Do people care about being nudged?

The acceptability and effectiveness of transparent nudges

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Certificate of Originality

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person or material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement is made in the text.

I also declare that the intellectual content of this thesis is the product of my own work, even though I may have received assistance from others on style, presentation and language expression.

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Abstract

Around the world, governments have become increasingly interested in the application of behavioural nudges as public policy tools. Although nudge policies have proven to be effective in improving public welfare, attitudes towards nudging continue to vary. While previous research suggests that people are generally supportive of nudges, not all nudges are well-supported. Across two experiments, we tested how greater transparency affects the public acceptability and effectiveness of nudge policies. The results of our first experiment suggest that improving people's understanding of policies, by equipping them with more information, can increase support for certain types of nudges. Following this, our second experiment tested the effect of transparency on social norm nudges, finding that they continued to be effective even when people were aware of the nudge. Together, our experiments provide preliminary evidence that by being more transparent, governments can increase support for nudge policies without sacrificing their effectiveness at producing behavioural change.

Introduction

The challenges we face as a society are increasingly serious and demand action. In Australia, nearly two-thirds of adults are overweight or obese (Australian Bureau of Statistics, 2015). Global temperatures are rising, with 15 of the 16 hottest recorded years in history occurring between 2000 and 2015 (CSIRO, 2016). The responsibility of addressing these significant issues has fallen largely upon our governments, who have sought to change our behaviour through public policy. Traditionally, they have relied on policies, like taxes and bans, which discourage unwanted behaviours. For example, many governments have targeted rising obesity levels by introducing 'sugar taxes' that reduce the purchase and consumption of unhealthy foods and beverages (World Health Organisation, 2015). Although these policies can be effective, public sentiment towards them tends to be negative because they restrict people's freedom to make their own choices. This has led governments to explore an alternative public policy tool – behavioural nudges.

In this thesis, we will first review the rise of government nudging and the ethical criticisms that have followed. We then explore the factors that influence the acceptability and effectiveness of government nudge policies – in particular, government transparency. In the studies presented here, we examine whether greater transparency can increase public support for nudging, and whether nudges continue to be effective when transparent. This research provides implications for governments, who face the challenge of implementing effective policies while maintaining public approval.

The Rise of Nudges

In Thaler and Sunstein's (2008) book, *Nudge: Improving decisions about health, wealth, and happiness*, they introduce the concept of behavioural nudges – changes to our choice environments that can influence our behaviour in predictable ways. Unlike a tax or

ban, nudges accomplish this without prohibiting any options or changing their financial incentives (Thaler & Sunstein, 2008). For example, a hospital canteen reduced unhealthy food purchases by stocking their checkout counter with mostly fruits and biscuits, rather than candy and sweets (van Kleef, Otten, & van Trijp, 2012). Although the staff had rearranged the checkout display, the candy and sweets were still available for customers to purchase and their price remained unchanged. Thus, the nudge accomplished a similar outcome to a sugar tax while preserving the original choice environment; customers were neither restricted nor financially disincentivised from purchasing unhealthy foods. This example illustrates the power of behavioural nudging – the ability to guide people towards better behaviour while preserving their autonomy for choice.

Behavioural nudging is effective because it capitalises on our cognitive biases and behavioural tendencies. It recognises that humans are not perfectly rational decision-makers but are instead susceptible to making systematic errors in judgment (Thaler & Sunstein, 2008). For example, previous research by Kahneman and Tversky (1979) has shown that people prefer taking risks to avoid potential losses, but not to achieve equivalent gains. Most participants preferred a certain win of $3,000 over an 80% chance of winning $4,000 (Kahneman & Tversky, 1979). Since the second option should result in an average win of $3,200 (80% × $4,000), these participants were demonstrating risk-averse behaviour – they preferred a certain win over the chance of a larger win. However, when the same problem was instead posed as a loss scenario, their preference changed. Most participants instead preferred an 80% chance of losing $4,000 over a certain loss of $3,000 (Kahneman & Tversky, 1979). This suggests that participants had become risk-seeking – they preferred to avoid a guaranteed loss by risking the chance to lose more. These preferences reflect a tendency for loss aversion; people are more motivated to avoid losses than to achieve gains.

