What do people think are the chances of winning money from a wagering requirement?

Supplementary results to the main report

July 2024

THE BEHAVIOURAL INSIGHTS TEAM

THE GAMBLING POLICY & RESEARCH UNIT

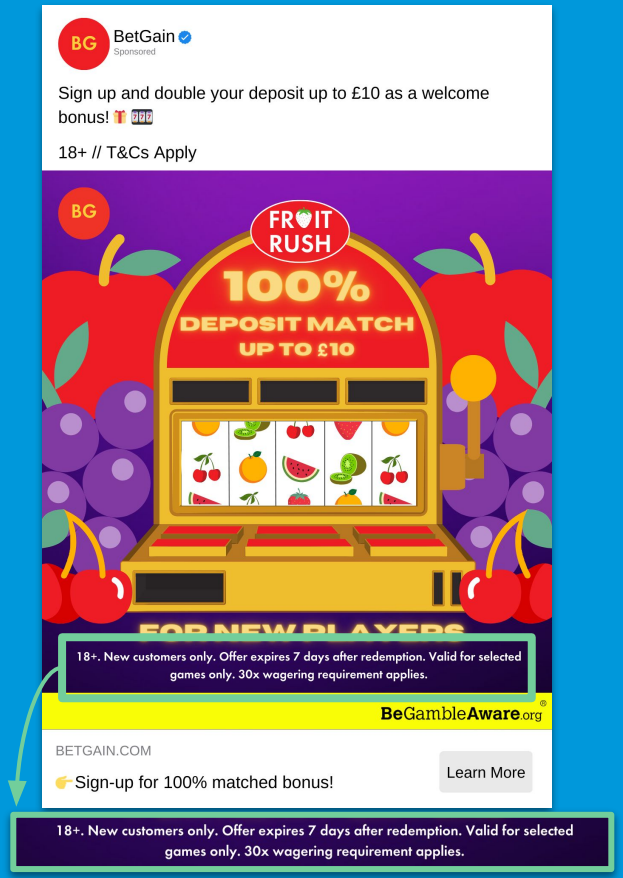
Executive Summary

Wagering requirements (WR) are common conditions on gambling bonus offers, stipulating the number of times consumers must bet bonus funds before they can withdraw the bonus and any associated winnings as their own money (see part 1 pp. 9–10 for examples). Our online experiment with 4,012 UK adults who had gambled in the last 12 months found evidence of poor consumer understanding of WRs.

This report presents further evidence from the same experiment, alongside mathematical and simulation analysis of wagering requirements. In summary, we show:

1. **For slot games it is impossible for consumers to know the probability of winning money from a WR** (or its expected value), with the exception of the 1x WR. Consumers need more information than a slot game's return to player, meaning two apparently identical advertised offers can have very different expected payouts with no way to tell the difference*. Consumers must therefore rely on their intuitions (see part 2, p. 12).
2. **Consumers' intuitions about WRs were systematically biased.** When asked about our in-house slot game, consumers underestimated the probability of 'hitting' a low WR and overestimated the probability at high WR. The overestimation may lead consumers to "over-consume" slot game offers relative to a fully informed state (see part 3, p. 24).
3. **Experience didn't meaningfully reduce the bias.** Neither playing through a WR within the experiment nor having redeemed a WR before our experiment were associated with a consistent improvement in calibration. The exception seems to be the 1x wagering level, the simplest possible WR (see part 3, p. 32).

* For other casino games it is technically possible to calculate the probability of hitting a WR (and its expected payout), but the overwhelming majority of consumers lack the mathematical training in stochastic processes or computer simulations required to do so.



Recommendations

Combining findings from our main report with those from this additional analysis, we suggest that regulators:

1. **Cap or ban wagering requirements on slot games.** Key metrics of slot game wagering requirements are incalculable for consumers (p.21), and intuitions appear to be systematically biased in harmful ways at higher wagering requirements (p.30). Lowering the wagering requirements permitted will reduce the harm associated with such mistakes by consumers.

2. **Restrict game contributions to 0% or 100%.** If a game has a 50% contribution, every £1 bet contributes £0.50 to meeting the wagering requirement. It is essential to restrict game contributions (ideally to either 0% or 100%) otherwise any cap will be ineffective: for example, for a 1x WR cap an operator may choose a 5% game contribution to all games and the *effective* wagering requirement becomes 20x (p.23).

3. **Ban framing wagering requirements in terms of the 'bonus + deposit'.** Knowing how much you need to bet to meet a wagering requirement is essential to understanding your chances of winning money. Framing wagering requirements in terms of the 'bonus + deposit' was shown to cause lower consumer understanding and underestimation of the total amount required to bet in our main results. We provide further evidence consumers don't adjust to sometimes very large increases in wagering requirements when framed on the 'bonus + deposit' (p.28). As every 'bonus + deposit' offer can be easily restated in terms of the bonus only (p.16), the 'bonus + deposit' framing has no function except to confuse consumers and we strongly recommend such framing is banned.

4. **Test different statistics of wagering requirement value** including the total amount you'd need to bet to meet a WR (p. 31), win rates, and expected payouts to improve consumer understanding. The current information provided is insufficient for consumers to make an informed choice between slot offers, and consumer understanding is very low suggesting more support is required for other casino games as well.

5. [From our main results] **Make "bonus only" wagering requirements salient at the point of choice.** A necessary condition for informed choice is to know a WR applies to an offer, which 3 in 5 did not realise in our main results. Field evidence is recommended to confirm this result, so we'd welcome the opportunity to work with an operator to test this.

Part 1 - Research Questions

This report attempts to answer three questions on whether consumers can make an informed choice about wagering requirements.

This report presents analysis from BIT's wagering requirement experiment to answer three questions:

1. **What information is needed** to calculate the theoretical probability of winning money from a wagering requirement? (see part 1)

2. **Are people's intuitions** about the probability of winning money from a wagering requirement **likely to generate harm?** (see part 2)

3. Is **experience with** wagering requirements associated with greater accuracy?

Calculating the average payout of a WR was computationally infeasible at the point of launching the trial, so we studied the probability of hitting the WR instead. We hope future work by us and others will look at perceptions of wagering requirement expected values and its link with gambling harm.

Box 1: Why probabilities and not the expected value?

Definitions. "Hitting" a wagering requirement (WR), or winning money from a WR, means you successfully stake the wagering requirement multiplied by the initial balance before running out of bonus funds. The expected payout of a WR offer, or the expected value, is the average balance you'll be able to withdraw from a wagering requirement offer if you played it many times.

The probability of winning money from a wagering requirement is a key input to both the expected value and variance of the payout from a wagering offer[1], but is likely not as relevant to decision making: when making an informed choice between two bonus offers, consumers will likely favour the offer that is worth more money to them, or has a higher expected value. (They may also care about variance, skew, or the visuals of the game, but the expected value of an offer is a good start.)

When launching this experiment, we could only analytically calculate the probability of winning money from a WR, not the expected value. Calculating the exact expected value was computationally infeasible because the Markov transition matrix was too large. The experiment therefore only asks participants about the probability of hitting WR offers, not their expected value.

[1] By the law of iterated expectations E[wr] = E[wr|hit]*Pr(hit) + 0, and by the law of total variance Var(wr) = Pr(hit)*Var(wr|hit) + Pr(hit)*(1-Pr(hit))*E[wr|hit]^2.

Contents

At the start of each section, the key takeaways are summarised.

Part 1: What are wagering requirements?

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What are wagering requirements?

1. Wagering requirements are a common feature of gambling bonus offers that stipulate the number of times consumers must play through, or stake, bonus funds before they can withdraw winnings derived from the bonus.
2. They can apply to the bonus only, or the total value of the bonus + amount deposited.

Part 1 - Definition of a Wagering Requirement

What are wagering requirements?

Wagering requirements are a common feature of bonus offers in gambling that stipulate **the number of times consumers must play through, or stake, bonus funds before they can withdraw winnings derived from the bonus**.

Wagering requirements can be applied to:

The value of the bonus amount offered ("bonus only"): For example, a bonus of £10 when a consumer deposits £10 with a 50 times wagering requirement on the bonus requires the consumer to play through (wager) **£500** before the winnings derived from the bonus can be withdrawn.

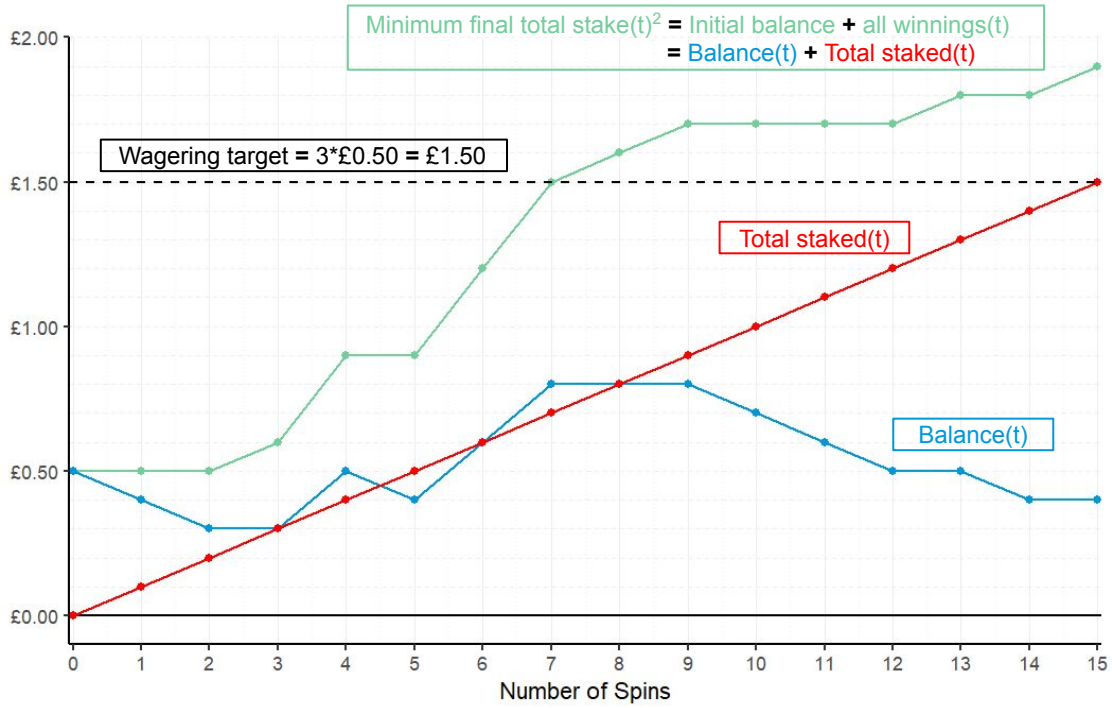
The value of the bonus amount and the deposited amount combined ("bonus + deposit"): For example, a bonus of £10 when a consumer deposits £10 with a 50 times wagering requirement on the bonus amount and the deposited amount combined requires the consumer to play through (wager) **£1000** before the winnings derived from the bonus can be withdrawn. These offers are reasonably common (operator site) in the UK.

