National Numeracy
for everyone, for life

Do interventions that improve financial capability work for people with low numeracy?

Further Analysis of the Financial Capability Lab data by National Numeracy

Context

In May 2018 the results from the Financial Capability Lab (The Lab) were published.[1] The Financial Capability Lab report included some promising results and ideas on how to improve financial comprehension and decision-making. The trials within the Lab showed that financial capability can be improved – on average – using behaviourally-informed interface-based interventions (when you interact with a computer screen in order to make a financial decision) as well as through information-based interventions (simplifying/reducing as much as possible the information displayed on a page).

A section about numeracy (skills only) was included within the Financial Capability Lab Report. The analysis clearly showed that people with higher levels of numeracy have better outcomes in almost every single experiment – i.e. they make better decisions, choose better products and comprehend information to a higher level;[2] financial capability would appear to be underpinned by numeracy skill level. This was not surprising given recent research on these links,[3] especially when one considers National Numeracy's definition of numeracy (i.e. one that encompasses confidence as well as skills).[4]

As stated in the Financial Capability Lab report, the purpose of including numeracy questions was so that it would be possible to "test whether certain approaches, particularly around the simplification of information, can benefit individuals with lower numeracy levels. Having this more nuanced view helps in designing effective interventions for implementation in the field." However, it must be stated that this was not the primary purpose of the Lab. Indeed, the further analysis reported here reveals that the respondents' numeracy levels are not representative of the nation's levels, and that numbers of respondents at the lower end of the numeracy spectrum are relatively sparse when compared to the national picture.

Here, we report on the findings of the more detailed analysis of the data that provides this more nuanced view, whilst recognising that it was not the primary purpose of the experiments. Any findings will be by their nature exploratory, rather than definitive.

Acknowledgements

National Numeracy would like to acknowledge and thank all the individuals that have contributed to the development of this report.

At BIT, particular thanks go to Max Mawby who agreed to add numeracy questions to the FinCap Lab work, Janna Ter Meer who helped us retrieve and analyse the data, and Pantelis Solomon and Alex Sutherland who helped with the report drafting. Thanks also go to David Haigh from MaPS who checked the final drafts.

[1] A behavioural approach to managing money: Ideas and results from the Financial Capability Lab (2018) - https://masassets.blob.core.windows.net/fincap-cms/files/000/000/306/original/Financial-Capability-Lab-Report-May18.pdf

[2] Section 5.3, page 61 of The Financial Capability Lab report

[3] Numeracy and Financial Capability Exploring the links – Money Advice Service (2017) https://www.nationalnumeracy.org.uk/sites/default/files/mas0026_num_report_a5_online_aw1.pdf

[4] It is important to highlight up front that when National Numeracy use the word 'numeracy' we are not talking about proficiency in 'doing sums'. Instead, we see being numerate as having the confidence and competence to use numbers and data to make good decisions in daily life. Being numerate is therefore not just about skills, instead it is about the interplay between skills and attitudes – and about the effective use of whatever digital tools you have available to help you make those decisions. It is also important to emphasise that the measurement of numeracy in the Financial Capability Lab was a measure of skills only. See section "How numeracy was tested in the Lab" for more details

Summary of findings:

1. In the original Lab report analysis, the interface and information-based interventions had a statistically significant impact on participants' financial capability – on average – but National Numeracy's further analysis shows that in three out of the four outcome measures investigated, the **impact on those groups with lower levels of numeracy is less clear-cut.** As detailed in the report we cannot be completely certain of these results, but there does appear to be a difference in outcomes for those with lower numeracy levels in three out of the four analyses.

2. The intervention that did have an impact on financial capability (specifically in this case, Repayment Amount) across all numeracy levels was an interface intervention; namely "Increasing Credit Card Repayments". But a more detailed analysis also revealed **a less clear-cut increase in comprehension among groups with lower levels of numeracy.** Could it be that people are repaying more without a corresponding improvement in comprehension for those with lower numeracy skills? Would it matter if this was the case?

Questions for further investigation in the field:

1. Once again, it is important to note that these results are suggestive and do not provide conclusive evidence on the relative effectiveness of interventions across different numeracy levels; this is because the trial was not designed to robustly test any such hypothesis and did not have a sufficiently large sample to do so. We therefore propose that further research is conducted on the field to robustly assess whether interventions which aim to improve people's financial capability can do so across all numeracy skill levels.[5]

   In addition, National Numeracy would suggest any such field trials be set up to answer the following question(s):

   a. Is there a level of numeracy below which some (information-based) interventions designed to improve financial capability are less likely to work?[6]

   b. Do some interface interventions improve financial capability without improving comprehension?[7]

2. The general level of comprehension appears to be very low. It is noteworthy that even with the best intervention(s) people choose the best/cheapest credit card 44% of the time on average, that they score on average 2.3 out of 6 (38%) when provided with salient information on balance transfers, and that they understand credit card repayments just 50% of the time on average. What else can be done to improve comprehension levels?

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[5] Any such research should also consider using a more robust measure of numeracy, namely more questions across a wider range of levels of difficulty.

[6] And if so, what can be done to support those beneath this level to make better financial decisions? How can we best acknowledge and incorporate differing levels of numeracy when designing policies and/or interventions?