By understanding these systematic errors, nudges can be designed to guide people

towards making better decisions. For example, our tendency for loss aversion can inform the way we frame blood donation appeals. A previous study found that only 0.78% of students in an American college donated blood after receiving an email asking them to "Help save someone's life!" (Chou & Murnighan, 2013). By instead framing blood donations as a way to avoid a loss – "Help prevent someone from dying" – the college nearly doubled its blood donation rates to 1.31% of its students (Chou & Murnighan, 2013).

This is just one example of a nudge that can induce behavioural change for society's benefit. 'Choice architects' – as Thaler and Sunstein (2008) call them – have a diverse range of nudges at their disposal. Reminder texts have been shown to be an effective way of encouraging people to save money (Karlan, McConnell, Mullainathan, & Zinman, 2016). In a field study involving three banks, customers who received texts reminding them of their saving goals were significantly more likely to achieve these goals when compared to customers who received no reminder (Karlan et al., 2016). Another way to nudge people is to provide them with descriptive social norms which compare their behaviour with others. Customers of the American utilities provider, OPOWER, received monthly 'social comparison modules', comparing their household's electricity usage to their neighbours (Allcott, 2011). As a result, the average household's energy consumption decreased by 2%, with some households decreasing their consumption by over 6% (Allcott, 2011).

Thus, the advantage of behavioural nudges is that they are both effective and versatile. The earlier examples illustrate how nudging can be applied across many different contexts – whether the goal is an improvement in health, environmental, or financial outcomes. In addition to this, nudges should be cheap and easily implemented (Thaler & Sunstein, 2008). Reframing an email about blood donations, sending reminder texts, or emailing 'social comparison modules' are inexpensive actions that are capable of producing tangible behavioural change.

For these reasons, governments have become increasingly interested in applying behavioural nudges as public policy tools. In 2010, the UK government established the first Behavioural Insights Team, which researched and recommended nudge interventions to its various departments (UK Behavioural Insights Team, 2011). The team implemented changes in areas such as healthcare, tax collection, and household energy consumption, resulting in estimated savings of more than £300 million for the UK government over a five-year period (UK Behavioural Insights Team, 2012). Following the success of the UK Behavioural Insights Team, governments around the world have established their own 'nudge units'. Australia, Denmark, and the United States are among the many countries who have since started applying behavioural insights to their public policies (Ly & Soman, 2013). With the Organisation of Economic Co-operation and Development (OECD) recently publishing a report showcasing over a hundred cases of nudges from twenty-three countries worldwide (OECD, 2017), it is evident that the global nudge movement is growing and gaining momentum. At the same time, the movement has also attracted critics who question whether government nudging is ethical.

Are Nudges Ethical?

Thaler and Sunstein (2008, p.5) describe nudges as a form of "libertarian paternalism". In theory, nudges are paternalistic because they aim to influence people's behaviour and guide them towards better outcomes (Thaler & Sunstein, 2008). At the same time, they are libertarian because they accomplish this without coercion, preserving people's freedom to make their own choices (Thaler & Sunstein, 2008). Although governments and policymakers have welcomed the idea of libertarian paternalism, others remain concerned that nudging may be unethical in practice. Criticisms surrounding the ethics of nudging have centred around two key issues: transparency and respect for autonomy.

To illustrate these criticisms, consider the following nudge: the government requires

electricity providers to automatically enrol their customers into a green energy plan unless they opt out and select a different plan. This is an example of a default nudge, which recognises that people tend to accept whichever option is set as the default. This default nudge has been applied with great success in two German communities, in which over 90% of households adopted the default green energy plan (Sunstein & Reisch, 2014). This is especially impressive, considering the adoption rates of green energy plans were below 1% for the rest of Germany (Sunstein & Reisch, 2014). Default nudges have similarly succeeded in achieving a variety of outcomes, such as increasing the number of organ donors (Johnson & Goldstein, 2003) and increasing employee participation in retirement savings plans (Madrian & Shea, 2001).