These **wagering requirement types** therefore determine the amount a consumer needs to bet to meet the wagering requirement. For 100% matched bonuses (e.g. £10 when you deposit £10), a bonus + deposit type doubles the wagering requirement.

Practically, how do you meet a wagering requirement? See the next two slides for concrete examples, but you hit a wagering requirement if your cumulative stake exceeds an operator defined threshold. In Britain only wagers out of your bonus funds contribute to hitting a wagering requirement. If you stake enough from the bonus funds to hit the requirement, your bonus balance transfers to your own account, and you can withdraw it. If you bet and lose your bonus funds before hitting the wagering requirement, to continue playing you must use your own money and you earn nothing from the offer.

Part 1 - Visualisations of Wagering Requirements

Visualising a wagering requirement: example of hitting a WR.



In this example a simulated agent, who we'll call Agent 1, hits a wagering requirement on our in-house slot game, Fruit Rush[1]. On the first spin Agent 1 starts with £0.50 in bonus funds, bets £0.10 and loses the stake finishing with £0.40.

The **blue** line is the bonus balance in their account (x-axis). Agent 1 starts with £0.50 of bonus funds.

The **black line** shows the total amount needed to stake before Agent 1 can withdraw any bonus funds. They face a 3x wagering requirement, so would need to stake 3*£0.50 = £1.50.

The **red** line represents the total amount Agent 1's staked: initially it is zero, but they are betting £0.10 each time. The **green** line is used in simulations and is for researchers[2].

Agent 1 meets the wagering requirement if the **red** line crosses the **black** line (the wagering target) before their **balance** goes to zero[2]. In this example Agent 1 wins £0.40 in bonus from the wagering requirement having bet £0.10 each spin.

[1] Fruit Rush can be played here. It is a single-armed bandit. It multiplies your stake according to the simple lottery L(0, 1, 3, 11; 0.55, 0.234, 0.21, 0.006). In R, the balance changes in a single spin according to `bal <- bal + stake * (sample(x=c(0, 1, 3, 11), size = 1, prob=c(0.55, 0.234, 0.21, 0.006)) - 1)`.

[2] The **green line** captures the minimum possible finishing stake if at the current balance Agent 1 bets all their money and loses each time. The agent is guaranteed to hit the wagering requirement if the **green line** crosses the **black line** before the **red line** cross the green line, or equivalently your **balance** is zero. Researchers can stop simulations should the green line cross the black line when studying probabilities.

Part 1 - Visualisations of Wagering Requirements

Visualising a wagering requirement: example of not hitting a WR.

This graphs shows a simulated (unsuccessful) attempt to meet a wagering requirement on Fruit Rush.

Agent 2 starts with £0.50 and bets £0.10 each spin.

Once again, the **red** line represents the cumulative amount Agent 2 has staked. The **blue** line is the total bonus balance Agent 2 has remaining.

The player cannot continue with bonus funds when the **balance** goes to zero before **total staked** reaches the **wagering requirement**. To continue playing they would need to use their own deposited funds and the value of the offer is £0.

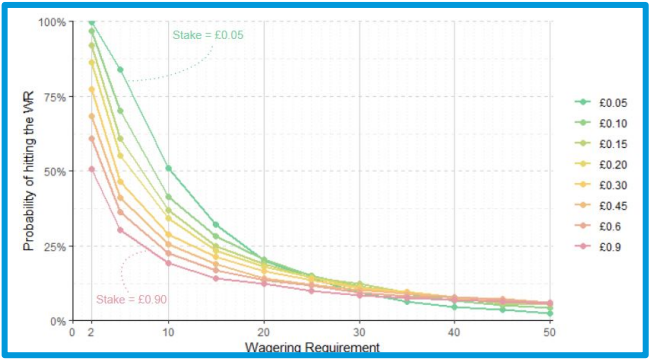
In this example Agent 2 runs out of money after 12 spins with £0.30 remaining of the wagering requirement, and therefore receive nothing from the bonus.

To budget for our experiment, we simulated millions of attempts to meet various wagering requirements on Fruit Rush. We needed to understand how much it would cost to offer wagering requirements at different levels so we knew how many participants we could recruit. **The simulation results**, which are on the next slide, **inspired this piece of research.**

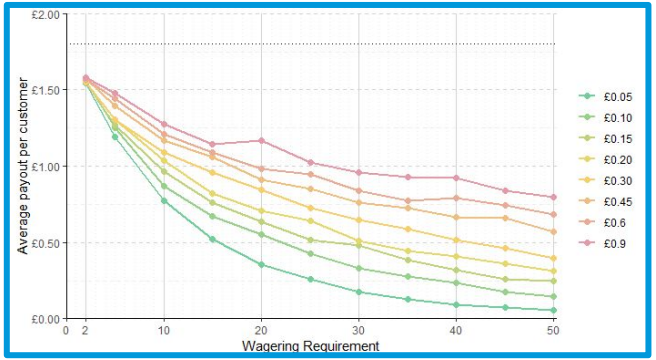
Part 1 - Initial Simulation Results

Simulations prior to our experiment produced 3 interesting results about how stake size and wagering level impact wagering requirements.

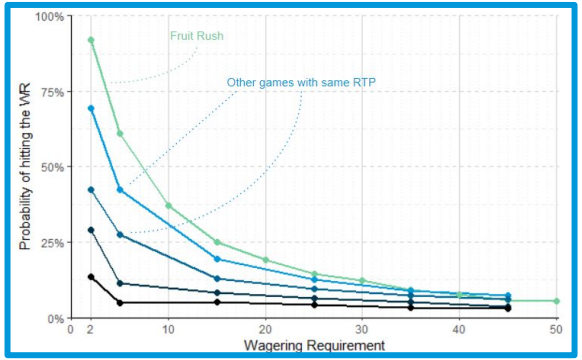
1. The chance of hitting wagering requirements depends on starting balance, stake size and wagering level in non-linear ways



2. The expected value, or average payout (see p.4), of a wagering requirement is higher for higher stake sizes.



3. Game design factors, invisible at the point of choice for slots, influence the expected payout and probability of winning.



What does this mean for consumers?

For this game, there was an inflection point around 30x where it became better to stake large amounts if the aim was to meet the wagering requirement.

If consumers only care about the financial return (and not the enjoyment from playing or chance of winning), it seemed betting the maximum possible stake size is the best strategy.

Given just the return to player of a slot game, it is impossible for consumers to calculate the expected value and probability of hitting a wagering offer.

Simulations run by BIT. Simulations assume a constant stake size.
Each dot in the first three graphs represents 5,000 attempts to meet a wagering requirement on Fruit Rush, our inhouse slot game.
Notes on the graphs (from left to right):
(a) Graph 1: The fraction of simulated agents hitting the wagering requirement on Fruit Rush by level of wagering requirement (x-axis) and fixed stake size (colours).
(b) Graph 2: The average payout to simulated agents playing Fruit Rush by level of wagering requirement (x-axis) and fixed stake size (colours).
(c) Graph 3: The fraction of simulated agents hitting the wagering requirement by level of wagering requirement (x-axis) and other games with the same return to player (colours). The darker games have higher variance.

Part 2: What information is needed to calculate the chance of hitting a wagering requirement?

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What information is needed to calculate the chance of winning money from a wagering requirement?

1. You will need:
   a. the total amount required to bet to meet the WR,
   b. how much you stake per spin, and
   c. the full payout distribution of the game.
2. For slots, the payout distribution is not publicly available. Therefore under current operator practices consumers are unable to calculate their chances of meeting a wagering requirement, nor its expected value.
3. Even with all the information about the game, the vast majority of consumers will not have the required expertise in stochastic processes or computer simulations to make these calculations. Consumers must therefore rely on their intuition for slot games.

You need three* pieces of information to calculate the probability of winning money from a WR. This section explains why this information (1-3) is needed.

What's required to calculate the probability of hitting a wagering requirement (WR)?

1. **The total amount you need to bet to meet the wagering requirement.** This depends on:
   a. The wagering requirement level
   b. Whether the WR applies to the bonus only or the bonus + deposit
   c. Your starting balance of bonus funds, which typically depends on how much you deposit.

2. **How much you stake per spin**, which is restricted by the maximum and minimum allowed stake sizes.

3. **The full payout distribution of the casino game.** For all casino games, including slots, the return to player (RTP) – i.e. the game's average payout – is not enough to calculate your chances. You need to know all probabilities for every outcome on each spin (the probability of losing your stake, getting your money back, hitting the jackpot etc.)

*While less commonly varied varied on wagering requirement offers, customers should also consider the 4) game contributions, 5) bonus expiry, and 6) whether bonus funds are bettable first. Information on each is typically available in the T&Cs of wagering offers. We briefly discuss factors 4–6 on p.23 in this report.

Theory - Calculating the chances of winning money from a wagering requirement (1/5)

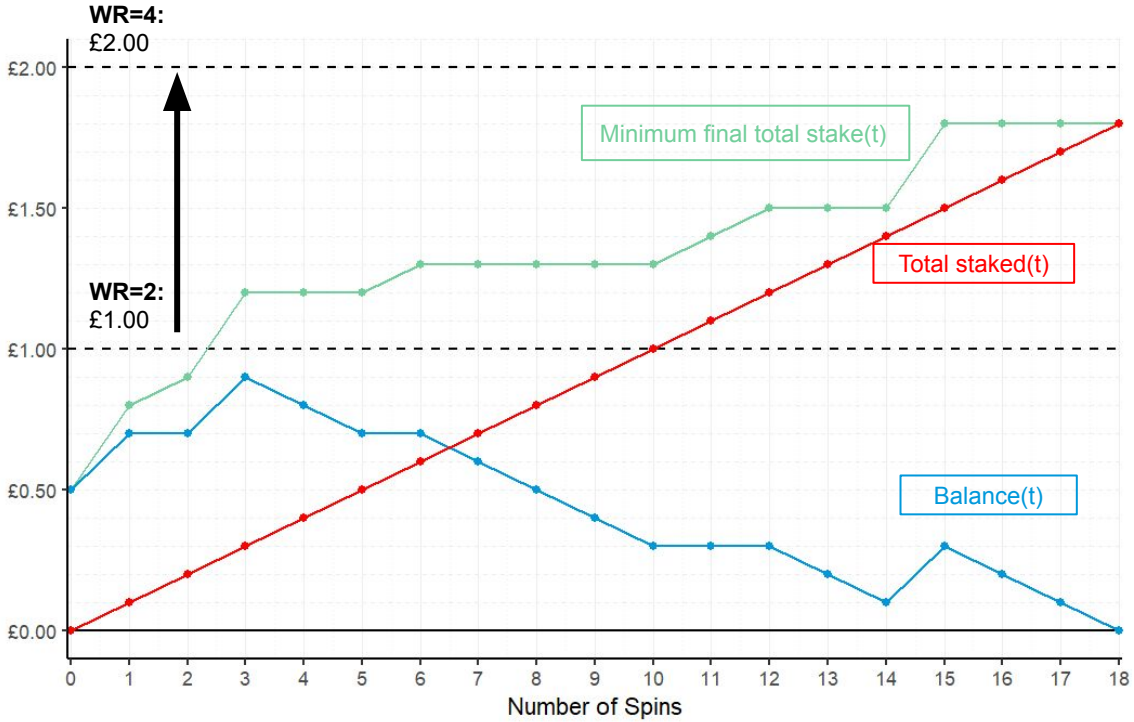
First, you must know the 1a) wagering level and 1b) whether the multiple applies to the ‘bonus only’ or the ‘bonus + deposit’.

