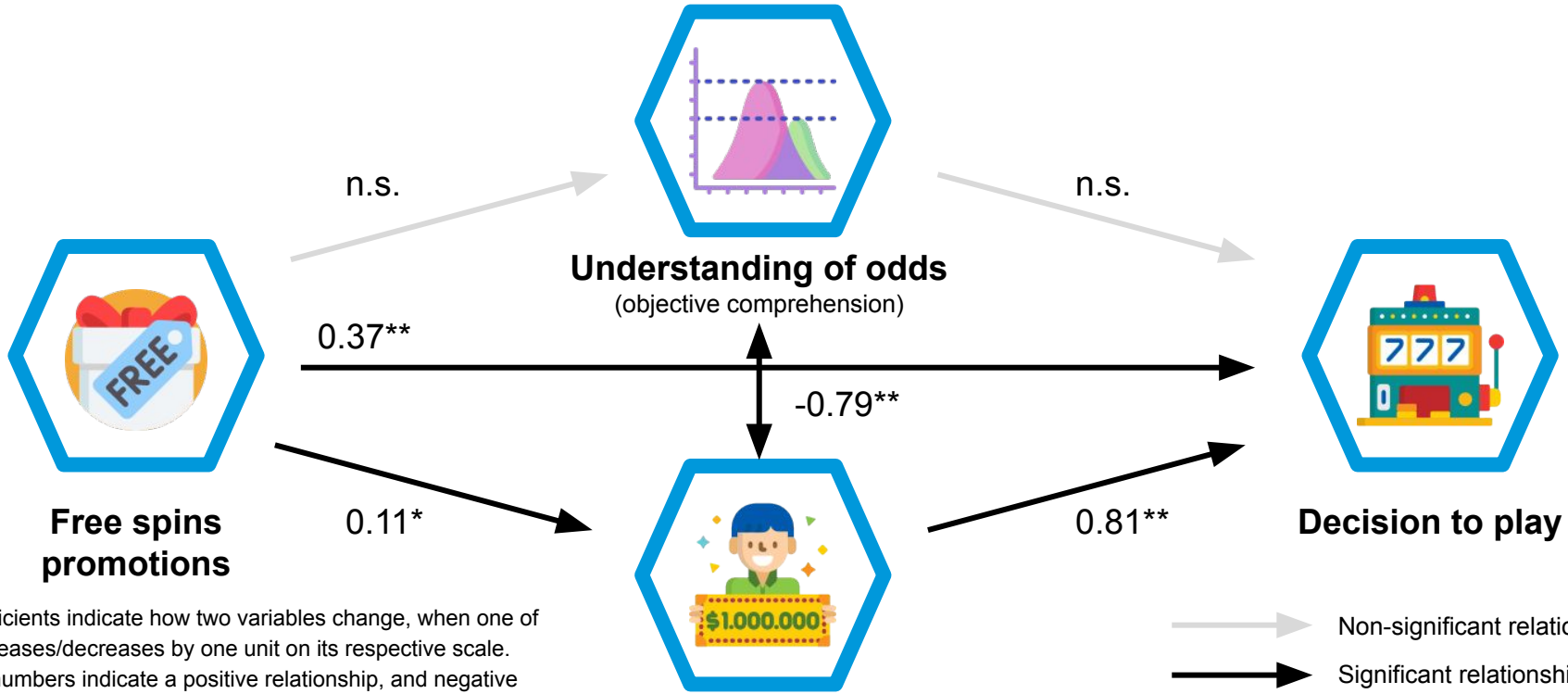
-0.48**

Perception of winning
(subjective comprehension)