Default nudges are effective for two main reasons; people tend to accept the pre-set default option because they assume it is the recommended choice, or because doing so requires less cognitive effort than considering the alternative options (Dinner, Johnson, Goldstein, & Liu, 2011). These tendencies become problematic when they can be exploited by government policies which impose a default option[1]. Extending this problem to nudges in general, governments can design policies which take advantage of our many psychological biases and tendencies. Furthermore, because people tend not to be aware of their own biases (Pronin, Lin, & Ross, 2002), they are unlikely to realise that they are being nudged towards a certain choice or behaviour. As a result, nudges have been labelled as "hidden persuaders" (Smith, Goldstein, & Johnson, 2013, p.162). In the media, similar ethical concerns have been raised that, in the hands of the government, nudging could lead to "state manipulation of the people" (Chater, 2015). These views have been echoed by others, who have described government nudges as "Orwellian" and a form of "mind-control" (Alexander, 2011;

[1] For example, the Australian government recently announced that it would create an online health record for all Australian citizens unless they opted out prior to a specified deadline.

Clabough, 2015). On the surface, these reactions may appear extreme and exaggerated. However, at their core, they express a rational fear that governments will abuse the power of behavioural nudging and undermine our autonomy.

Even when governments have good intentions, the use of behavioural nudge policies can be ethically contentious. Let us return to the default nudge example used earlier, where households were nudged towards the green energy plan. Suppose that you are a new homeowner living with a modest income. You might be interested in the green energy plan but given your current financial situation, you can only afford the cheaper, grey electricity plan. Alternatively, you may not value the environmental benefits of the green energy plan at all. In either case, the government is nudging you towards the green energy plan despite your preferences. Herein lies the flaw with this default nudge and nudging in general: it does not discriminate. Regardless of your individual circumstances, beliefs, and values, the government has determined what the 'right' decision is for you. This example illustrates how there can be a clear mismatch between your preferences and the decisions that the government nudges you towards. Furthermore, because these nudges often go unnoticed, they are difficult to avoid and undermine our freedom to make personal decisions.

It is in these situations when governments face an ethical dilemma. In the case of default nudges, how should the government decide which option is set as the default? More generally, how does the government decide what the 'right' choice is for its people? Governments could nudge people in the direction they believe will maximise the population's wellbeing. This might suffice in contexts where most people share the same preferences. For example, a nudge which promotes healthier diets and more physical exercise is unlikely to negatively impact anyone. However, this strategy is less useful in contexts where there are a diverse range of preferences (Smith et al., 2013) – for example, the selection of superannuation schemes. Even a nudge which benefits the majority will still leave the

minority dissatisfied or potentially even harmed (Smith et al., 2013).

Governments could opt for a different approach, instead letting people decide what is best for themselves. Carroll et al. (2009) recommended the use of active decisions as an ethical alternative to default nudges. Active decisions require an explicit choice to be made as there are no defaults to fall back on (Carroll et al., 2009). For example, employees of a large firm had to explicitly choose whether they wanted to participate in their employer's retirement savings plan (Carroll et al., 2009). Because employees were neither automatically opted in nor out, they were forced to consciously evaluate whether they should participate. As a result, 69% of employees enrolled in the savings plan (Carroll et al., 2009). This was a 28% increase from when the firm required employees to opt-in – that is, when the default option was to not participate (Carroll et al., 2009). Although requiring employees to opt out of savings plans has been shown to produce even greater participation rates (Madrian & Shea, 2001), active decisions can accomplish a similar result without "tricking" employees into joining (Carroll et al., 2009, p.1671).

However, there are also ethical disadvantages of allowing people to make their own decisions. Firstly, requiring an active decision can force people to make choices in domains where they possess limited knowledge. For example, an employee with low financial literacy is unlikely to make an informed choice about whether they should participate in a retirement savings plan (Carroll et al., 2009). In this case, it may be more ethical to set default options and act paternalistically. This would guide the employee towards a decision that will likely benefit them, rather than forcing them to make an uninformed choice.

Secondly, people often make poor decisions even when they know the 'right' choice. Previous research has consistently found that people fail to act in line with their intentions, whether it is an intention to eat healthier or to adopt pro-environmental habits (e.g. Allan, Johnston, & Campbell, 2011; Kennedy, Beckley, McFarlane, & Nadeau, 2009). This

'intention-action gap' is often driven by situational factors such as a lack of information or time (Blake, 1999). For example, perhaps you had been meaning to switch to the green energy plan for months but had been unable to find time, given how busy you were with work. Due to the government's default nudge, your energy provider switches you to the green energy plan without requiring any effort from you. In situations like these, nudges are especially useful because they provide boosts that help us act upon our intentions. You might even appreciate the default nudge because without it, a few more months may have passed before you found the time to change energy plans yourself. Given that we know people have trouble making choices that align with their intentions, it may be more ethical to use nudges which bridge this 'intention-action gap'.