What’s required to calculate the probability of hitting a wagering requirement (WR)?

1. **The total amount you need to bet to meet the wagering requirement.** This depends on:
   a. The wagering requirement level
   b. Whether the WR applies to the bonus only or the bonus + deposit
   c. Your starting balance of bonus funds, which depends on how much you deposit.
2. **How much you stake per spin**, and therefore the maximum and minimum amounts you’re able to stake
3. **The full payout distribution of the casino game**
   a. For all casino games, including slots, the return to player (RTP) is not enough to know calculate your chances. You require the full probability mass function for payout multiples for a given slot or casino game.

Theory - Higher wagering requirements lower your chances of winning

Increasing the wagering requirement, or applying it to the 'bonus + deposit', increases the total amount required to bet, lowers your chances of winning money.



Increasing the **wagering requirement (WR)** level increases the **black line**, increasing the total stake required to meet a WR, meaning you're more likely to run your bonus **balance** to zero.

In this example, the player would have met the **2x WR** and withdraw **£0.30** from the offer, but with a **4x WR**, would have run out of bonus funds with **£0.20 left to bet**.

"Bonus + deposit" offers change the chances of hitting a WR by increasing the total amount bet and the effective WR

If you have a 100% matched bonus (e.g. "Deposit £10 and get £10 welcome bonus"), then applying the WR to bonus + deposit is the same as doubling the WR on the bonus[1]. Please see our main report (pp.26–30) for evidence of higher consumer understanding of 'bonus only' wagering offers.

[1] All 'bonus + deposit' wagering requirements can always be framed in terms of the 'bonus only' using high-school algebra. If the bonus (*b*) is a multiple (*m*) times the deposit (*d; b=m*d*), a wagering requirement on bonus and deposit (*k*) can be equated to a wagering requirement on the bonus only (*a*): *k*(b+d) = a*b*. Using *d = b/m*, *a = k*(b+d)/b = k*(b+b/m)/b*. This means ***a = k*(1 + 1/m)***.
For a 100% matched bonus (*m=1*), *a=(1+1/1)*k=2k* so a 10x 'bonus + deposit' WR is a 20x 'bonus only' WR. For a 200% matched bonus (m=2), a 10x 'bonus + deposit' WR is a 15x 'bonus only' WR.

Second, you must know 1c) your starting balance and 2) your chosen stake size. Your stake behaviour influences your chances to win.

What's required to calculate the probability of hitting a wagering requirement (WR)?

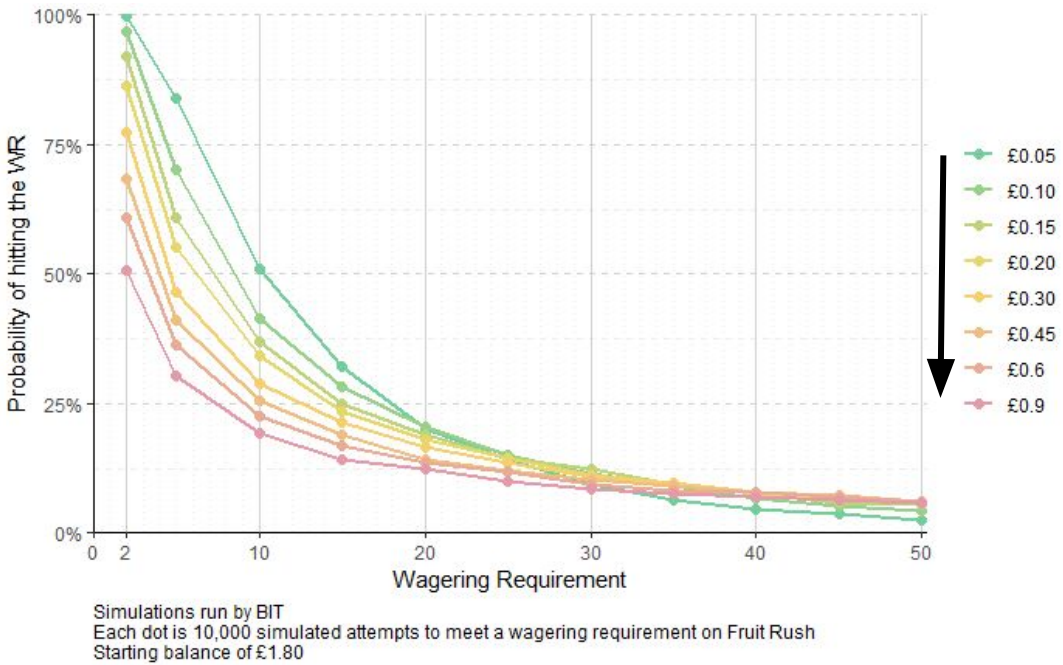
1. **The total amount you need to bet to meet the wagering requirement.** This depends on:
   a. The wagering requirement level (higher WR means lower chances)
   b. Whether the WR applies to the bonus only or the bonus + deposit (bonus + deposit means lower chances)
   c. Your starting balance of bonus funds, which depends on how much you deposit.

2. **How much you stake per spin**, which is restricted by the maximum and minimum allowed stake sizes.

   a. For all casino games, including slots, the return to player (RTP) is not enough to know calculate your chances. You require the full probability mass function for payout multiples for a given slot or casino game.

Theory - Stake size influences your probability of a positive payout

All else equal, changing stake size (or initial balance) will have ambiguous effects on the probability of a winning money from a wagering requirement.



Changing the stake size has an ambiguous effect on the probability of hitting a wagering requirement. Sometimes, for very high wagering requirements, staking a lot in the hope of getting lucky early maximises your chances, whilst for lower wagering requirements betting a smaller amount maximises your chances of winning at least something. This point of inflection may vary by game type.

It is worth noting that for all simulations we've run the expected value (not shown) of a WR has always increased as you stake more, so there doesn't appear to be an inflection point for expected payouts and stake size.

Changing the starting balance of bonus funds impacts the probability of hitting a wagering requirement in the same way as changing the stake[1], though having a higher starting balance always increases the expected value of a wagering requirement.

[1] Doubling both the stake size and starting balance at the same time has no impact on the probability of hitting the wagering requirement, but doubles the expected value. This leads to an equivalence between halving your stake size, and keeping your stake size fixed but doubling your starting balance.This is explained in the appendix (p.48). The implication is, for a given stake size, increasing the starting balance has an ambiguous impact on the chances of winning (see orange and black lines of p.49), but an unambiguous change in the expected value.

Third, you need to know 3) the full payout distribution of the casino game. The game's return-to-player (RTP) is insufficient.

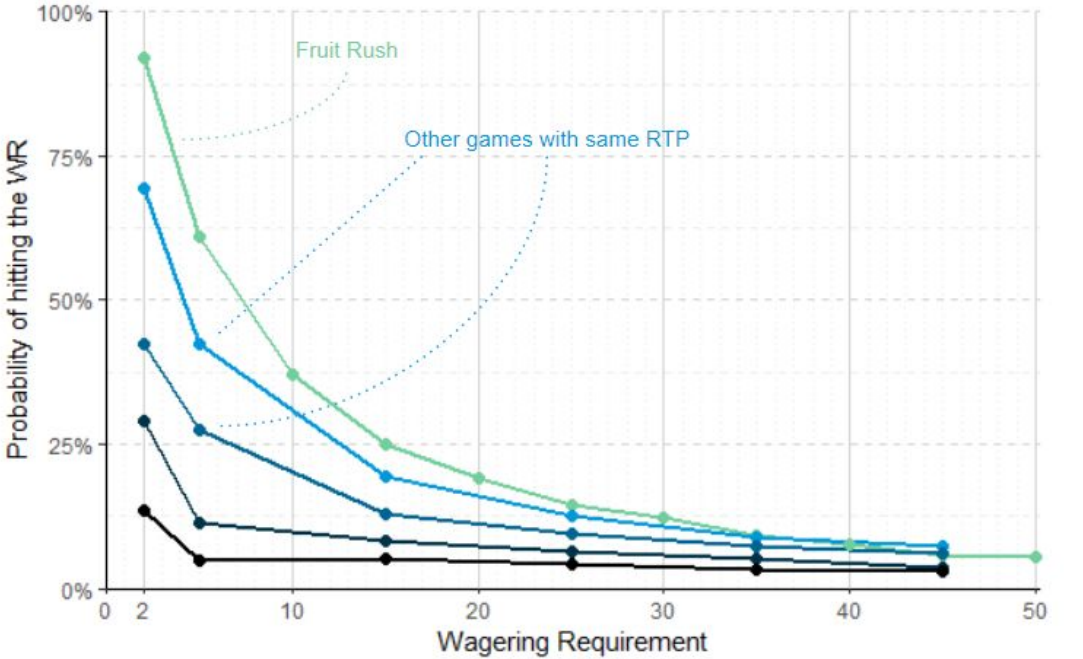
What's required to calculate the probability of hitting a wagering requirement (WR)?

1. **The total amount you need to bet to meet the wagering requirement.** This depends on:
   a. The wagering requirement level
   b. Whether the WR applies to the bonus only or the bonus + deposit
   c. Your starting balance of bonus funds, which depends on how much you deposit.

2. **How much you stake per spin**, which is restricted by the maximum and minimum allowed stake sizes.

3. **The full payout distribution of the casino game.** For all casino games, including slots, the return to player (RTP) – i.e. the game's average payout – is not enough to calculate your chances. You require the full probability mass function for payout multiples for a given game.

The probability of hitting a wagering requirement (and its generosity) depends on more than just the return to player (RTP) of a slot game.



Simulations run by BIT
Each non-green dot is 5,000 (10,000 for green) simulated attempts to meet a wagering requirement
All five games have the same return to player (93%)
Starting balance of £1.80, stake size of £0.15

This graph shows the simulated probability of hitting a wagering requirement for five slot games with the same return to player (RTP=93%).

The blue games are higher volatility than Fruit Rush, showing the chances of hitting a wagering requirement are better on less volatile slots games. While not shown in this graph, the same argument also applies to expected values but with more volatile slots being worth more to the consumer.

Consumers therefore need to know more than the return to player in order to be able to choose between slot games

Choosing a wagering requirement on a slot game is equivalent to not knowing which strategy you are allowed to play on roulette.

Theory - Calculating the chances of hitting a wagering requirement (4/5)

Due to the full payout distribution (3) not being publicly available, it is impossible for a consumer to calculate the probability of hitting a wagering requirement.

What's required to calculate the probability of hitting a wagering requirement (WR)?