[7] And if so, is that a positive outcome? Either way, who defines how the interface is set up (i.e. who sets the default / decides on where to position the slider?)

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The Financial Capability Lab – An Overview

In 2016, the Money and Pensions Service (MaPS) and the Behavioural Insights Team (BIT) created the Financial Capability Lab to identify and test new, behaviourally informed ideas to solve some of the most important money challenges facing people in the UK. The focus of the Lab's work is on supporting the 'financially squeezed', who have significant financial commitments but relatively little provision for coping with sudden changes to their financial circumstances or security (e.g. an unexpected bill, being made redundant). For example, three quarters of these households have average savings of less than £600, whilst the remaining quarter have no savings at all. The Lab aims to address three of the most pressing challenges to effective money management:

1. How can we encourage people to build up a savings buffer to withstand financial shocks?
2. How can we encourage people to seek financial advice and guidance?
3. How can we help people to take control of their spending and better manage their credit?

How numeracy was tested in the Lab

Numeracy skills were assessed in seven of the online experiments by using a short four-item questionnaire using two questions provided by National Numeracy (NN) and two Financial Literacy questions from the Financial Capability survey.

The four questions used in the Lab were:

1. Susie works 4.5 hours per day and get paid £9.00 per hour. How much does Susie earn each day? (Answer = £40.50)
2. Susie gets a 5% pay increase. What is her new pay per hour? (Answer = £9.45)
3. If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have more, less or the same amount of buying power in a year's time? (Answer = Less)
4. Suppose you put £100 into a savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? (Answer = £102)

All questions were presented as multiple choice with up to 5 answer options (including "I Don't Know")

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Figure 1 summarises the numeracy scores of the participants of the seven online experiments where numeracy was tested.

Figure 2 summarises the data collected in the Skills for Life Survey in 2011.

The graphs highlight three issues:

1. The numeracy levels of the Lab participants are not in line with nationwide numeracy data. The most robust data on adult numeracy in recent years is from the Skills for Life survey (2011 – BIS). There, 22% of working-age adults were found to have numeracy levels at Level 2 or above (roughly equivalent to a GCSE pass), with 49% at, or below, the level we expect of an 11-year-old (i.e. Entry Level 3 and below). In the Lab, 32% answered all four of the questions above correctly, and 35% scored 0, 1 or 2 out of 4.

2. There are significantly fewer respondents with lower scores (15% scored 0 or 1). This imposes limitations on the strength of any conclusions we may reach about the effectiveness of interventions on these groups, as the results will have wider margins of error.

3. Four items are not sufficient to provide enough granularity for the type of analysis conducted here, especially when we consider the items here were multiple-choice where the chances of guessing correctly one out of four are quite high. It was not practical to include more items during the Financial Capability Lab experiments, but this must be seriously considered in any future field work.

Figure 1: Distribution of numeracy scores across the tests of the Lab (0 = lowest, 4 = highest)

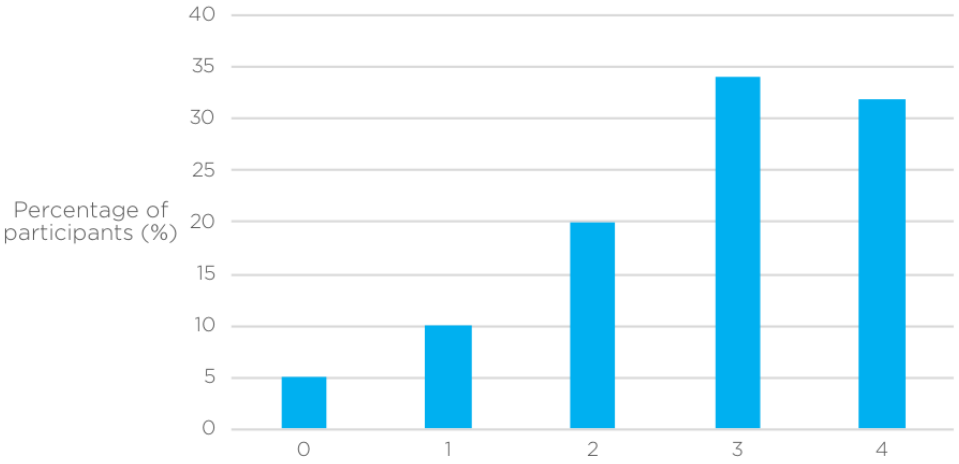
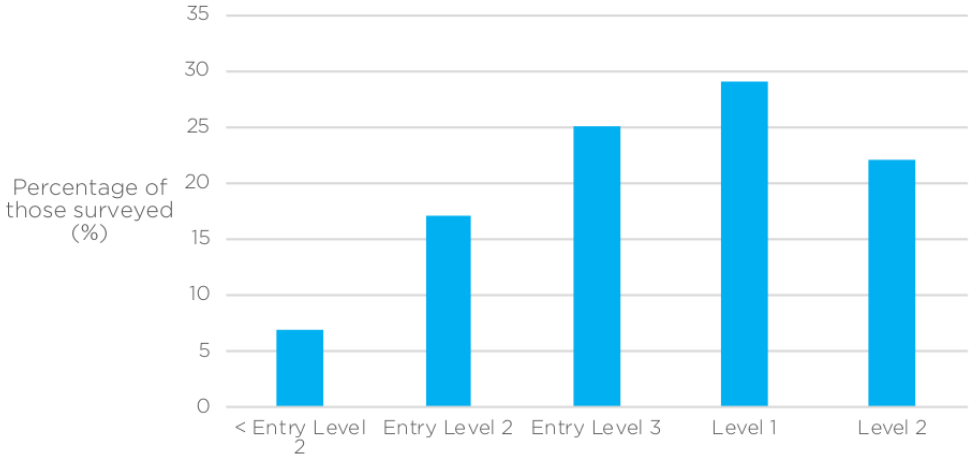