Finally, everyday life would be exhausting if we needed to make active decisions in all domains of our lives. Imagine if every time you wanted to use the microwave, it first asked you what temperature it should use to heat up your food. Or, imagine if every time you wanted to drive to a new destination, your GPS provided you with three routes and asked you to select one. Having to constantly make trivial decisions is cognitively demanding, and these cognitive loads have been shown to impair our self-control and subsequent decision-making capabilities (e.g. Deck & Jahedi, 2015; Vohs et al., 2008). Default nudges alleviate this problem by making the mundane decisions for us. They are arguably more ethical as they then allow us to allocate our attentional resources towards the decisions that matter most.

The reasons above demonstrate how paternalistic nudges are not necessarily unethical. Instead, the argument can be made that nudges are the more ethical approach towards increasing public welfare, despite their potential to infringe on people's freedom to choose. At the same time, these reasons do not invalidate the ethical criticisms against nudging that were mentioned earlier. While there remains the possibility for governments to

use nudging for malicious or self-serving purposes, there will continue to be contention over whether nudges are ethical.

Public Opinions on Nudging

Sunstein (2015) acknowledges these ethical advantages and disadvantages of nudges but argues that it is pointless to continue the debate because nudging is unavoidable. Every shop or website needs a design, which will influence the products people first see and are more likely to purchase (Sunstein, 2015). Likewise, every government will need to design systems and legislation that determine what privileges people are entitled to by default (Sunstein, 2015). Instead of discussing whether nudging is ethical, the more pertinent question is whether people consider nudging to be acceptable.

Sunstein (2015, p.429) proposed that nudges should aim to "influence choices in a way that will make choosers better off, as judged by themselves". Under this definition, nudges should be evaluated based on the opinions of the people being nudged, rather than a theoretical discussion of ethics. An important implication of this definition is that public opinion – which can be measured and quantified – thus determines whether nudging is acceptable. For governments, this should raise two immediate questions. Firstly, to what extent does their population support nudging? Secondly, are some types of nudges better supported than others?

Previous research has addressed these questions by surveying people on their opinions of different government nudge policies (e.g. Hagman, Andersson, Vastfjall, & Tinghog, 2015; Reisch & Sunstein, 2016). These surveys presented people with a diverse range of potential government initiatives, such as educational campaigns on healthy eating or subliminal advertisements that discourage smoking (Reisch & Sunstein, 2016).

The results from these surveys suggest a positive public attitude towards nudging. Reisch and Sunstein (2016) surveyed thousands of people across six European countries:

Denmark, France, Germany, Hungary, Italy, and the UK. Participants were asked whether they approved or disapproved of fifteen different nudges (Reisch & Sunstein, 2016). Across the six countries, the average approval rate for nudges was 63% (Reisch & Sunstein, 2016). Similar positive attitudes were found in surveys of Swedish and American participants, which reported average approval rates of 73% and 66% respectively (Hagman et al., 2015).

Although public perceptions around the world have been mostly positive, there are two important caveats governments should consider before implementing new nudges. Firstly, attitudes towards nudging differ between countries. Out of the six countries surveyed by Reisch and Sunstein (2016), Italian participants were the most supportive of nudges, reporting an average approval rate of 71%. In contrast, Danish participants were the least supportive, reporting an average approval rate of 51% (Reisch & Sunstein, 2016). Differences this large can have significant practical implications; for a government, this could mean the difference between implementing a nudge that most people accept and support, versus a nudge that is controversial and divides the country. Thus, these intercountry differences highlight the need for governments to first understand their own people's attitudes towards nudging before introducing any new policies.