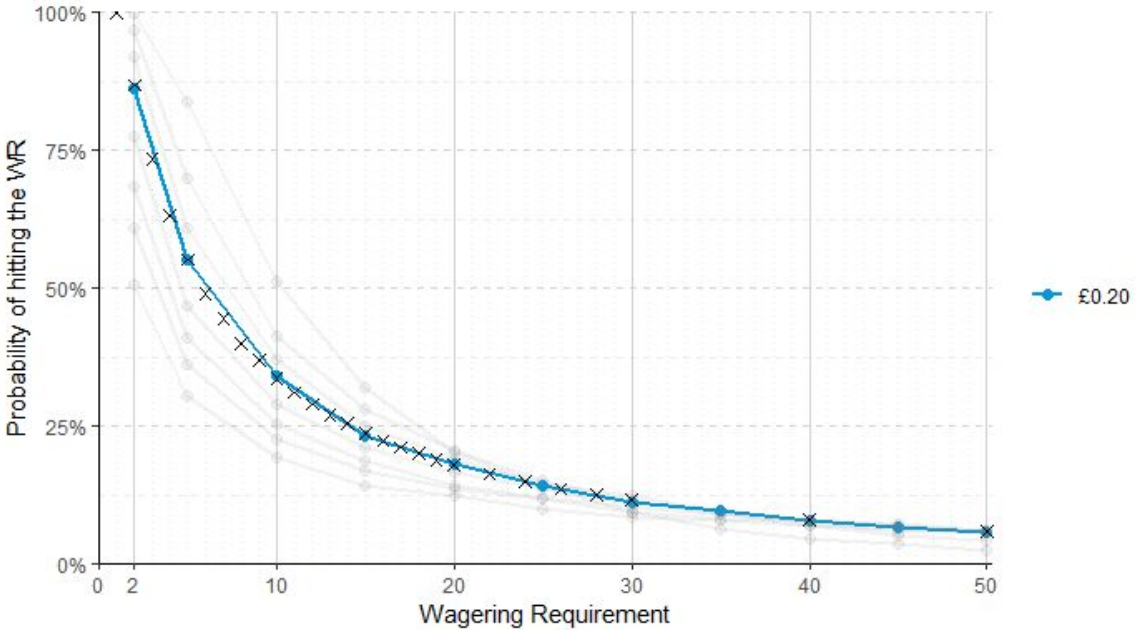
1. **The total amount you need to bet to meet the wagering requirement.** This depends on:
   a. The wagering requirement level
   b. Whether the WR applies to the bonus only or the bonus + deposit
   c. Your starting balance of bonus funds, which usually depends on how much you deposit.
2. **How much you stake per spin**, which is restricted by the maximum and minimum allowed stake sizes.
3. **The full payout distribution of the casino game.** For all casino games, including slots, the return to player (RTP) is not enough to know calculate your chances. You require the full probability mass function for payout multiples for a given slot or casino game.

If you have the above information it is possible to create a set of Markov transition matrices and calculate the chance of hitting a wagering requirement. To our knowledge, without **all** of the above it is impossible to calculate your chances. As the payout distribution of slot games is commercially sensitive it is currently never possible for a slot player to know the chances of meeting a wagering requirement, or the offer's expected value, before they play the game.

Other casino games, such as Roulette, permit exact calculation of average payouts and probabilities of hitting, though you require undergraduate stochastic process knowledge or the coding ability to run computer simulations.

Choosing a wagering requirement on a slot game is the same as not knowing which strategy you would be playing on roulette before you sign up.

Using the information above we calculated the probability of a positive payout from a WR on our in-house slot game with Markov transition matrices.



Each blue dot is 10,000 simulated attempts to meet a wagering requirement on Fruit Rush
The black crosses are the theoretical probabilities derived using a Markov transition matrix
Starting balance of £1.80 and stake size £0.20

In addition to simulating outcomes for our inhouse slot game (p.11) we explicitly modelled the probability of hitting the wagering requirement using Markov chains[1].

The **blue dots** show the simulated probabilities from many attempts to meet the wagering requirement, and the **black crosses** show the theoretical probabilities from our model. They fit closely.

We added an exploratory question into our experiment to see how consumers' perceptions of the chances of hitting a wagering requirement differ from the 'correct' results reported here. Part 3 of this document contains our findings.

Theory - Calculating the chances of hitting a wagering requirement (5/5)

Additionally, the value of a wagering offer also depend on the 4) game contributions, 5) the bonus expiry, and 6) whether bonus funds are bettable first.

What's required to calculate the probability of hitting a wagering requirement (WR)?

1. The total amount you need to bet to meet the wagering requirement.
2. How much you stake per spin, and therefore the maximum and minimum amounts you're able to stake
3. The full payout distribution of the casino game
4. **Game contributions:** Operators can apply a specific "contribution" to each game eligible for the wagering requirement.
   a. For example, if blackjack has a 50% contribution, every £1 staked counts 50p towards meeting the wagering requirement. A 50% contribution is equivalent (if you only play on such a game) to doubling the total amount you would need to bet, or doubling the wagering requirement.
   b. All else equal, higher contributions always increase the probability of hitting and expected value of a wagering requirement in the same way as lowering a wagering requirement (information point 1).
   c. Game contributions can undermine a wagering requirement cap. Allowing only 0% or 100% contributions (eligible or not eligible) may make it easier for players to understand offers and removes a straightforward way for operators to avoid a wagering cap.
5. **The bonus expiry:** many offers will remove your bonus funds if you do not meet the wagering requirement within a certain time period.
   a. Meeting large wagering requirements can take a considerable amount of time, especially for smaller stake sizes. Having a longer bonus expiry date lower the sense of time pressure that may lead to lower decision making quality.
6. **Whether bonus funds are bettable first:** if you are required to stake your deposit first, the probability of hitting a WR is unchanged but the expected value of the offer is lower.

Part 3: What do people think are the chances of hitting a wagering requirement?

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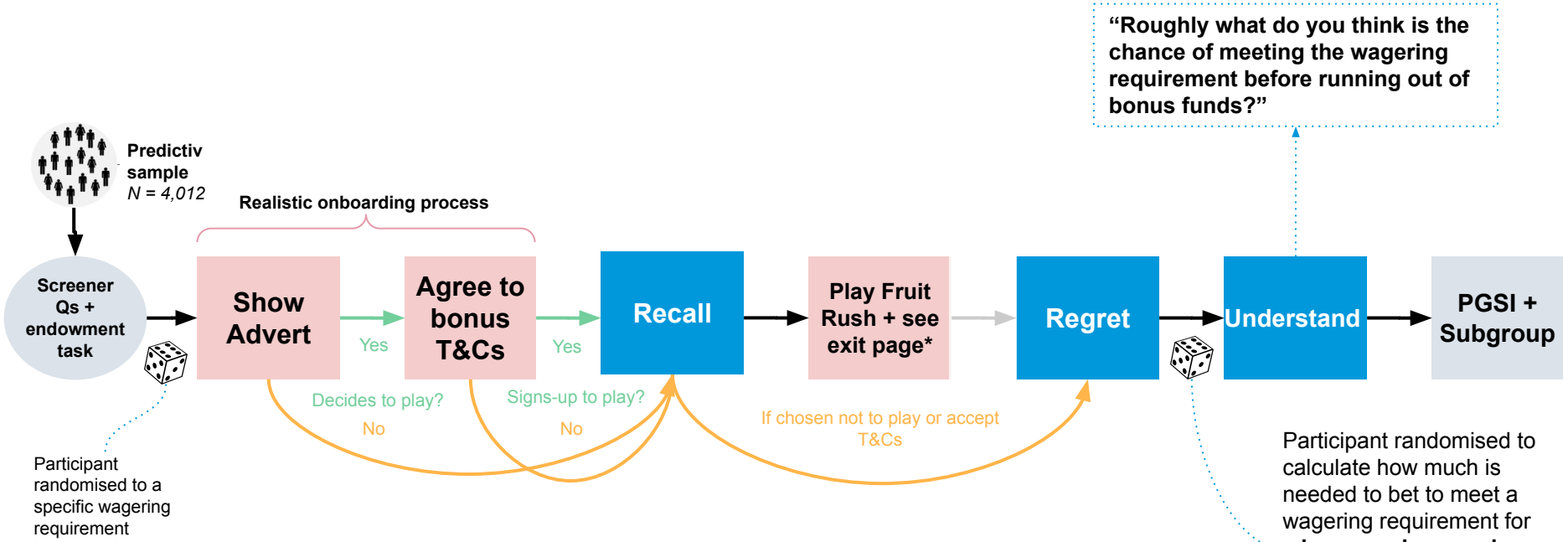
What do 4,012 people who gamble think are their chances of winning money from a wagering requirement?

1. 1 in 5 (22%) thought their chances of hitting a wagering requirement were within 10pp either side of their actual chances. This means the majority (78%) had intuitions that weren't aligned with the actual chances of meeting the wagering requirement.
2. For our specific slot game, people underestimated the chances of hitting a wagering requirement at low wagering levels and overestimated for high wagering levels.
3. Knowing the amount you need to bet to meet a wagering requirement (see Part 2) was associated with more accurate perceptions about the changes of hitting a wagering requirements for very high and very low wagering requirements.

Empirical - Experiment flow

Consumers must rely on their intuitions when judging WRs on slot games (see part 2). We tested their intuitions in an online experiment with 4,012 UK adults who gamble.



Empirical - Comprehension questions

This report mainly focuses on the two questions about the chances of hitting a wagering requirement (Q3, Q4) from the comprehension section of our experiment.

We asked participants:

Imagine you see a different gambling advert for Fruit Rush that says: "We'll double your deposit up to £20. **[30x/10x/5x/1x]** wagering requirement applies to the **[bonus/bonus + deposit]**". Please imagine you have signed up for this bonus and deposited £20.

Participants saw the same wagering level as they saw on the advert, but ½ of participants saw "bonus" and ½ saw "bonus + deposit" (we explained the differences in part 1 of this report).

Q1) What is the total amount of money you would have to play with?
This includes both the bonus amount and the money you deposited.

Q2) How much do you think you need to bet before you meet the wagering requirement?

The correct answers and participant responses to questions 1 and 2 are discussed in section 2 of our main report.