Figure 2: Numeracy Levels as per Skills For Life (BIS – 2011)



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To gain a more nuanced view - Rationale / Methodology

In the Lab, numeracy was tested in seven of the online experiments. In Q2 2019 NN and BIT conducted an initial piece of analysis on five of these trials. The five trials were chosen because the Lab report listed them as having a strong correlation between numeracy score and the main outcome of interest in each experiment. This initial work enabled us to focus on three specific trials where the intervention results and numeracy correlation were more clear-cut.

A detailed analysis of these three trials was then conducted by NN using the original datasets that were provided by BIT. Whilst recognising the limitations of the analysis because of a paucity of respondents with low numeracy, we used the data to assess whether there is evidence of a differential impact of these interventions across numeracy levels. The rest of this report sets out this analysis.

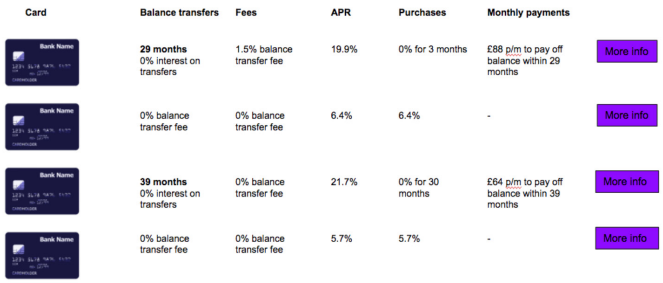
In all three trials we looked at the primary outcome of interest as our measure of effectiveness, just as the Financial Capability Lab results had. As the analyses showed a particularly different result in one intervention (Increasing Credit Card Repayments showed a significant improvement in Repayment Amount across all numeracy scores), we extended our analysis of this test to include the secondary outcome – a measure of comprehension.

To assess whether there was any evidence of a differential impact, BIT ran regressions to compare the treatment(s) against the control for each level of numeracy. Independently NN ran a series of 2-tailed, two-sample unequal variance (heteroscedastic) t-tests to compare the treatment(s) against the control for each level of numeracy. The results from the two analyses are practically identical. The results of the t-tests are the ones that are displayed and discussed here.

The Results

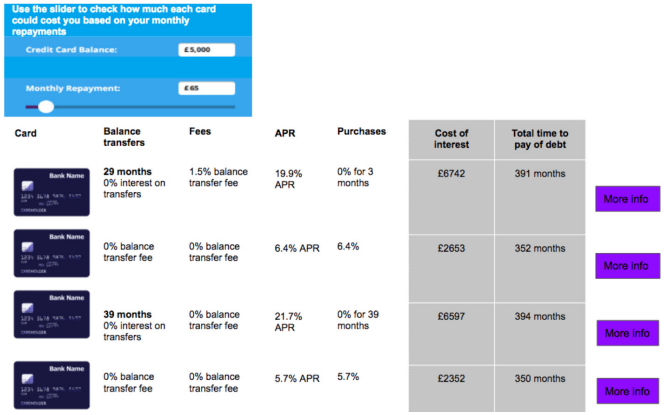
A. Improving Price Comparison Websites (PCWs)

Figure 3: Improving Price Comparison Websites. Standard Interface



Card	Balance transfers	Fees	APR	Purchases	Monthly payments	
Bank Name	**29 months** 0% interest on transfers	1.5% balance transfer fee	19.9%	0% for 3 months	£88 p/m to pay off balance within 29 months	More info
Bank Name	0% balance transfer fee	0% balance transfer fee	6.4%	6.4%	-	More info
Bank Name	**39 months** 0% interest on transfers	0% balance transfer fee	21.7%	0% for 30 months	£64 p/m to pay off balance within 39 months	More info
Bank Name	0% balance transfer fee	0% balance transfer fee	5.7%	5.7%	-	More info

Figure 4: Improving Price Comparison Websites. Enhanced Interface



Card	Balance transfers	Fees	APR	Purchases	Cost of interest	Total time to pay of debt	
Bank Name	**29 months** 0% interest on transfers	1.5% balance transfer fee	19.9% APR	0% for 3 months	£6742	391 months	More info
Bank Name	0% balance transfer fee	0% balance transfer fee	6.4% APR	6.4%	£2653	352 months	More info
Bank Name	**39 months** 0% interest on transfers	0% balance transfer fee	21.7% APR	0% for 39 months	£6597	394 months	More info
Bank Name	0% balance transfer fee	0% balance transfer fee	5.7% APR	5.7%	£2352	350 months	More info