+ p < 0.10, * p < 0.05, ** p < 0.01

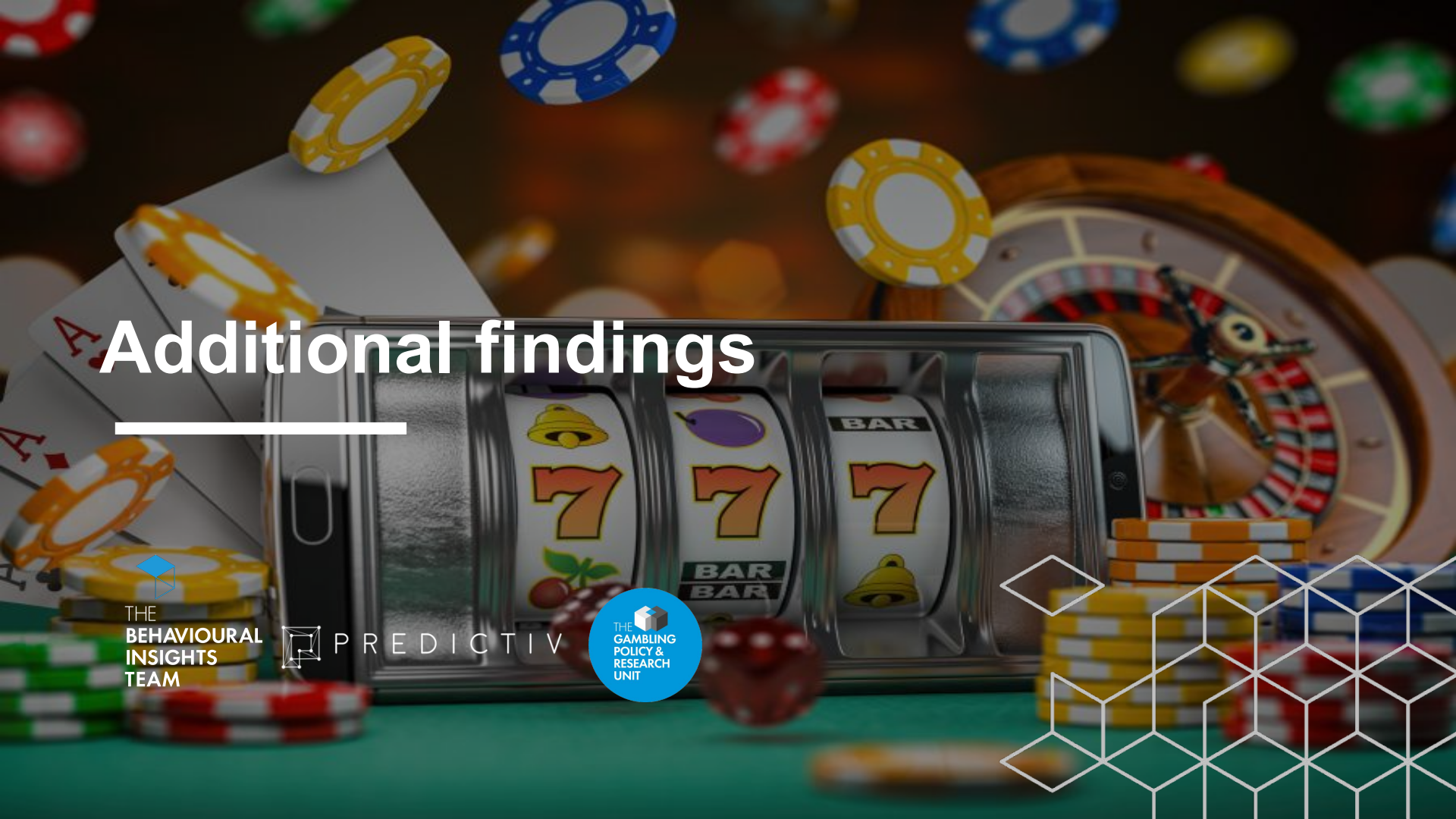
Data collected by BIT on 14 March - 6 April 2022.

Free spin promotions increase decisions to play by increasing subjective perception of winning. However, this only partially explains the effect of promotions on decision to play, suggesting there is alternative explanation(s) not measured in this study.



The coefficients indicate how two variables change, when one of them increases/decreases by one unit on its respective scale. Positive numbers indicate a positive relationship, and negative numbers indicate a negative relationship between the variables. In all cases, we control for the effect of promotions and treatment.
Data collected by BIT on 14 March - 6 April 2022.