Secondly, governments also need to recognise that some nudges are considered less acceptable than others. To illustrate, consider Italy, which demonstrated a high level of support for nudging. Some nudges were widely supported – for example, 89% of Italian people approved of a public education campaign seeking to promote healthier eating habits in children (Reisch & Sunstein, 2016). However, there were also nudges that most Italian people disapproved of – for example, only 40% approved of a policy that would require airline tickets to include a default carbon offset cost which consumers could opt out of (Reisch & Sunstein, 2016). Even in Italy, where there is strong approval of nudges, the government must be cautious about what types of nudges it implements. In countries where people are

less supportive of nudges, like Hungary and Denmark, governments will likely need to exercise even greater caution. This shows why it is important for governments to understand not only the general attitudes towards nudging, but also the attitudes towards specific types of nudges. Thus, recent research has turned its attention towards investigating the factors which influence the acceptability of nudges.

Hidden nudges. One key factor that has emerged is the degree to which a nudge policy threatens the decision-maker's autonomy. Prior studies have consistently found that people consider nudges less acceptable when they operate unaware to the decision-maker (e.g. Jung & Mellers, 2016). An American survey found that people tend not to approve of default nudges, with only 33% of participants approving of a policy that would automatically enlist them as organ donors unless they opted out (Jung & Mellers, 2016). In comparison, people strongly approve of informational nudges, with 82% of participants approving of a policy that instead educated them on the benefits of becoming an organ donor (Jung & Mellers, 2016). People prefer these types of nudges because they engage and facilitate our conscious decision-making processes, rather than trying to bypass them. These findings are consistent with other studies which have similarly found that people approve less of nudges when they covertly target our decisional processes (Felsen, Castelo, & Reiner, 2013; Reisch & Sunstein, 2016; Sunstein, 2016).

Trust in government. Previous research also suggests that people's trust in the government may influence whether they consider nudges acceptable. Junghans, Cheung, and de Ridder (2015) conducted qualitative interviews on consumers' attitudes towards nudges aimed at improving public health. The interviewees expressed that they found nudging acceptable when they trusted the source – for example, if the nudges were designed by doctors or nutritionists (Junghans et al., 2015). However, they were less accepting of nudges that were designed by marketers, who are motivated to generate profits (Junghans et al.,

2015). Interestingly, attitudes towards government nudging were mixed; some interviewees believed that the government should exercise its influence to drive health initiatives, while others were more cynical about the government's motivations (Junghans et al., 2015). This suggests that political orientation may also factor into attitudes towards nudging – people who align with the left end of the political spectrum tend to be more trusting of government interventions than people who align with the right end (Christensen & Lægreid, 2005).

The existing research highlights two important factors that influence the acceptability of nudges – the extent to which a nudge is 'hidden', and the extent to which people trust the government's motivations. Combining these two factors suggests a key insight: people highly value government transparency. However, previous research has not yet investigated whether government transparency affects people's support for nudging. Furthermore, the broader research on the acceptability of nudging has been limited; it has focused on understanding people's attitudes towards nudging but has not investigated whether these attitudes can be changed. If governments can identify ways to change attitudes towards nudging, this will enable them to use a wider range of nudge policies, rather than restricting themselves to only the nudges that people currently find acceptable. Hence, our research explores whether governments can increase public support for nudging by being more transparent.

Government Transparency

In recent years, there has been greater pressure for governments to be more open and transparent. In Australia, the government has responded by establishing its *Open Government National Action Plan*, which aims to promote transparency, increase citizen engagement, and fight corruption (Department of the Prime Minister and Cabinet, 2016). Similar initiatives have been launched around the world, which collectively strive to make governments effective and accountable to the public.

For example, the South Korean government implemented its *Public Project Quality*

Management OK System in response to allegations of corruption in its public works sector (Park & Blenkinsopp, 2011). Citizens can access the system online to review complete information about local government construction projects, from their status to the arrangements formed with private contractors – even allowing citizens to monitor construction activity real-time through a camera installed on-site (Park & Blenkinsopp, 2011). Three years after the *OK System* was established, citizens rated their local governments as more trustworthy and transparent, and reported greater satisfaction with local construction projects (Park & Blenkinsopp, 2011).

These initiatives are effective because they alleviate the uncertainty and distrust that surround government activity (Venkatesh, Thong, Chan, & Hu, 2016). In the case of the *OK System*, citizens were uncertain about whether projects were being carried out efficiently, and whether private contractors had won their work legitimately rather than through bribery. By providing greater access to information about the project, the South Korean government reduced its citizens' uncertainties, leading to greater satisfaction with public services. In other countries, governments have similarly promoted transparency by making more information publicly available – particularly for official processes, such as immigration requests and the transfer of land titles (Bertot, Jaeger, & Grimes, 2012).