Given the importance of information regarding total cost when making credit decisions, in the original report the Lab set out to improve the presentation of this information on PCWs to help consumers (including the 1.6 million people who systematically make minimum repayments) to choose credit cards that reduce the overall cost of their borrowing. To test this idea, BIT ran an online experiment using Predictiv. The Lab randomly allocated participants to see a basic PCW interface (Figure 3) or to see a behaviourally informed PCW interface (Figure 4). The behaviourally informed interface:

- **Made fees and charges salient using a dynamic interface.** The information on the total cost of the card and time to repay the debt changed dynamically in response to participants' interactions with the slider. The interface was designed to display comparative information on cost for each card on our PCW when making only minimum repayments.
- **Expressed the total cost of borrowing in pounds rather than percentage rates.**
- **Used colour to create a pop-out effect.** Highlighted the most important information using a colour that contrasted with its surroundings, taking advantage of the pop-out effect.
- **Enabled participants to personalise** their financial situation to increase the relevance of the material to them and their engagement with that material.
- **Expressed the time to repay the debt in years and months** (for example, 4 years and 3 months) rather than only in months (for example, 51 months), to make the information easier to understand.

The Lab examined whether participants chose the best credit card from four options, which included low-interest cards and cards with 0 per cent interest promotional offers. The best credit card varied across two hypothetical individuals with different financial scenarios: a systematic minimum repayer for whom an introductory rate was likely to be a negative feature, and someone who could pay more and potentially take advantage of the promotional interest rate.

Improving Price Comparison Websites - A more nuanced view

The enhanced version of the PCW interface significantly improved the ability of the participants to choose the least costly card, both for minimum repayers and those who could pay more (see Figure 5). Average accuracy rates have improved from 0.66 to 0.89 (out of 2).

However, when these results are split out by numeracy score (Figure 6), the picture is less clear. We see that for those who scored 0–2 on the numeracy questions, the enhanced version of the PCW interface appears to have had less impact in improving the ability of participants to choose the least costly card. However, these results should be treated with caution because of the insufficient sample size at the lower numeracy levels (hence the size of the error bars). We have not tested whether the differences between the results for those at the higher and lower levels of numeracy are themselves significantly different from one another.

Figure 5: Improving Price Comparison Websites.
As per the Financial Capability Lab report - An improvement on average
n = 1,370 ** p <0.01, * p<0.05, + p<0.1

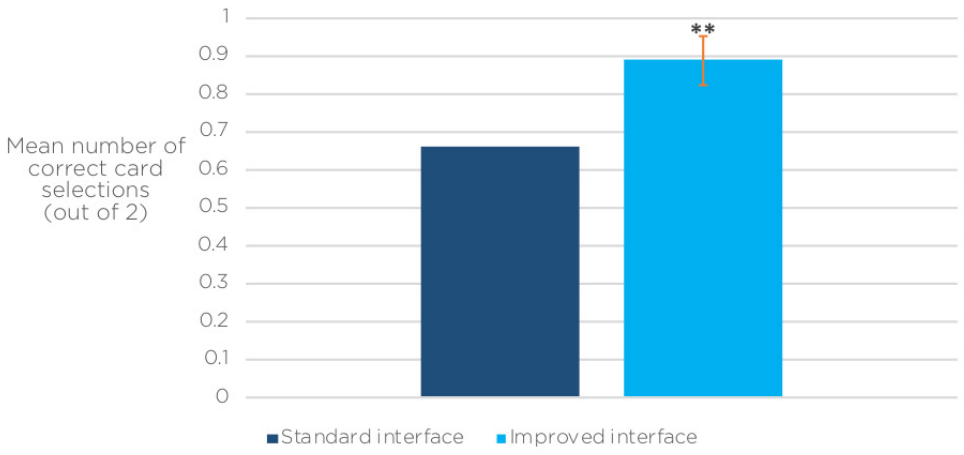
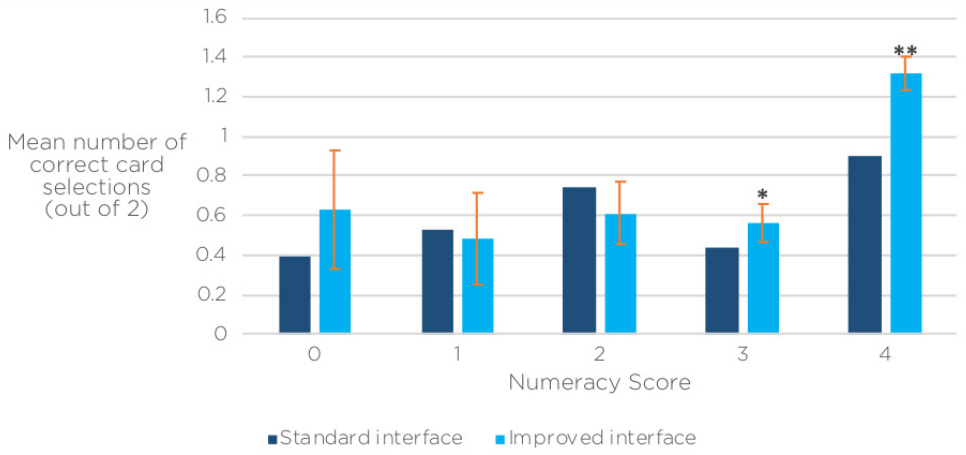


Figure 6: Improving Price Comparison Websites by Numeracy Level
An improvement – but only for the most numerate?
n = 1,370 ** p <0.01, * p<0.05, + p<0.1