** p < 0.01; * p < 0.05, + p < 0.10
n.s. = not significant, p > 0.10



Additional findings

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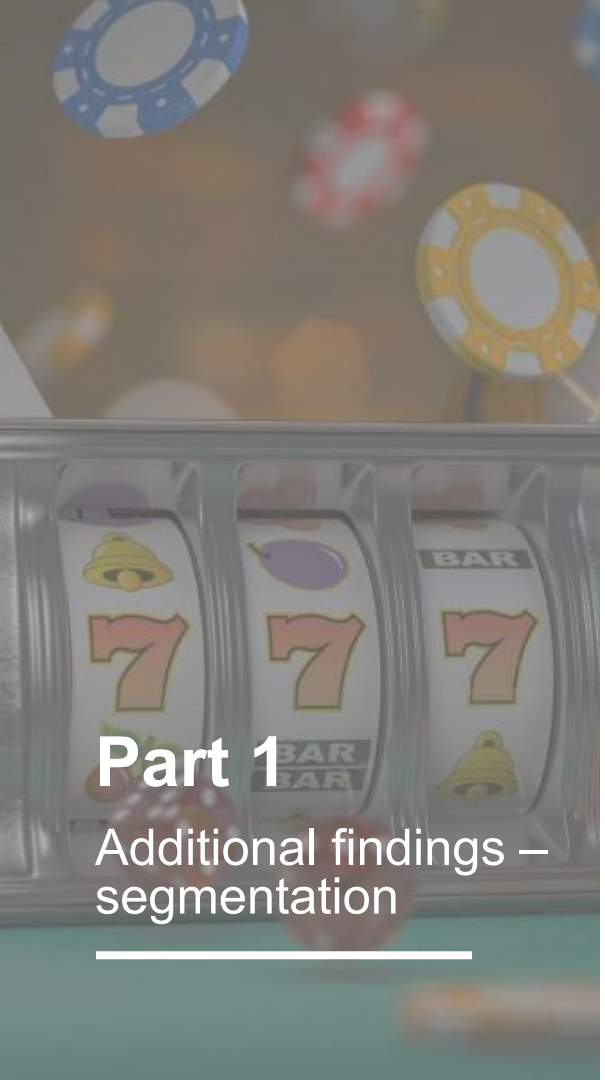


Part 1

Additional findings – segmentation

Do our findings vary across different groups?

This subsection explores how comprehension of odds and gambling behaviour varies by:

A. PGSI score

- Being a problem gambler, or being at risk of experiencing gambling-related harm.

B. Risk literacy

- Having a high or low understanding of risk, measured using the 3-question Schwartz's test.[1]

C. Demographics

- Region, gender, ethnicity, education or income.

We also explore whether the treatment arms differentially affect these groups.

[1] Schwartz, L. M., Woloshin, S., Black, W. C., & Welch, H. G. (1997). The role of numeracy in understanding the benefit of screening mammography. *Annals of internal medicine*, *127*(11), 966-972.

[A] Additional findings: objective comprehension + gambling behaviour, by PGSI score

Gamblers who scored 1+ on PGSI scale were characterised by higher willingness to play, lower final balance, and higher average stake size compared to non-risk gamblers. Objective comprehension was ~10pp lower among moderate risk and problem gamblers vs. non-risk gamblers.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction.

	Non-Risk (Score 0 on PGSI; N = 2,574)	Low Risk (Score 1 on short-form PGSI scale; N = 533)	Moderate Risk (Score 2-3 on short-form PGSI scale; N = 572)	Problem gamblers (Score 4+ on short-form PGSI scale; N = 542)
Gambling behaviour				
% of participants who decide to play	75%	80%**	80%**	92%**
Final balance	£1.32	£1.23+	£1.19**	£1.19*
Total amount lost	-£1.29	-£1.34	-£1.41	-£0.89**
Number of spins	18.19	17.94	17.46	7.94**
Average stake size	£0.15	£0.16+	£0.17**	£0.18+
Time between spins	3.79s	3.77s	3.65s	15.90s**
Objective comprehension				
All correct (%)	14%	13%	6%**	2%**
Average number of correct answers	45%	43%	34%**	20%**

Gambling behaviour
Problem gamblers were more likely to play, but played for fewer spins and lost less on average. They had a lower final balance, likely due to not playing long enough to receive more high value payouts. However, these results should be interpreted with caution due to the small sample.