Q3) Roughly what do you think is the chance of meeting the wagering requirement before running out of bonus funds?
Assume you may only bet £0.20 every spin and the return to player of the slot is 93%.
Please answer to the nearest percent

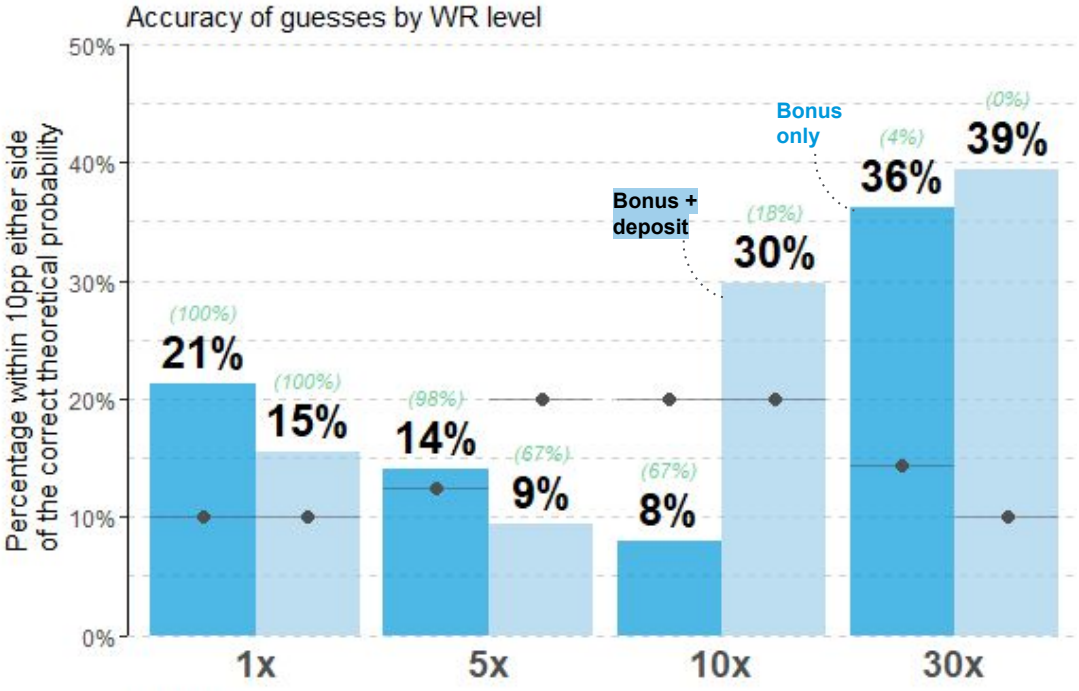
Due to technical challenges with question 3, the minimum answer we could accept was 1%, not 0%. Mapping all 1% answers to 0% doesn't alter any results in this report, though there's a chance the lower limit signalled low answers were not correct.

Q4) [Appeared after they answered Q3] **How confident are you in your previous answer about the chance of meeting the wagering requirement?**

Answer options: Very confident, moderately confident, a little confident, I guessed

Empirical - “Correct” answers

Overall 22% of participants were within 10pp either side of the correct answer, roughly what you’d expect if people chose a random number between 1 and 100.



N=4,012.
Black dots are the percentage of correct answers you’d expect if people were guessing.
Green numbers are the correct theoretical probability of hitting the wagering requirement.
Data collected by BIT on 6th - 22nd December 2023.

The percentage of people within 10pp either side of the correct answer is low for all arms. This is unsurprising because calculating the correct answer is impossible for all but the 1x bonus only wagering requirement (see the next slide).

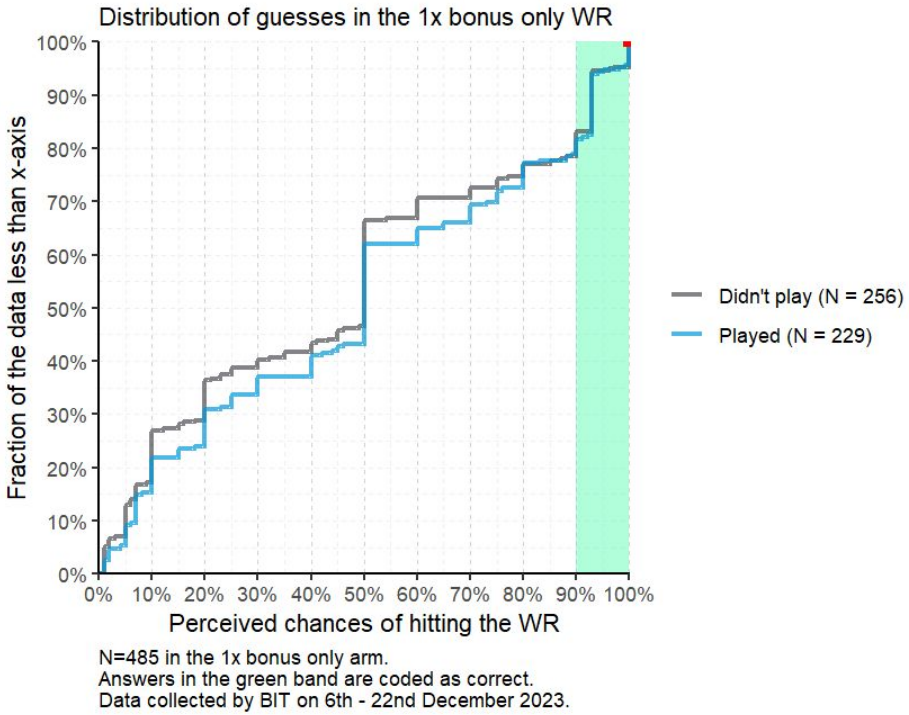
The **black dots** give the proportion of answers within 10 percentage points if people guessed randomly. They show that significantly more people are giving approximately correct answers when wagering requirements are higher, up to a maximum of 4 in 10.

The small **green** numbers in brackets give the correct theoretical chance in that arm, rounded to the nearest percentage point.

This tells us at least some participants intuit they have a low chance of hitting the wagering requirement at higher levels, but leaves open the scale of the overestimation for the others.

Empirical - “Correct” answers in 1x bonus only WR

For a 1x WR, the correct answer to the chances of hitting the WR is always 100%. Just playing a wagering requirement had no impact on subsequent correct answers.



N=485 in the 1x bonus only arm.
Answers in the green band are coded as correct.
Data collected by BIT on 6th - 22nd December 2023.

Under a 1x wagering requirement on the bonus, you always have a 100% chance of meeting the wagering requirement. Despite this, only 5% of participants in the 1x wagering requirement arm of our experiment stated their chances were exactly 100%**.** 21% of participants under a 1x wagering requirement were within 10pp of the correct answer.

Those who had just played through a 1x wagering requirement said their chances were between 90–100% at exactly the same rate as those who hadn’t played (21% in both). There may have been some modest updating, with mean stated probabilities of 49% for those who played and 46% for those who didn’t play, but we can’t rule out people who play are better informed before they play. It is worth noting that 24% of people who played in this arm left the wagering requirement before they staked the £1.80, therefore walking away from free money (see page 37 of our main report).

There are clusters of answers at 50% and 93% (the return to player given to consumers).

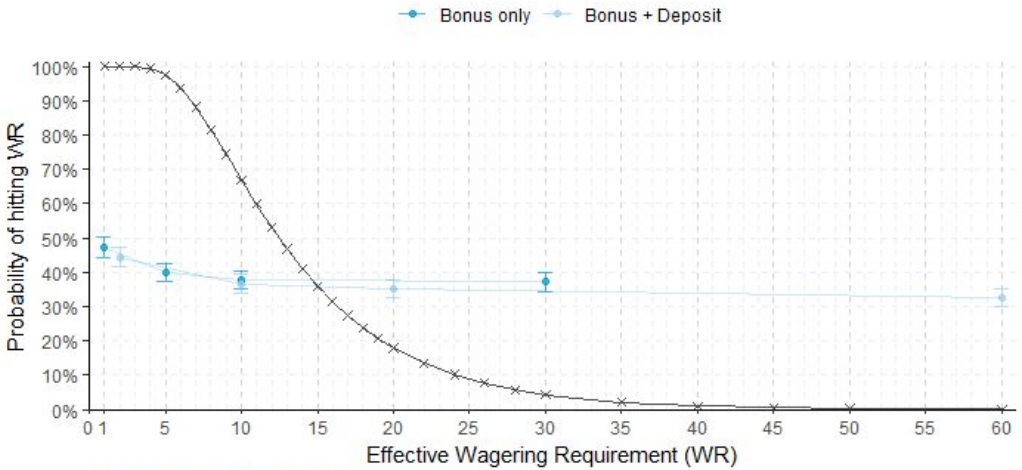
Taken together this suggests people don’t fully learn from their experience when it comes to 1x wagering requirements. **While we haven’t seen many 1x wagering requirements in the field, this result suggest people are underestimating their generosity and don’t understand them.**

Empirical - Intuitions about chances are biased

Participants were insensitive to changes in the probability of hitting a wagering requirement.

"Roughly what do you think is the chance of meeting the wagering requirement before running out of bonus funds?
Assume you may only bet £0.20 every spin and the return to player of the slot is 93%."

Stated chances of hitting the wagering requirement versus actual chances



N=4,012. Exploratory analysis.
Blue dots are participants' mean stated chances of hitting the WR.
95% HC3 confidence intervals are plotted around each mean.
Black line is the 'correct' theoretical probability on Fruit Rush.
Data collected by BIT on 6th - 22nd December 2023.

On average, participants overestimated the probability of winning money at high wagering requirements and underestimated at low wagering requirements.

The **blue dots** show the mean guess for each level of the *effective* wagering requirement*. The **black line** shows the 'correct' theoretical probability of winning money from a wagering requirement on Fruit Rush for each wagering level at a £20 starting bonus balance and 20p stake.

The "correct" probabilities are specific to this game, starting balance and stake size, but we couldn't find a combination on this game that corresponds to a 30%+ chance of success at a 60x wagering requirement. We believe this pattern of overestimation will generalise to both other games and other strategies.

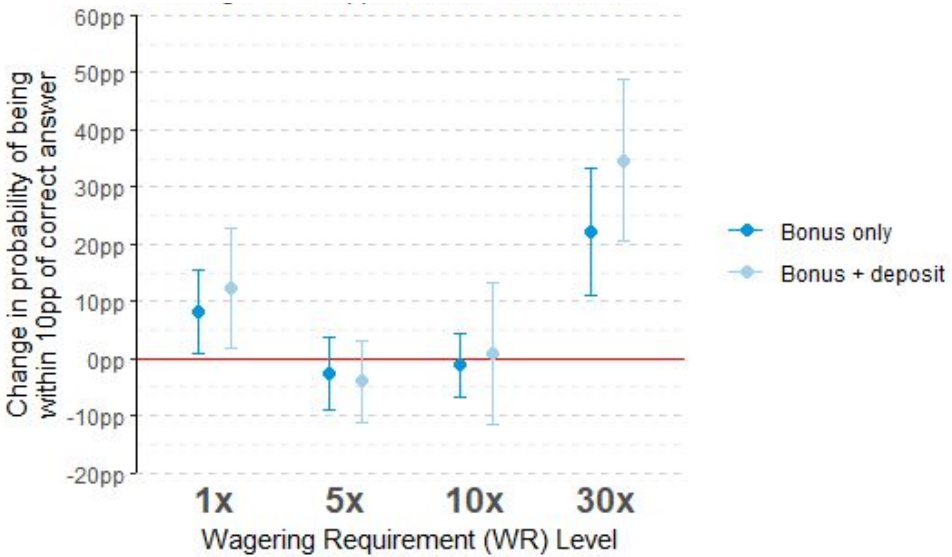
If higher perceived probabilities lead to greater rates of play, operators will maximise the profitability of offers by choosing higher wagering requirements. Our main report also shows that most people were inattentive to the wagering level, compounding the benefit of offering high wagering requirements to operators.