Considering the effectiveness of these initiatives, governments may find similar success by making their nudge policies more transparent. Earlier this year, the Australian government announced that it would automatically create an online health record for all Australian citizens unless they opted out before a specified date. The announcement of this default nudge was met with mixed reactions, as people were left with many unanswered questions: What benefits would the health record provide? How would the government use the data it collected? Would it be secure against cybersecurity threats? These questions reflect uncertainties about the effectiveness of the policy and the government's intentions in

implementing it. This example illustrates how these uncertainties can prevent people from supporting government initiatives. Furthermore, it suggests that governments who address these uncertainties, by being more transparent and providing people with the right information, may experience greater public support for their nudge policies.

The Present Study

Thus, in our first experiment, we investigated whether governments who provide additional information about their nudge policies would experience greater public support for nudging. We chose two types of information that would be especially important when evaluating a government policy: why the policy was being implemented (the government's rationale) and why it would be effective (the policy's mechanism). This formed the basis for our three nudge information conditions: control, rationale, and mechanism.

Previous research suggests that providing additional information about nudge policies increases their transparency (e.g. Venkatesh et al., 2016), and that people are more supportive of nudges that they consider transparent (Junghans et al., 2015). In line with these findings, we hypothesised that participants who received additional policy information – whether it explained the government's rationale or the policy's mechanism – would be more supportive of nudge policies than participants who received no additional information (i.e. the control group). However, we made no predictions about whether participants who received different types of additional information (rationale or mechanism) would report different levels of support for nudging.

Additionally, it has previously been shown that a person's trust in the government influences their support for government policies (Junghans et al., 2015). Since people who align with the left end of the political spectrum tend to be more trusting of governments than people who align with the right end (Christensen & Lægreid, 2005), we expected to observe a correlation between political orientation and support for nudge policies.

Experiment 1

To test our hypotheses, we developed a list of twelve government nudge policies by adapting previously used examples from the literature (e.g. Reisch & Sunstein, 2016).

Nudge Domains

The twelve policies covered three domains: health, the environment, and personal finance. These domains were chosen because they are key areas in which governments are currently implementing nudge policies (OECD, 2017).

Nudge Types

The policies also involved one of four types of nudges: social norm, default, framing, or option-related effort nudges.

Social norms. Social norm nudges inform people about the behaviour of others, encouraging them to adjust their own behaviour. For example, households show reduced energy usage when they receive feedback comparing their energy consumption with their neighbours (Allcott & Mullainathan, 2010).

Defaults. Default nudges set the option which will be chosen if the decision-maker takes no action. For example, parents are more willing to vaccinate their children when their physician treats it as the default course of action instead of asking them whether they would like to vaccinate their child (Opel et al., 2013; Opel & Omer, 2015).

Framing. Framing nudges occur when the presentation of the same information in a different way yields a different decision. For example, blood rates at an American college were greater when donating blood was said to “prevent a death” instead of “save a life” (Chou & Murnighan, 2013). This change in framing was effective because people would rather avoid a loss than make an equivalent gain (Kahneman & Tversky, 1979).

Option-related effort. Finally, option-related effort nudges can increase the effort of making a choice so that it becomes less appealing. Conversely, they can decrease the effort of making a choice so that it becomes more appealing. For example, serving healthier foods at the start of buffet lines makes them more accessible, leading to an increased consumption of healthy foods (Wansink & Hanks, 2013).

These four types of nudges were chosen to include a mix of nudges that tend to be more covert (default and option-related effort nudges), as well as nudges that tend to be more overt (social norm and framing nudges).

Method

Participants

Participants were 180 first-year psychology students (127 women) from the University of New South Wales, with an average age of 19.60 years (SD = 4.32). Participants received course credit in exchange for their participation.

Design

Experiment 1 used a mixed factorial design with one between-subject factor (information) and two within-subject factors (domain, nudge type). There were three information conditions (n = 60): the control, rationale, and mechanism conditions.