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B. Understanding Credit Cards Better

Figure 7: Understanding Credit Cards Better – Business as usual

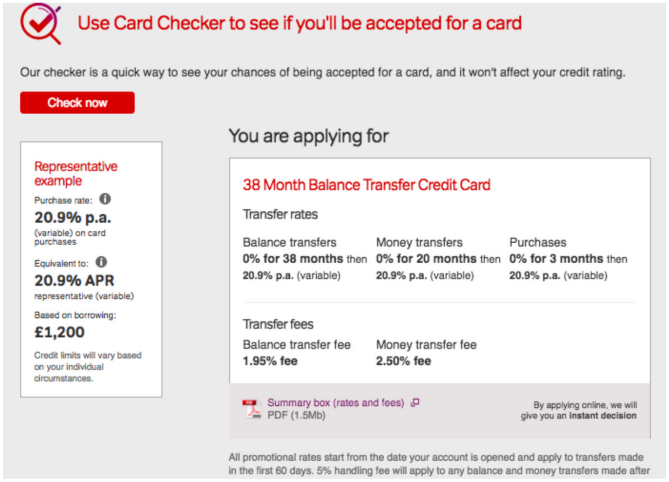
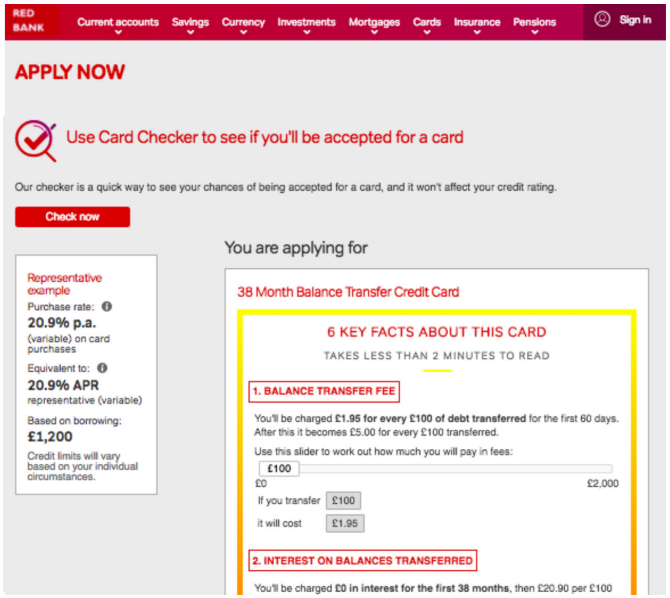


Figure 8: Understanding Credit Cards Better – 6 Key Facts (in part)



This test compared a current provider website with two behaviourally informed versions of the same website that sought to make the most important information for people purchasing a balance transfer credit card simple, salient and interactive. Importantly, we did not remove information when producing our behaviourally informed websites. Rather, we used insights on informational positioning to present the most vital information in the most salient part of the website. We tested:

1. **an actual credit card application page as a control (see Figure 7),**
2. **presenting the most important information as 'Six Key Facts' (see Figure 8); and**
3. **presenting the most important information as 'Four Key Facts', removing two pieces of information that were less relevant at the application stage.**

In addition, both treatments:

- represented costs as **pound values rather than percentages;**
- added a **reading cue** that told participants it would take them less than two minutes to read the key facts; and
- made the information **interactive** by adding a slider that provided feedback on the cost of transferring various balances.

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Understanding Credit Cards Better – A more nuanced view

Figure 9: Understanding Credit Cards Better
As per the Financial Capability Lab report - An improvement
n = 1,327 ** p <0.01, * p<0.05, + p<0.1

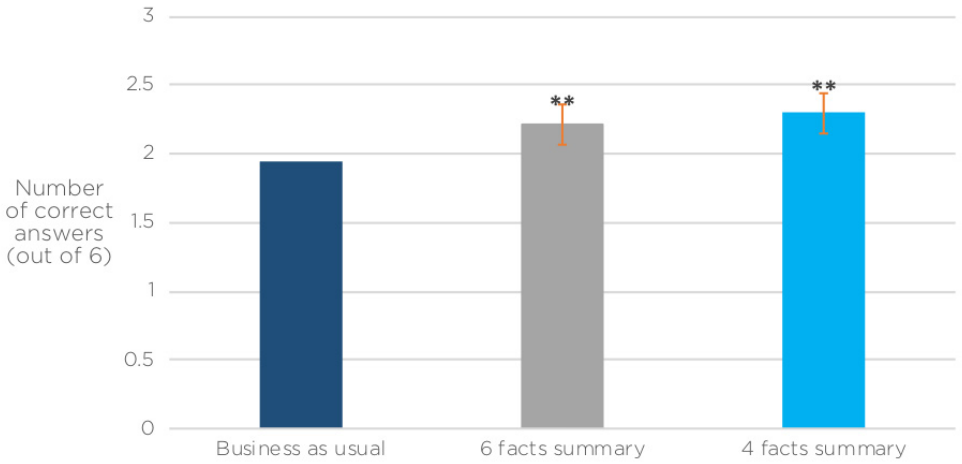
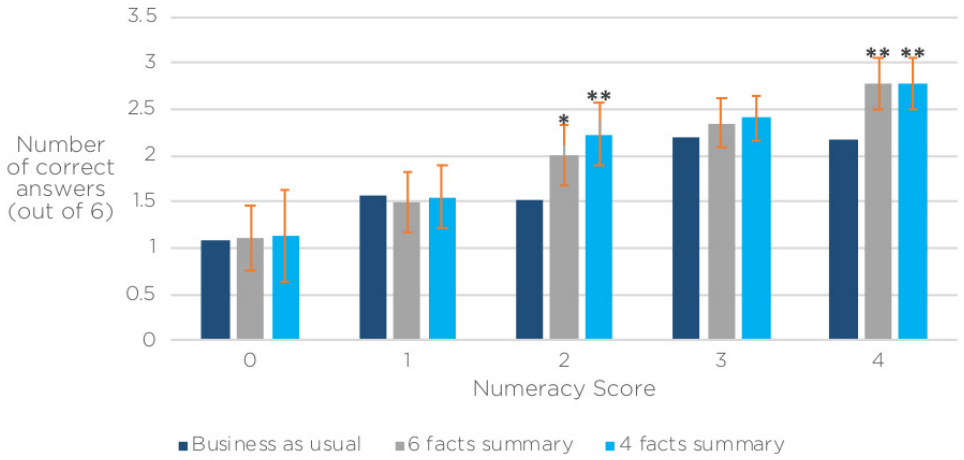