*The effective wagering requirement is a multiple of how much a consumer receives in bonus funds. Our experiment used a 100% matched offer so the effective wagering requirement for a 'bonus + deposit' offer is twice what's advertised on the 'bonus only' leading to the staggered dots in our main chart. (See footnote 1 on p.16 of this report for more details).

Empirical - Clarifying the amount required to bet is likely insufficient to correct bias

Knowing how much you need to bet might reduce biases in the perceived probability of hitting a wagering requirement for large wagering requirements.

Regression coefficients of the impact of improving the accuracy in the perceived amount bet on the probability of being within 10pp of the correct theoretical probability of winning money from a wagering requirement.



N=4,012. Exploratory analysis.
The blue dots are OLS estimates for the change in probability of being within 10pp of the correct theoretical probability associated with knowing exactly the total amount they'd need to bet to meet a wagering requirement.
95% confidence intervals derived from HC3 SEs are plotted around each estimate.
Data collected by BIT on 6th - 22nd December 2023.

While not causal, telling consumers how much they need to bet in order to meet a wagering requirement may improve calibration for very small and very large wagering requirements.

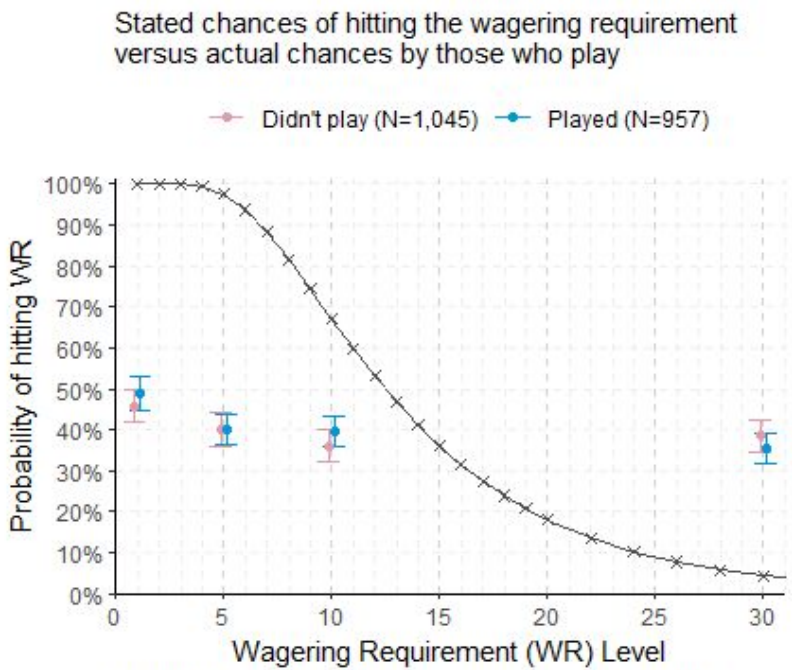
Knowing exactly how much you need to bet to meet a wagering requirement (Q2) is associated with improved calibration about the perceived chances of hitting the WR at the 1x and 30x level.

However, these results not causal. We cannot rule out the improved calibration is driven by higher numeracy among the 18% and 9% of people answering correctly in the 30x 'bonus only' and 30x 'bonus + deposit' arms respectively. Randomised experiments testing whether providing the amount required to bet to meet a wagering requirement change play behaviour are needed to confirm this finding.

Is experience associated with improved intuitions?

1. Though not causal, playing through a wagering requirement within the experiment is not associated with better calibration.
2. Having previously redeemed a wagering requirement is associated with slightly better answers for 1x and, to a lesser extent, 10x bonus only wagering requirements.

Playing Fruit Rush moments before answering leads to a small and statistically insignificant reduction in bias.



N=2,002 in the bonus only WR arms. Exploratory analysis.
Dots are participants' mean stated chances of hitting the WR.
95% HC3 confidence intervals are plotted around each mean.
Black line is the 'correct' theoretical probability on Fruit Rush.
Data collected by BIT on 6th - 22nd December 2023.

While not causal—as people who chose play might have lower understanding to start with which is improved by playing—those who had just attempted to reach a wagering requirement were statistically indistinguishable from those who hadn't played when guessing their chances of winning money.

Pink dots represent the average guess for people who didn't play a wagering requirement just prior to answering the question, whilst **blue dots** are the average guesses for those who did play.

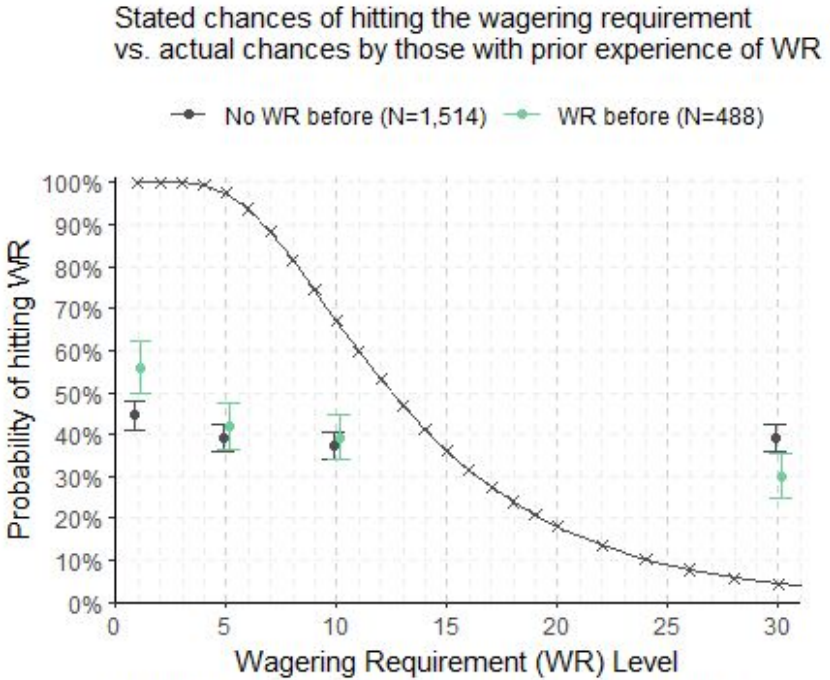
The same pattern of overestimation at high wagering requirements and underestimation at low wagering requirements applies.

Of the 179 people who successfully met a 1x WR on Fruit Rush moments before, 4% of people gave the always correct answer of 100%.

While not causal, our results suggest players are not learning much from a single playthrough of a wagering requirement. Regression results in the appendix (p.42) support this conclusion for the bonus + deposit arms.

Empirical - Previously experiencing a wagering requirement

Prior experience of Fruit Rush is associated with a modest improvement in calibration, especially at the 1x WR level.



N=2,002 in the bonus only WR arms. Exploratory analysis.
Dots are participants' mean stated chances of hitting the WR.
95% HC3 confidence intervals are plotted around each mean.
Black line is the 'correct' theoretical probability on Fruit Rush.
Data collected by BIT on 6th - 22nd December 2023.

Those who had played a WR before participating in our experiment (25% of our sample) were slightly more accurate in their perceived chances of hitting a wagering requirement in the 1x and 10x bonus only conditions.

Black dots represent the mean guess of people who hadn't experienced a WR before this experiment, while **green dots** are for those who did.

Regression analysis in the appendix (p.43) shows there are more correct answers in the 1x and 10x bonus only arms.

Though we're not powered to detect subgroup effects, there is some evidence that previously experiencing a wagering requirement improves average calibration, though the size of the improvement is small.

If consumers are learning, it is happening slowly (see Kahneman and Klein, 2009).

Appendix

THE BEHAVIOURAL INSIGHTS TEAM

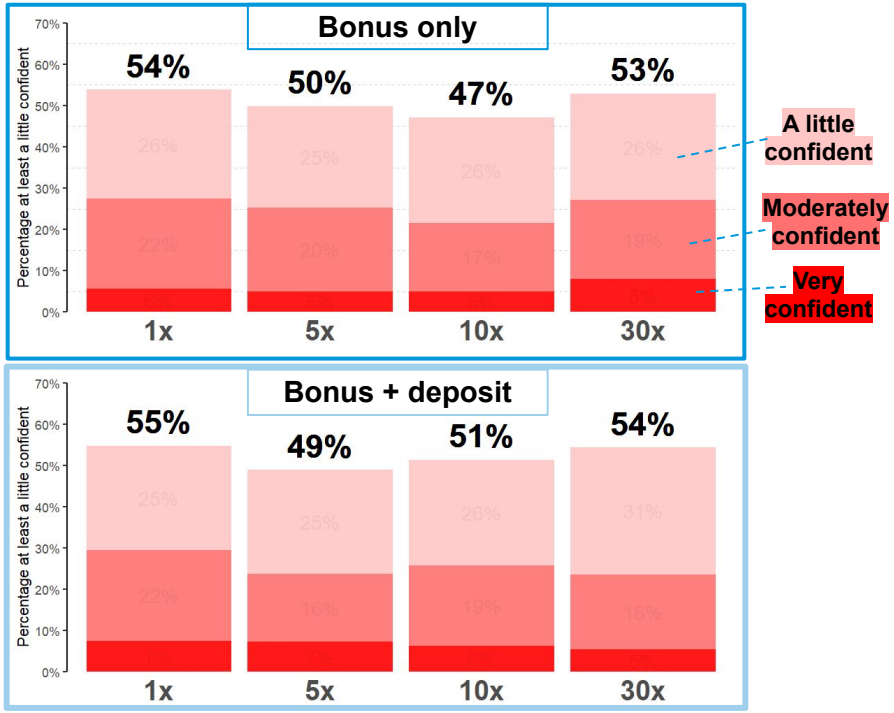
THE GAMBLING POLICY & RESEARCH UNIT

Is confidence associated with improved intuition?

1. Around half of participants (48%) said they guessed when asked the probability of hitting the wagering requirement, consistent for every level of wagering requirement.
2. Men were more likely to express confidence in their answers, which surprised nobody.
3. Confidence was associated with improved calibration about the chances of winning at low wagering requirements but worse calibration at high wagering requirements, consistent with those with higher confidence generally believing they have higher chances of winning rather than better understanding of the problem.

Around half of participants (48%) said they guessed the chances of hitting a wagering requirement, roughly the same across all wagering levels.

Percent at least a little confident in their answer about the chances of hitting the wagering requirement.