Objective comprehension
The lower comprehension score in higher risk gamblers is consistent with gambling literature, whereby problem gamblers have a lower understanding of randomness and are more likely to fall victim to the gambler's fallacy.

The time spent answering the comprehension questions did not differ between problem gamblers and low or moderate risk groups. We are therefore reasonably confident our results capture low understanding of odds among problem gamblers, rather than inattention.

Data collected by BIT on 14 March - 6 April 2022.

[A] Additional findings: impact of arms on gambling behaviour, by PGSI score

Framings of odds did not influence problem gamblers' decision to play. Loss framings generally reduced the proportion of non-problem gamblers and non-gamblers who chose to play, relative to other arms.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction.
Data collected by BIT on 14 March - 6 April 2022.

Average	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss- graphic
	Problem gamblers (N = 542)				
% of participants who decide to play	91%	95%	91%	91%	91%
Total amount lost	-£1.04	-£0.78	-£0.74	-£0.53+	-£1.12
	Non-problem gamblers (N = 3,679)				
% of participants who decide to play	79%	81%	78%	72%**	69%**
Total amount lost	-£1.38	-£1.25	-£1.3	-£1.4	-£1.19*
	Non-gamblers (N = 1,090)				
% of participants who decide to play	53%	45%+	54%	45%	37%**
Total amount lost	-£1.22	-£1.16	-£1.03	-£1.2	-£1.4

The results seen in the above table should be interpreted with caution and have not been corrected for multiple comparisons, meaning significance findings may be invalid.

[B] Additional findings: impact of arms on objective comprehension, by risk literacy score

The 'simplified loss-volatility' frame increased understanding of odds regardless of risk literacy. As expected, understanding was much higher among those with high risk literacy.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction.
1. Participants are defined as having 'high' risk literacy if they scored above or at the median.

% of participants who correctly identified that…	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss- graphic
	High risk literacy (N = 3,263)[1]				
All correct	**16%**	**15%**	**16%**	**21%***	**17%**
Q1 For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game	34%	35%	40%*	61%**	55%**
Q2 They are not guaranteed any wins while they play	54%	50%	49%	49%	49%
Q3 The choices they make while playing do not influence whether they win or lose in the next bet	48%	44%	47%	48%	40%**
	Low risk literacy (N=2,047)[1]				
All correct	**3%**	**3%**	**3%**	**5%+**	**3%**
Q1 For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game	15%	15%	21%+	38%**	39%**
Q2 They are not guaranteed any wins while they play	37%	34%	37%	34%	33%
Q3 The choices they make while playing do not influence whether they win or lose in the next bet	31%	26%	31%	30%	26%

Data collected by BIT on 14 March - 6 April 2022. Significantly fewer participants in the high risk literacy group, in the salient RTP + reversed arm, answered all three questions correctly (11%).

[C] Additional findings: differences in subjective comprehension, by demographics

Participants from more urban areas, with higher income, and no degree, tended to perceive their subjective chances of winning as higher.

22% **Thought they would make money when playing the slot game. This was significantly higher among those…**

… who live in an urban area
(39% vs 10% rural)

… who don't have a degree
(31% vs 16% without a degree)

… who live in London
(39% vs 19% living in other parts of England)

… whose income is above the median
(30% vs 15% with a below median income)

… who are Asian men
(37% vs 22% of white men)

The groups were similar in terms of …
Other gender and ethnicity categories, income, suburban vs. rural, London vs. Wales, Scotland, Northern Ireland

Statistically significant at $p < 0.05$.
Data collected by BIT on 17-26 January 2022.