Figure 10: Understanding Credit Cards Better by Numeracy Level.
An Improvement – but only for the more numerate?
n = 1,327 ** p <0.01, * p<0.05, + p<0.1



Compared to the standard website, the behaviourally informed websites resulted in a statistically significant improvement in the average number of questions answered correctly by participants. Specifically, there was a 16 per cent increase between the control (the standard application page already used by the card provider) and the Six Key Facts and a 21 per cent increase between the control and the Four Key Facts (see Figure 9).

Splitting the results by numeracy level, as in the Improving Price Comparison Websites analysis, we see that the average impact is less clear-cut (see Figure 10). Again, we must be cautious with our interpretation, but there does seem to be little difference in the average number of questions answered correctly by participants who had a numeracy score of 0 or 1, although the error bars are again quite large.

We also note that there was no significant improvement for those with a numeracy score of 3, yet there was an improvement for those who scored 2 and 4. It is our conjecture that this is because the measure of numeracy was too blunt. BIT had to take a pragmatic view of how to measure numeracy by keeping the number of questions low. We call for a more granular measure of numeracy in the "Questions for further investigation in the field".

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C. Increasing Credit Card Repayments (primary outcome – Repayment Amount)

Figure 11: Increasing Credit Card Repayments – Control (numeric input)

Stage 1

Task: In this section you will be shown a credit card statement. Afterwards we'll ask you how much you want to repay.

Please have a look at your statement below. Imagine that this is your actual statement.

Pay Credit Card	
2298765698	
Outstanding Balance	£5,000
Available Credit	£2,000
Minimum Payment	£169
Payment due date	13 November

Imagine that your total monthly income is £2,600.

And your spending this month amounts to £ 2,200.

QUESTION: How much would you like to repay this month?

169

Figure 12: Increasing Credit Card Repayments – Slider with minimum default

Stage 1

Task: In this section you will be shown a credit card statement. Afterwards we'll ask you how much you want to repay.

Please have a look at your statement below. Imagine that this is your actual statement.

Pay Credit Card	
2298765698	
Outstanding Balance	£5,000
Available Credit	£2,000
Minimum Payment	£169
Payment due date	13 November

Imagine that your total monthly income is £2,600.

And your spending this month amounts to £ 2,200.

QUESTION: How much would you like to repay this month?

Please use the slider to indicate your repayment

£169

£169 £400

If my monthly repayments continue to be: £169 each month

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Figure 13: Increasing Credit Card Repayments – Slider with higher default

Stage 1

Task: In this section you will be shown a credit card statement. Afterwards we'll ask you how much you want to repay.

*
Please have a look at your statement below. Imagine that this is your actual statement.

Pay Credit Card	
2298765698	
Outstanding Balance	£5,000
Available Credit	£2,000
Minimum Payment	£169
Payment due date	13 November

Imagine that your total monthly income is £3,100.

And your spending this month amounts to £ 2,700.

QUESTION: How much would you like to repay this month?

Please use the slider to indicate your repayment.

£284

£169 £400

I have decided my monthly repayments will be: £284 each month

Total repayable: £6,549

Total interest I will pay: £1,549

Repayment date: November 2019

Figure 14: Increasing Credit Card Repayments – Timing Slider

*
Please have a look at your statement below. Imagine that this is your actual statement.

Pay Credit Card	
2298765698	
Outstanding Balance	£5,000
Available Credit	£2,000
Minimum Payment	£169
Payment due date	13 November

Imagine that your total monthly income is £2,600.

And your spending this month amounts to £2,200.

QUESTION: When would you like your debt to be cleared?