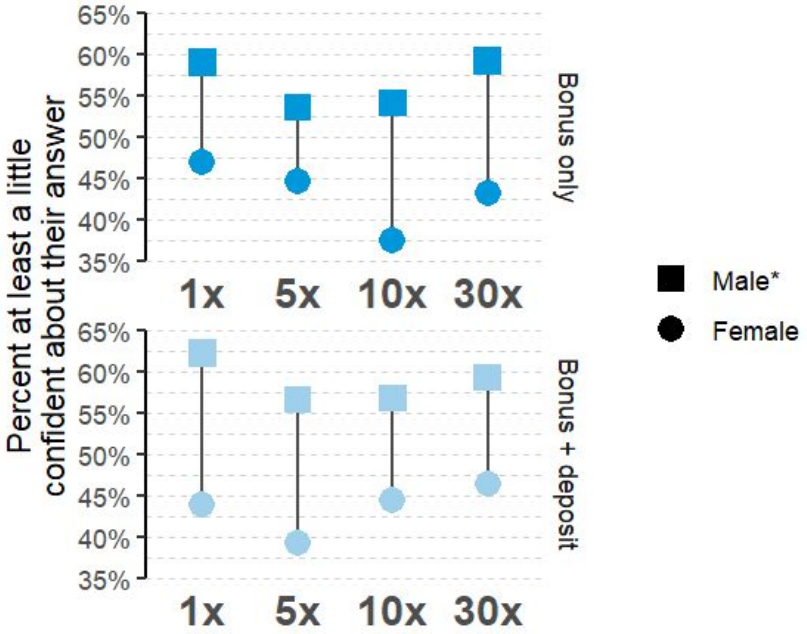
Calculating the probability of meeting a wagering requirement exactly was impossible because you need more than the return to player (RTP) (see p.21 of this report). The exception is in the 1x 'bonus only' wagering requirement, where the correct answer is always 100%. **You are guaranteed to complete a 1x wagering requirement** as you only need to stake the bonus funds you have, once.

Confidence in the 1x bonus only arm is statistically indistinguishable from all treatment conditions except the 10x bonus only arm.

The proportions of participants at least a little confident in their answers are statistically indistinguishable when comparing 'bonus only' offers to their 'bonus + deposit' counterparts.

Exploratory analysis. N = 4012.
Data collected by BIT on 6th December - 22nd December 2023

Across all treatment arms, men are substantially more confident in their answers and state a higher chance of hitting a wagering requirement.

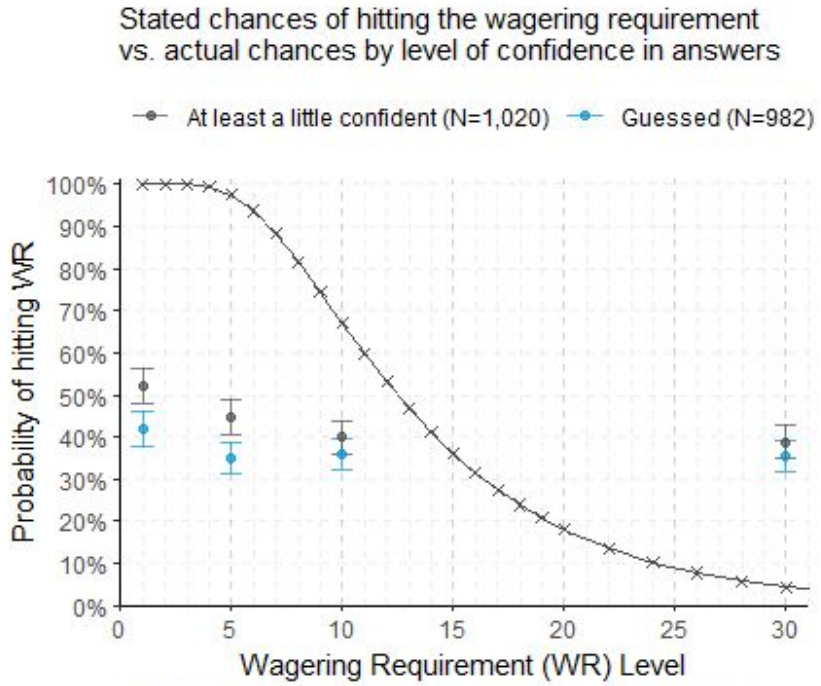


N=4,012. Exploratory analysis.
* 14 people preferred not to say and are included with the men
Points are percentage at least a little confident in their answer.
Data collected by BIT on 6th - 22nd December 2023.

58% of men* said they were at least a little confident in their answers about the chances of hitting a wagering requirement compared with 43% of women.

Is the additional confidence misplaced? Women were within 10pp of the correct answer 20% of the time compared to 24% of the time for men. Much of this comes from men giving higher answers than women, which was more appropriate for smaller wagering requirements.This result survives controlling for previous experience.

Those with higher confidence gave higher predictions, which were sometimes appropriate.



N=2,002 in the bonus only WR arms. Exploratory analysis.
Dots are participants' mean stated chances of hitting the WR.
95% HC3 confidence intervals are plotted around each mean.
Black line is the 'correct' theoretical probability on Fruit Rush.
Data collected by BIT on 6th - 22nd December 2023.

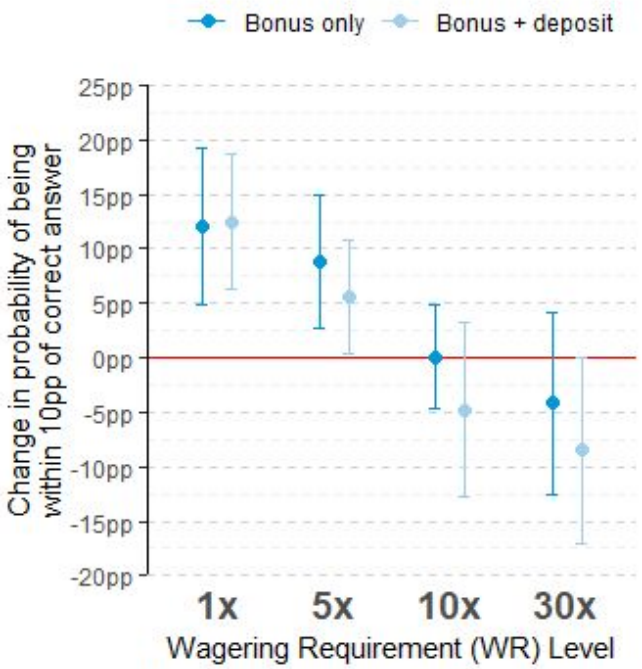
Those who were at least a little confident gave higher average guesses at the chance of hitting a wagering requirement.

For lower wagering requirements the more confident, higher guesses were closer to the truth. For higher wagering requirements the more confident guesses were further from the truth.

The more confident are not noticeably more sensitive to changes in the wagering level.

The next slide reports regression analysis for the bonus + deposit group as well, and finds the same pattern of more confidence leading to higher stated probabilities.

Confidence was associated with better answers only for the smallest wagering requirements, again due to higher answers being given by the more confident.



The blue dots are OLS estimates for the change in probability of being within 10pp of the correct theoretical probability when at least a little confident in their answer versus saying they guessed.
95% confidence intervals derived from HC3 SEs are plotted around each estimate.

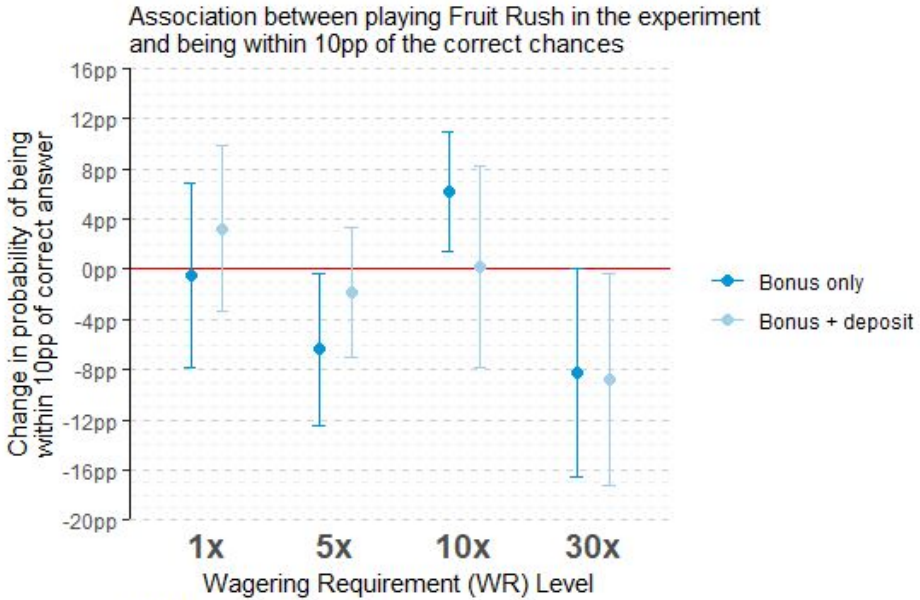
Regression analysis confirms being more confident was associated with a higher probability of being within 10pp of the correct answer only at low wagering requirements.

This might be because higher confidence signals better understanding of the true probability, but it may also be confident people will think they have a higher chance of "winning" and giving higher answers.

This result is robust to including controls for gender and the absolute error about the total amount bet required to meet a wagering requirement.

Regression analysis of learning effects

Playing Fruit Rush was not associated with improved accuracy about the chances of hitting the wagering requirement.



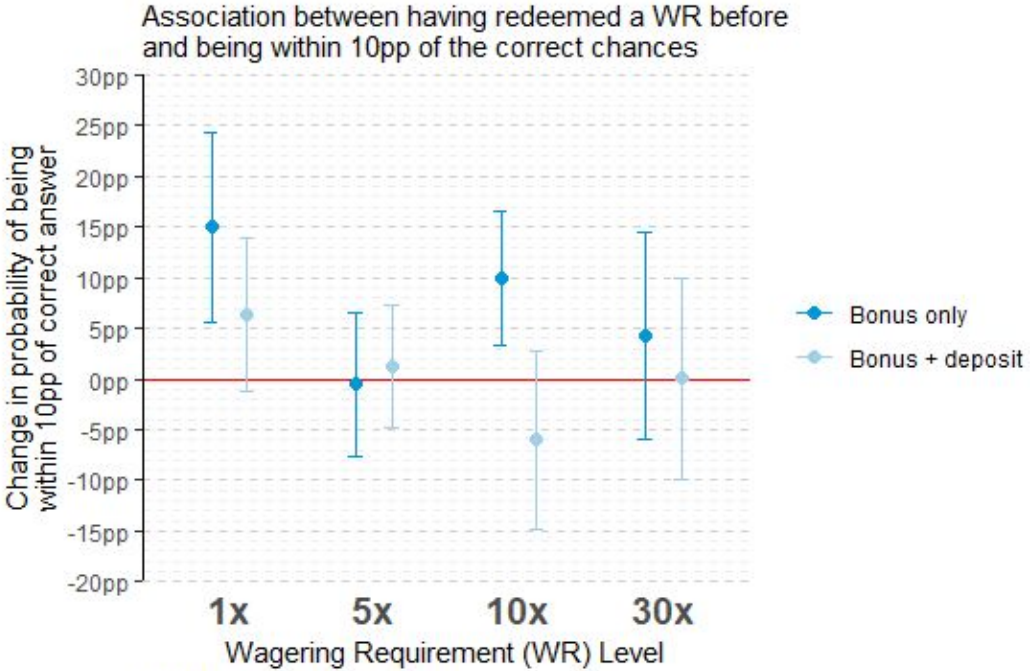
N=4,012. Exploratory analysis.
The blue dots are OLS estimates for the change in probability of being within 10pp of the correct theoretical probability associated with playing Fruit Rush
95% confidence intervals derived from HC3 SEs are plotted around each estimate.
Data collected by BIT on 6th - 22nd December 2023.