[C] Additional findings: differences in objective comprehension, by demographics

Participants who live rurally in the South and East, are men, and/or are white, had significantly higher understanding of odds.

40% **Was the average comprehension score. This was significantly higher among those…**

… who live in the South & East
(44% vs 33% in London)

… who are men
(43% vs 36% of women)

… who live in rural areas
(43% vs 33% living in urban areas)

… who are white
(41% vs 31% of Asians)

The groups were similar in terms of …
Other gender and ethnicity categories, suburban vs. rural, Other location comparisons, education, income

Statistically significant at $p < 0.05$.
Data collected by BIT on 17-26 January 2022.

[C] Additional findings: differences in gambling behaviour, by demographics

Participants from urban areas with above median income were more likely to decide to play. Although Asian women were less likely to play than white women, the opposite was true for Asian men.

72% **Was the average % of participants who decided to play the slot game. This number was higher among participants who…**

… who live in an urban area
(78% vs 68% rural)

… who are white women
(72% vs 65% Asian women)

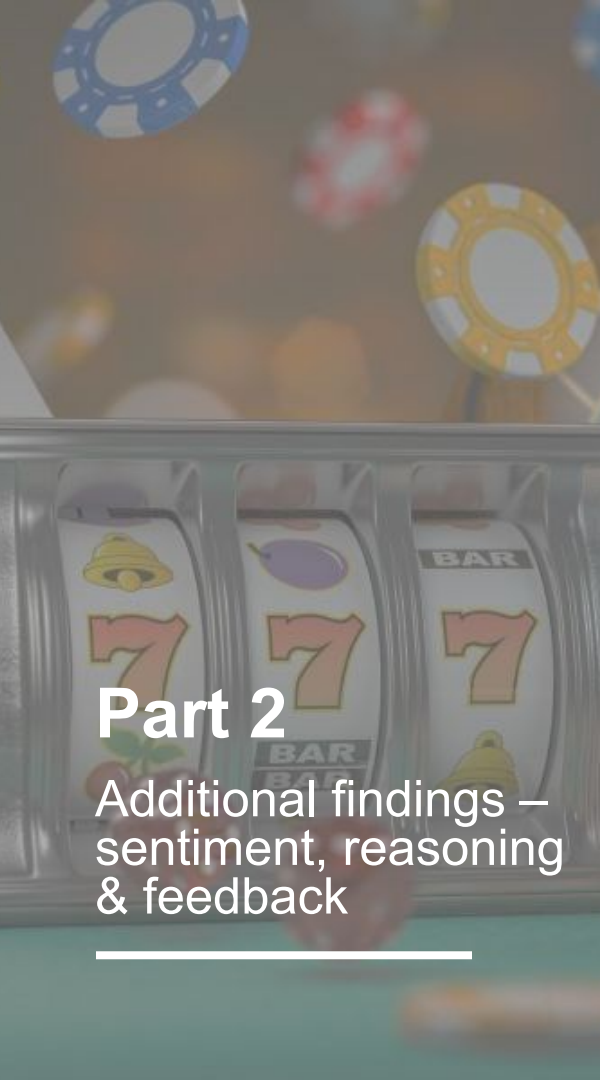
… who live in London
(78% vs 68% living in the South & East)

… whose income is above the median
(75% vs 70% with a below median income)

… who are Asian men
(78% vs 73% of white men)

The groups were similar in terms of …
Other gender and ethnicity categories, income, suburban vs. rural, London vs. Wales, Scotland, Northern Ireland

Statistically significant at $p < 0.05$.
Data collected by BIT on 17-26 January 2022.



Part 2

Additional findings – sentiment, reasoning & feedback

What opinions did participants share about the information they saw?

This subsection presents additional findings on:

1. Reasons why participants decided not to play the slot game.
2. Participant's ratings of how effective they thought the information was at explaining the slot game's odds.
3. Additional free text feedback given on the odds information.

Additional findings: reasons for not playing

Among the 1,469 participants who chose not to play the slot game, the most common reasons were not wanting to lose money (31%), and because they didn't think they had a good chance of winning (21%).