In the control condition, participants were only presented with the government nudge policy before being asked to rate its acceptability. In the rationale and mechanism conditions, participants received additional information about each policy. Participants in the rationale condition were provided an explanation for why the government was intending to implement each policy. Participants in the mechanism condition were instead provided an explanation

for why each policy would be effective. As an example, Table 1 shows the information provided to each condition for the health default nudge policy.

Table 1.

Example Nudge Policy Information

Condition	Example Nudge Information
Control	Children enrolled in school are automatically signed up to the vaccination program unless their parents opt out.
Rationale	Children enrolled in school are automatically signed up to the vaccination program unless their parents opt out. *Why are we doing this? This policy aims to increase child immunisation levels, which are as low as 70% in certain Australian suburbs.*
Mechanism	Children enrolled in school are automatically signed up to the vaccination program unless their parents opt out. *Why will this be effective? Previous research has found that people are more likely to participate in a program when they must opt out of it rather than opt in.*

Note. Additional information presented in rationale and mechanism conditions is italicised.

In all three information conditions, participants received the same list of nudge policies. These policies varied by their domain: health, environment, and personal finance. They also consisted of different types of nudges: social norm, default, framing, and option-related effort. The list of nudges is described in further detail below.

Materials

The survey for Experiment 1 was designed using the online survey platform, Qualtrics. It could be completed using any electronic device with internet access.

Nudge policy list. A list of twelve government nudge policies was used in Experiment 1. These policies were adapted from examples used in previous studies (e.g. Reisch & Sunstein, 2016). The policies were either related to health, the environment, or

personal finance. The list was designed such that there were four policies within each of these three domains. Each of these four policies used a different nudge type: social norm, default, framing, or option-related effort. Therefore, each of the twelve policies was a unique combination of domain and nudge type. For example, the financial framing nudge policy was: "People with outstanding fines will be issued with personalised texts, which include their name and the amount owed." See Appendix A for the complete list of nudge policies.

Political orientation measure. Participants reported their political orientation using a 7-point scale ranging from 1 (*liberal*) to 7 (*conservative*). They were provided with brief descriptions of typical liberal and conservative views. People with liberal views were said to "generally believe in government action to achieve equal opportunity and equality for all, to reduce community issues and to protect civil liberties/human rights." People with conservative views were said to "generally believe in personal responsibility, limited government interventions and free markets."

Procedure

Experiment 1 was described as a questionnaire about support for different government policies. Students who signed up received a website link to the Qualtrics survey. They first provided demographic information and rated themselves on the political orientation measure.

Participants were instructed that they would be presented with twelve potential government policies or initiatives. They were then randomly allocated into one of the three information conditions – control, rationale, or mechanism.

All participants were presented the same list of twelve nudge policies in a randomised order. The policies were presented one at a time, and participants were asked to provide two ratings. Firstly, participants rated the extent to which they supported the policy using a scale from 1 (*strongly object*) to 7 (*strongly support*). Secondly, they were asked to estimate the

percentage of the Australian population who shared their level of support for the policy using a slider scale from 0% to 100%[2]. Because the Qualtrics platform required the slider to be set at an initial value, the value of 50% was chosen. However, it should be noted that participants needed to either click on or move the slider before they could provide an estimate.

The survey also included an attention check which appeared after participants had rated a random number of nudge policies. The attention check was designed similarly to the other survey questions; participants were instructed to provide a support rating of 2 (*object*) and a percentage estimate of 35% to confirm that they were paying attention.

Analysis

In both Experiments 1 and 2, we conducted Bayesian statistical analyses using the freely available software, JASP (JASP Team, 2018). Bayesian hypothesis testing has increased in popularity following the criticism of standard null-hypothesis significance tests (NHST; see Wagenmakers, 2007, for a summary of the issues with the NHST approach). It incorporates our prior hypotheses and evaluates them in light of the observed data. For all of the reported analyses, we used the default prior distributions assigned by JASP.

We report Bayes factors (BFs) which compare the likelihood of the observed data under the null and alternative hypotheses. Bayes factors less than 1 indicate evidence in favour of the null hypothesis, while Bayes factors larger than 1 indicate evidence in favour of the alternative hypothesis. It is important to note that Bayes factors reflect the strength of evidence but are not indicative of effect sizes. Thus, it is possible to obtain a large Bayes factor for a small effect or vice versa. Alongside our analyses, we also use the guidelines for interpreting Bayes factors proposed by Jeffreys (2011), as cited in Jarosz and Wiley (2014).