Regression analysis confirms that having just played a wagering requirement is not associated with improved calibration in the probability of hitting the wagering requirement.

While not causal, because people who choose to play may be systematically different to those who don't play within each treatment arm, we find this evidence suggestive of slow learning from play. Slow learning from experience may result in biases persisting.

The 1x bonus only wagering requirement provides the cleanest example. There is an always correct answer (100%), though we find no association between playing a 1x WR moments before and guessing the correct answers.

Previously redeeming a WR before our trial had a modest impact in estimating the chances of hitting the wagering requirement, but only in bonus only framings.



N=4,012. Exploratory analysis.
The blue dots are OLS estimates for the change in probability of being within 10pp of the correct theoretical probability from previously having redeemed a WR
95% confidence intervals derived from HC3 SEs are plotted around each estimate.
Data collected by BIT on 6th - 22nd December 2023.

Regression analysis suggests that having previously redeemed a wagering requirement is not associated with improved correct answers in the **bonus + deposit** group.

There's some evidence of experience improving answers in the 1x and 10x bonus only arms: for 1x 18% of those who hadn't redeemed an offer before were within 10pp of the correct answer compared to 33% for those who had; for the 10x offer experience is associated with correct answers moving from 5% to 15%.

Balance Tables

Appendix - Balance Tables

Balance checks: randomisation was effective - there was good balance across treatment arms for our covariates.

Data collected by BIT on 18 May - 12 June 2023.	**30x (N=1,037)**	**10x (N=1,010)**	**5x (N=996)**	**1x (N=969)**
Mean Age (years) *(mean, (sd))*	43 (*15*)	41 (*14*)	41 (*14*)	42 (*15*)
Gender (female) *(count, (%))*	408 (39%)	433 (43%)	424 (43%)	409 (42%)
Mean Short PGSI Score (0-9 scale) *(mean, (sd))*	1.1 (*1.6*)	1.0 (*1.5*)	1.0 (*1.5*)	1.0 (*1.6*)
Higher-risk gambler (sPGSI 2+) *(count, (%))*	283 (27%)	254 (25%)	245 (25%)	254 (26%)
Mean Number of gambling types (last 12 months) *(mean, (sd))*	3.6 (*2.0*)	3.4 (*1.9*)	3.5 (*2.0*)	3.5 (*2.0*)
Employed (part-time or full-time) *(count, (%))*	770 (74%)	779 (77%)	745 (75%)	733 (76%)
Education (has degree or higher) *(count, (%))*	330 (32%)	313 (31%)	310 (31%)	321 (33%)
Income (above £40k) *(count, (%))*	496 (48%)	492 (49%)	455 (46%)	478 (49%)
Ethnicity (non-white) *(count, (%))*	114 (11%)	108 (11%)	115 (12%)	131 (14%)
Region (not in England) *(count, (%))*	155 (15%)	165 (16%)	150 (15%)	143 (15%)
Used a Wagering Requirement Before *(count, (%))*	238 (23%)	264 (26%)	250 (26%)	260 (27%)
Mean Impulsivity Scores (subset of BIS11 asked after experiment)) *(mean, (sd))*	13.2 (*2.8*)	13.3 (*2.8*)	13.2 (*2.9*)	13.1 (*2.8*)

Italicised values in brackets are standard deviations.

Appendix - Balance Tables

Robustness check: with the tentative exception of gender, those who chose to play Fruit Rush were similar across treatment arms.

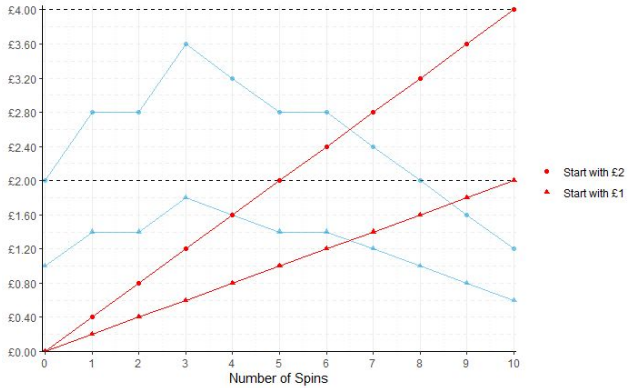
Data collected by BIT on 18 May - 12 June 2023.	Chose to play Fruit Rush				Chose not to play Fruit Rush			
	30x (N=506)	10x (N=497)	5x (N=488)	1x (N=449)	30x (N=531)	10x (N=513)	5x (N=508)	1x (N=520)
Mean Age (years) *(mean, (sd))*	43 (15)	43 (14)	42 (14)	42 (14)	42 (15)	40 (15)	41 (15)	42 (15)
Gender (female) *(count, (%))*	187 (37%)	226 (45%)	210 (43%)	183 (41%)	221 (42%)	207 (40%)	214 (42%)	226 (43%)
Mean Short PGSI Score (0-9 scale) *(mean, (sd))*	1.1 (1.6)	0.9 (1.5)	0.9 (1.5)	1.0 (1.6)	1.1 (1.6)	1.1 (1.5)	1.0 (1.5)	1.1 (1.6)
Higher-risk gambler (sPGSI 2+) *(count, (%))*	139 (27%)	112 (23%)	112 (23%)	110 (24%)	144 (27%)	142 (28%)	133 (26%)	144 (28%)
Mean Number of gambling types (last 12 months) *(mean, (sd))*	3.8 (2.0)	3.6 (2.0)	3.7 (2.0)	3.6 (2.0)	3.3 (1.9)	3.2 (1.8)	3.3 (2.0)	3.3 (2.0)
Employed (part-time or full-time) *(count, (%))*	382 (75%)	383 (77%)	367 (75%)	344 (77%)	388 (73%)	396 (77%)	378 (74%)	389 (75%)
Education (has degree or higher) *(count, (%))*	173 (34%)	146 (29%)	164 (34%)	154 (34%)	157 (30%)	167 (33%)	146 (29%)	167 (32%)
Income (above £40k) *(count, (%))*	252 (50%)	249 (50%)	240 (49%)	241 (54%)	244 (46%)	243 (47%)	215 (42%)	237 (46%)
Ethnicity (non-white) *(count, (%))*	52 (10%)	39 (8%)	49 (10%)	53 (12%)	62 (12%)	69 (13%)	66 (13%)	78 (15%)
Region (not in England) *(count, (%))*	68 (13%)	86 (17%)	72 (15%)	70 (16%)	87 (16%)	79 (15%)	78 (15%)	73 (14%)
Used wagering requirement before *(count, (%))*	142 (28%)	160 (32%)	140 (29%)	148 (33%)	96 (18%)	104 (20%)	110 (22%)	112 (22%)
Mean Impulsivity Scores (subset of BIS11) *(mean, (sd))*	13.2 (2.7)	13.3 (2.7)	13.2 (2.9)	13.3 (2.8)	13.3 (2.8)	13.3 (2.9)	13.3 (2.9)	13.0 (2.8)

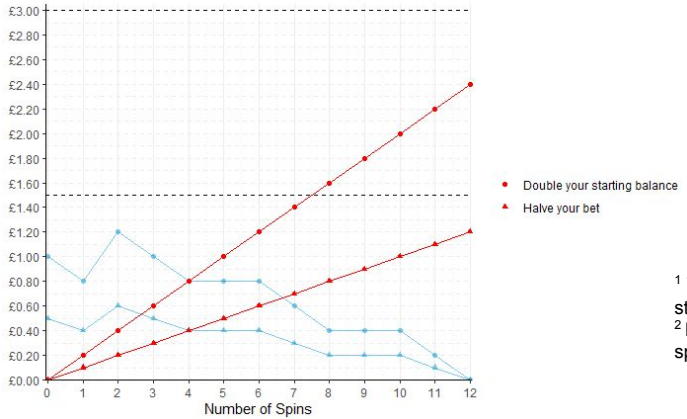
Each row jointly tested the hypothesis that the coefficients on treatment terms in the regression `y~treatment` are all zero for those who played and those who didn't play.
There is some evidence people in the 30x arm differ on gender (p=0.045), but controlling for multiple comparisons eliminates this result (we conducted 24 statistical tests).

The relationship between starting balance and stake size

Appendix - Stake size and starting balance

Doubling both the balance and stake has no impact on probability of hitting a wagering requirement. This links stake changes to changes in starting balance.





Doubling both the balance and stake has no impact on probability of hitting a wagering requirement. It does double an offer's expected payout.

The top graph provides an example[1]: for a 2x wagering requirement, starting with £1 and betting £0.20 is identical to starting with £2 and betting £0.40. You have the same chances of hitting a wagering requirement, but the expected value is twice as large with the larger balance.

If follows that the impact of doubling your starting balance (to £2, keeping your bet at £0.20) will have the same impact on the probability of hitting the wagering requirement as halving your stake size (to £0.10).

Figure 2 illustrates this[2]: if you double your starting balance and fail, you would always have also failed if you had halved your bet.

[1] We hold the sequence of payouts constant so these are direct counterfactuals: "what would have happened if I doubled my starting bonus and stake size at the same time". Graph 1 is the same payout sequence as we saw on slide 16.
[2] In graph 2 we again hold the sequence constant. This is different sequence to in graph 1, and shows that the number of spins before you bust out is always identical for these two strategies. This is the same payout sequence we saw on slide 10.

Appendix - comparison of a £20 to a £1.80 starting balance.

The overestimation at high wagering requirements is robust across starting balances and stake sizes.

"Roughly what do you think is the chance of meeting the wagering requirement before running out of bonus funds?
Assume you may only bet £0.20 every spin and the return to player of the slot is 93%."

N=4,012. Exploratory analysis.
The blue dots are participants' mean stated chances of hitting the WR.
95% HC3 confidence intervals are plotted around each mean.
The black line is the 'correct' theoretical probability on Fruit Rush.
The orange line is the theoretical probability starting with a balance of £1.80.
Data collected by BIT on 6th - 22nd December 2023.

Participants overestimated the probability of hitting the wagering requirement for high wagering requirements and underestimated for low wagering requirements.

The orange line gives the theoretical probabilities for Fruit Rush if they had £1.80 in bonus funds to start with (as in the real experiment). We believe the intersection at the 10x wagering requirement is similar to "a broken clock is right twice a day".

For both starting balances (and all inbetween) we see considerable overestimation at higher wagering requirements. We have been unable to find a starting balance or stake size that allows a 30%_ chance chance of hitting a wagering requirement at a 30x WR. Therefore we believe the pattern of overestimation is robust, but our results should be replicated for other games, starting balances and stake sizes.

THE BEHAVIOURAL INSIGHTS TEAM

PREDICTIV

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