Among those who decided not to play:
"Why did you decide not to play today?"

(n=1,469, *participants could select more than one reason*)

31%	I don't want to lose money
21%	I don't think I have a good chance of winning
19%	I don't like slot games
13%	I don't think I would enjoy the game
10%	I don't understand the game
5%	Other reason(s)

By far the most common 'other' reason given was that a person simply doesn't gamble

Suspicion of trickery
"It sounds like a fool's game."
"It's a mug's game"
"I have a brain"

Aesthetics
"I didn't like the graphics in the example given"
"To much colour"
"I don't like the looks of it"

RTP concerns
"Poor RTP"
"Low RTP"

Lack of belief in randomness
"Seems fixed"
"I don't trust that these games are genuinely random".

Data collected by BIT on 14 March - 6 April 2022.

Additional findings: sentiment

The presentation of odds did not influence sentiment. Sentiment was lower than expected across arms, suggesting that the odds descriptions could be improved further.

% of participants who think the information…	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
Improved their understanding of slot game odds[i]	34%	33%	34%	33%	31%
Effectively explained the game's odds[ii]	70%	66%+	67%	67%	70%
Was easy to understand[ii]	66%	65%	65%	65%	66%

[i] *Moderately/A lot*
[ii] *Somewhat/Very responses*

Perceived effectiveness was lowest when the RTP statement was discreet, indicating that making the odds more salient increased the perception the game effectively explained the game's odds.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction compared to Salient RTP
Red shading indicates significant change in outcomes in the negative direction compared to Salient RTP

Data collected by BIT on 14 March - 6 April 2022.

Additional findings: free text feedback

Participants opinion on the information shown before the slot game differed in terms of whether the information was clear and what the information meant.

Some had suggestions on how to make the information clearer

*"**Perhaps expressing it as "on average people lose 10% of their money" or "a tenth" or "10p for every pound" would be clearer.** The way the game works seems simpler than any slot machine I've ever seen which seem to be a deliberate confusion of lights and sounds" (Simplified loss-volatility)*

*"Seems fairly similar to rules I have seen before. I understand what it says, but it's still **difficult to work out how likely I am to win.**" (House edge)*

*"The explanations are way too complex. **breaking the rules down into infographics that can be easily understood would be great"** (House edge)*

"The game information should be simplified without the use of jargon words"

*"They should **make it clear that the game is random because the 93% statement may confuse people.**"*

Some thought the information was clear and helpful

"Though I am not a gambler, the instructions & odds were clear enough to understand." (Simplified loss-volatility)

"I wish all games came with this level of information before playing."

Some incorrectly seemed to think they would win 93 times out of 100

"The wording is rather confusing: does it mean that (on average) for every 100 plays, there will be 93 wins and 7 losses? The use of £ values is confusing, as the amounts that can be won are various multiples of £s." (Simplifield loss-volatility)

"If the % is 93% it seems too good to be true and i thought slot machines notoriously paid out quite low with most people losing." (House edge)

Data collected by BIT on 14 March - 6 April 2022.

Blue shading indicates free text feedback given by participants in the treatment group

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Get in touch:

Project lead
Lauren Leak-Smith
lauren.leak-smith@bi.team

Project oversight
Aisling Ní Chonaire
aisling@bi.team

Dr. Abigail Mottershaw, Head of Online Experiments
Dr. Filip Gesiarz, Predictiv Research Advisor
Adam Jones, Predictiv Associate Research Advisor
Elena Meyer zu Brickwedde, Predictiv Associate Research Advisor
Deelan Maru, Associate Advisor

Appendix

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Appendix 1: methodology

Slot game design

Note on the block design: participants were not aware of the existence of blocks. They were created to make the wins/losses more predictable, and the experience of each individual to be more aligned with theoretical RTP.