Please use the slider to indicate your repayment period

March 2022 August 2021 January 2021 May 2020 October 2019 February 2019

Date when debt repaid: March 2022

If my monthly repayments continue to be: £169

Total amount I repay: £8,718

Total interest I will pay: £3,718

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Minimum repayments are typically featured prominently on statements sent to card holders and are a regulatory requirement. This minimum repayment can act as an anchor that leads to lower repayments. Over time this significantly increases the cost of credit cards, as card holders are holding debt and paying interest for much longer periods of time. BIT developed a repayment interface informed by behavioural science – what BIT will call a 'behaviourally informed interface' – that complied with current regulations on minimum repayments whilst aiming to help card holders to overcome the anchoring effect that minimum repayment information can exert. The main component of the interface was a slider. Sliders are used across the financial services sector, often to help consumers decide how much they would like to borrow, potentially making it easier to borrow larger amounts. In an online experiment, BIT randomly allocated participants to different interface designs, some incorporating variations of a slider:

- **A control condition (see Figure 11) based on the industry standard: a box to enter the repayment amount.**
- **A monthly repayment slider interface (see Figure 12) defaulted to the minimum repayment. The scale on the slider ran from the minimum monthly repayment on the left (£169) to the maximum available in the online experiment scenario on the right (£400). The default position of the 'thumb' (the interactive part of the slider that is clicked and dragged to set the repayment amount) was on the far left, the minimum repayment.**
- **A monthly repayment slider interface (see Figure 13) with a higher default. The only difference compared to the previous slider interface was the default position of the thumb, which in this case was set to the centre of the slider rather than the far left of it. BIT expected this higher default position (with the thumb at £284) to anchor participants to make higher repayments than when the thumb was set at the level of the minimum repayment.**
- **A timing slider interface (see Figure 14) with the slider set by default to the minimum repayment. The scale on the slider ran from the date participants would repay their hypothetical debt if they were making minimum monthly repayments (on the left), to the date they would repay their debt if they were making the maximum monthly repayments (on the right).**

The minimum repayment amount was highlighted in the instructions to all participants. This minimum repayment amount was pre-entered in the box in the industry-standard repayment interface and was the default position of the slider in two out of the three slider interfaces. BIT asked participants to make two choices:

- a hypothetical choice about what they would repay if faced with this decision in the real world; and
- an incentivised choice where we paid participants based on their ability to work out what they should repay (the maximum repayment available within the confines of the experiment).

Increasing Credit Card Repayments (primary outcome – Repayment Amount) - A more nuanced view

Figure 15: Increasing Credit Card Repayments (repayment amount)
As per the Financial Capability Lab report - An improvement
n = 1,758 ** p <0.01, * p<0.05, + p<0.1

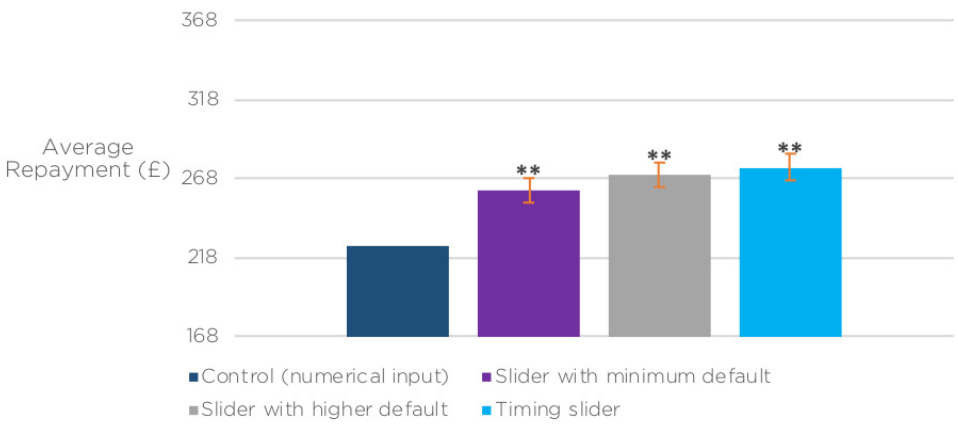
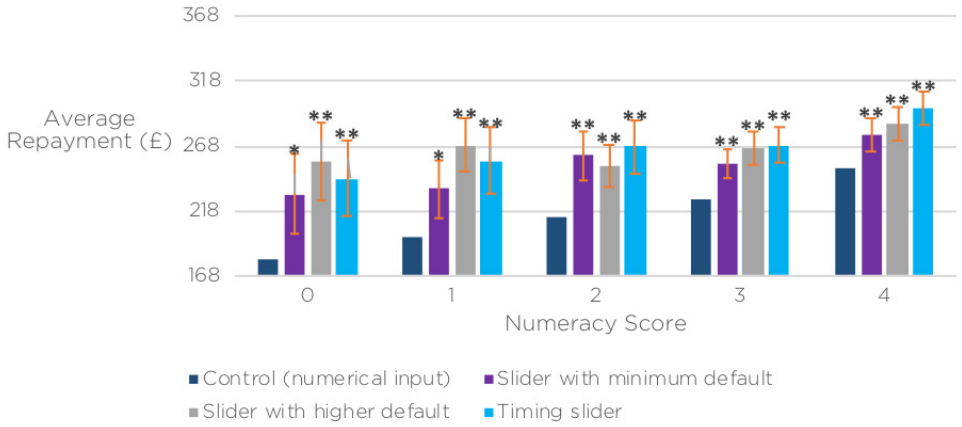


Figure 16: Increasing Credit Card Repayments (repayment amount) by Numeracy Level
An Improvement – for all – Levelling the playing field?
n = 1,758 ** p <0.01, * p<0.05, + p<0.1



The Lab results show significant increases in repayments for all the slider interfaces that BIT tested, compared with the current industry standard. This result held across both what participants thought they would repay (see Figure 15) and what they thought they should repay.