	Set-up
Symbols (fruit)	11
Reels	5
Rows	3
3x symbols reward	1x stake
4x symbols reward	3x stake
5x symbols reward	18x stake
RTP	92.9% (based on 2 mln simulations)

Distribution of wins & losses

The block design below roughly reproduces the theoretical RTP 92.9%, and eliminates the chances of extreme loss/win streaks:

- Single block consists of 10 spins. In each block players drew exactly 4 times a 3x repetition of a single symbol and 1 time a 4x repetition of a single symbol, except the blocks described below.
- In the 4th block (and then every 10th block from then), players drew exactly 1 times a 3x repetition, and 1 time a 5x repetition; unless below case.
- Every 3rd block of 10 spins, players drew exactly 3 times a 3x repetition of a single symbol, and 1 time a 4x repetition of a single symbol.

Assumptions

- Each row has independent probability of winning
- In case of multiple repetitions of symbols in different lines, players get a reward based on the highest repetition

Wins/Loss distribution in the first 100 spins

Participants were not aware of the block structure of the game.

Block of 10 spins / reward repetition	1	2	3	4	5	6	7	8	9	10
3x	4	4	3	4	4	3	4	4	3	4
4x	1	1	1	0	1	1	1	1	1	1
5x	0	0	0	1	0	0	0	0	0	0

If left totally up to randomness, around 50% of participants would draw a jackpot of 5x repetitions at least once by this point in the game.

Appendix 3: further findings – objective comprehension

Making the RTP statement salient increased the proportion that incorrectly thought 93% of people who play will win something compared to all other versions. Both loss framings increased the incorrect impression that there is a fixed maximum loss of no more than £7.

Amongst those who incorrectly answered one or more of the objective comprehension questions, we compared how misconceptions varied between groups. The results table below outlines some of the main differences in common misconceptions.

% of participants who gave one of the following incorrect responses, when asked the objective comprehension questions (Q1-3)...	Controls		Treatments		
	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
Q1 93% of people who play this game will win something, and 7% will lose something	32%	21%**	22%**	14%**	13%**
Q2 For every £100 I bet, I will lose no more than £7	9%	9%	10%	20%**	22%**
Q2 This information does not tell me anything about how likely I am to win or lose	15%	15%	18%*	15%	13%
Q3 The choices I make while playing do influence whether I win or lose in the next bet	34%	41%**	34%	37%	36%
Q1-3 Average % of 'Not sure' answers	19%	23%**	21%+	18%	20%

Significantly more participants in the 'salient RTP + reversed' arm thought "the choices I make while playing do influence whether I win or lose in the next bet" (39%).

Data collected by BIT on 14 March - 6 April 2022.

+ p < 0.10, * p < 0.05, ** p < 0.01

Green shading indicates significant change in outcomes in the positive direction compared to Salient RTP

Red shading indicates significant change in outcomes in the negative direction compared to Salient RTP

Appendix 4: checking for backfire effects among our treatment arms

We asked participants to select between two identical slot games that only varied by RTP (Game A = 94%; Game B = 97%). The simplified loss-volatility framing increased comprehension of RTP odds, with more selecting Game B with higher odds, without changing how much they would plan to spend.