When splitting the same results by numeracy score, we found that the positive effects of the various treatments can be seen across all scores, from low to high (see Figure 16). Indeed, in absolute terms, people with lower numeracy have shown a greater increase in average repayment, compared to those with higher numeracy scores. This is an example of where the interventions may be "levelling the playing field" through raising the average repayment for all, regardless of numeracy score.

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D. Increasing Credit Card Repayments (secondary outcome – Comprehension)

Figure 17: Increasing Credit Card Repayments (comprehension) As per the Financial Capability Lab report - An improvement
n = 1,758 ** p <0.01, * p<0.05, + p<0.1

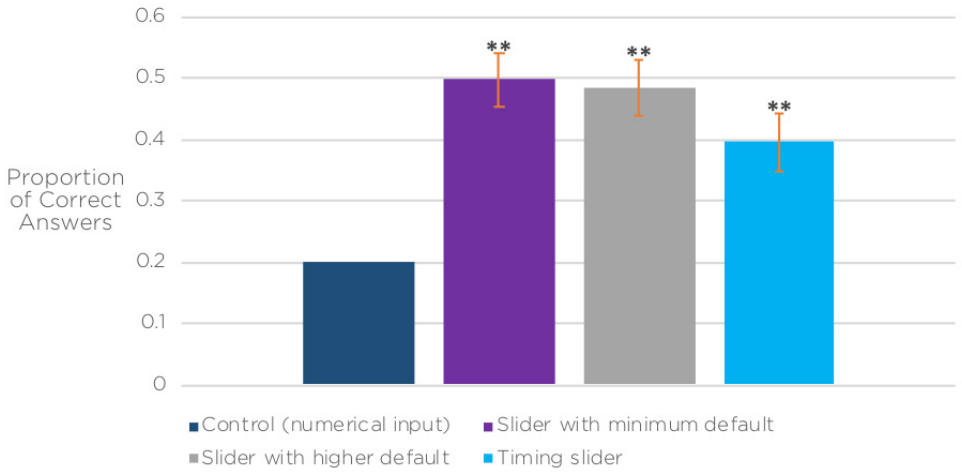
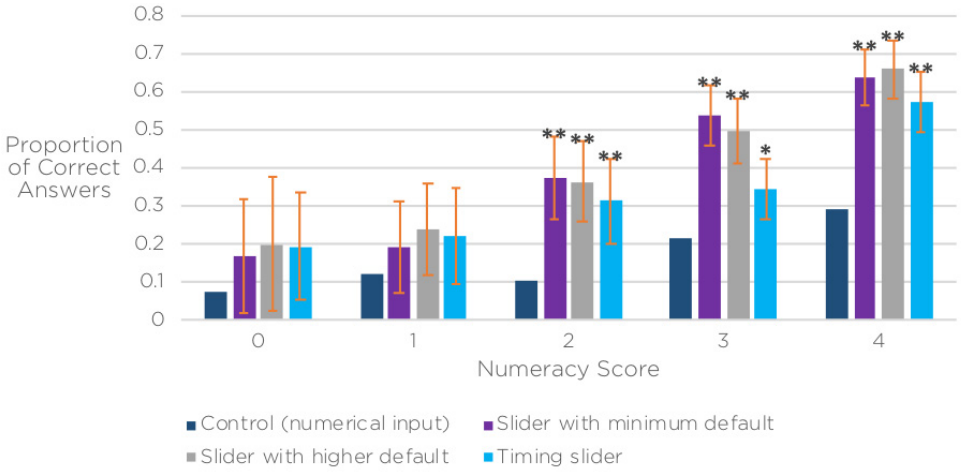


Figure 18: Increasing Credit card Repayments (comprehension) by Numeracy Level. An Improvement – but only for the more numerate?
n = 1,758 ** p <0.01, * p<0.05, + p<0.1



Although not covered in the summary Financial Capability Lab report, a secondary measure for Increasing Credit Card Repayments was captured, namely Comprehension. The question was "How much should you repay this month if you want to minimise your cost from debt?" or "When would you like your debt to be cleared if you want to minimise your cost from debt?" in the timing slider condition. This was measured as a binary variable, where 1 denotes that the participant provides the correct answer (within a 3% margin of the actual answer) and 0 that the answer lay outside the margin.

As per the primary outcome measure (repayment amount), we see significant increases in comprehension for all the slider interfaces that we tested, compared with the current industry standard (Figure 17).

When splitting by numeracy score (Figure 18), we found that the effects of the various treatments are again less clear. The results here are not conclusive without a greater sample size. We could only detect differences between conditions for those in more numerate groups because the samples were large enough to allow for these tests to be done. All that said, the graph is markedly different to Figure 16 (Increasing Credit Card Repayments (repayment amount) by Numeracy Level), and very similar to other graphs where we have split the results by numeracy score (Figures 6 and 10). We need to conduct further field tests to verify (or otherwise) this interesting exploratory result.