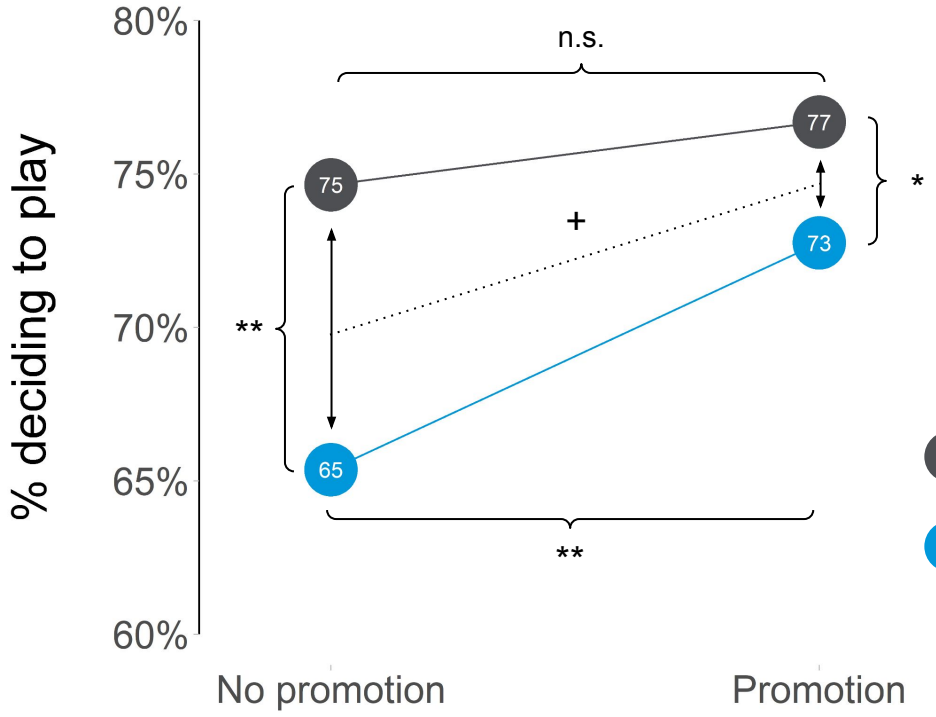
We predicted our treatments would increase the proportion selecting the Game B due to an increased understanding that the game had better odds on average, without been mistaken for a perceived increase in chance of winning (as indicated by planned spend). This was the case for the loss-volatility arm.

	Controls		Treatments		
% of participants who would…	Salient RTP (baseline)	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
Play Game B over Game A (where Game B has better chances of winning)	85%	86%	82%	88%*	87%
Spend £10 or less in the game	74%	72%	70%+	71%	67%**
Spend £10 to £50 in the game	18%	19%	18%	18%	19%
Spend more than £50 in the game	3%	2%	3%	2%	4%
Not sure	6%	7%	10%	9%	10%

Significantly less participants in the salient RTP + reversed arm would intend to spend £10 or less if they chose to play Game B (68%).

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction

The free spin promotion partially counteracted the effectiveness of the treatment framings in reducing the proportion who decided to play. This was not seen in the control arms, however.



Alternatively, treatment framings were associated with increased differences between promotion and no-promotion treatments.

We didn't find any significant differences in reactions to treatments, depending on promotion, on any other outcomes.

Control framings

Treatment framings

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$
n.s. = not significant, $p > 0.10$
Dotted line indicates the interaction effect.

Data collected by BIT on 14 March - 6 April 2022.

Data collected by BIT on 14 March - 6 April 2022.

Appendix 6: further findings – impact of arms on objective comprehension, by PGSI score

Treatment arms increase understanding of the ratio of wins to losses among non-problem gamblers, but loss framings reduce understanding that wins are not guaranteed.

+ p < 0.10, * p < 0.05, ** p < 0.01
Green shading indicates significant change in outcomes in the positive direction
Red shading indicates significant change in outcomes in the negative direction.

% of participants who correctly identified that…	Controls			Treatments		
	Salient RTP (baseline)	Salient RTP + reversed	Discreet RTP	House edge	Simplified loss-volatility	Simplified loss-graphic
	Problem Gamblers *(n=542)*					
All correct	**7%**	**2%**	**1%***	**0%***	**0%***	**3%**
For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game	34%	21%+	26%	32%	37%	35%
They are not guaranteed any wins while they play	22%	16%	20%	13%	17%	15%
The choices they make while playing do not influence whether they win or lose in the next bet	22%	12%+	10%*	7%**	11%+	13%
	Non-problem Gamblers *(n=3,679)*					
All correct	**13%**	**9%***	**12%**	**13%**	**16%**	**14%**
For every £100 bet on this game, about £93 is paid out in prizes, and about £7 is kept by the game	27%	27%	29%	34%*	55%**	53%**
They are not guaranteed any wins while they play	52%	48%	47%*	49%	46%*	47%*
The choices they make while playing do not influence whether they win or lose in the next bet	44%	44%	40%	44%	42%	38%*