[2] This question was originally included because we were interested in exploring potential false consensus effects. However, we later decided to focus our analyses on the support ratings and did not further analyse these percentage estimates.

Results

Experiment 1 involved 180 first-year psychology students from the University of New South Wales. We excluded 17 participants who failed the attention check by not providing a rating of 2 (*object*) and an estimate of 35% in the attention check question. After excluding these participants, the number of participants per information condition remained near equal: control (n = 53), rationale (n = 57), and mechanism (n = 53). The results hereafter are based on the participants who remained after applying the exclusion criteria (N = 163).

We began our analysis by comparing the mean support ratings for each nudge policy across the three information conditions. A visual inspection of the data revealed patterns that suggested potential interactions between our three factors – information, domain, and nudge type. As can be seen in Figure 1, the different information conditions appeared to have an effect on support ratings for the social norm and option-related effort nudges, but not the default and framing nudges. On the other hand, there did not appear to be an interaction between information and domain; Figure 2 suggests that the different information conditions had a systematic effect on support ratings for the three domains – health, environment, and finance. Statistical analyses of these apparent patterns in the data are reported below.

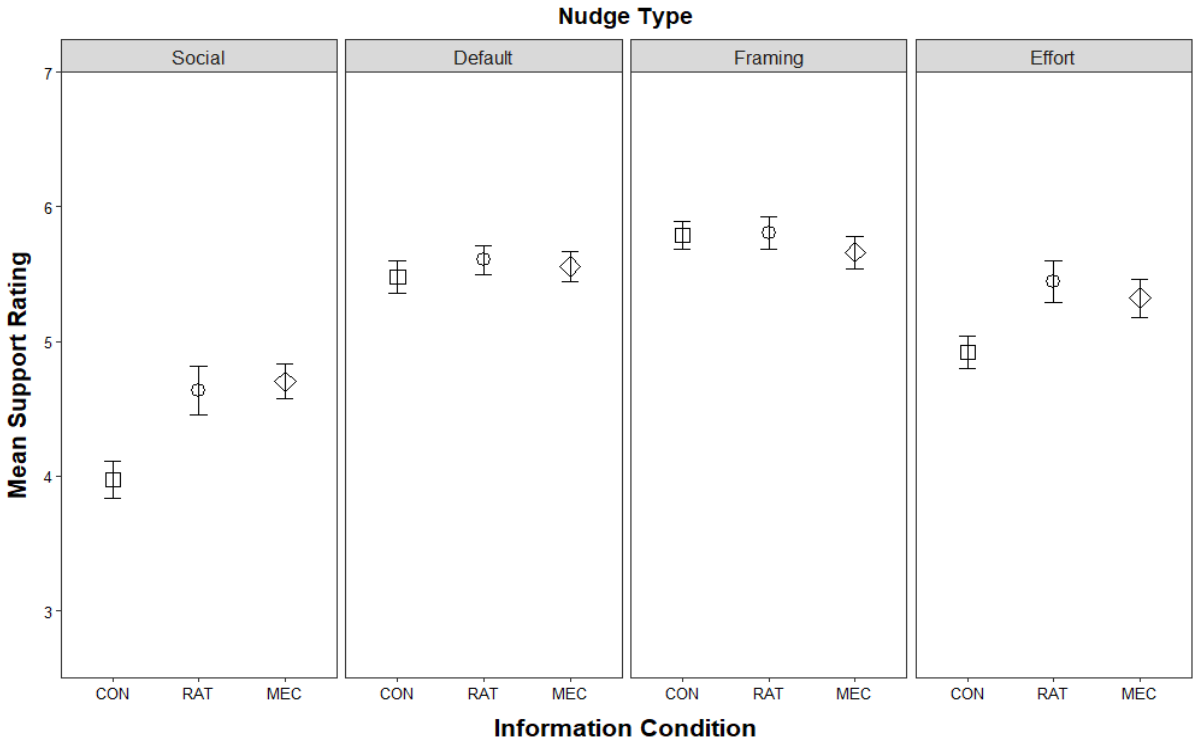

Figure 1. Mean support ratings for each nudge type by information condition (CON = condition, RAT = rationale, MEC = mechanism). Error bars indicate standard error.

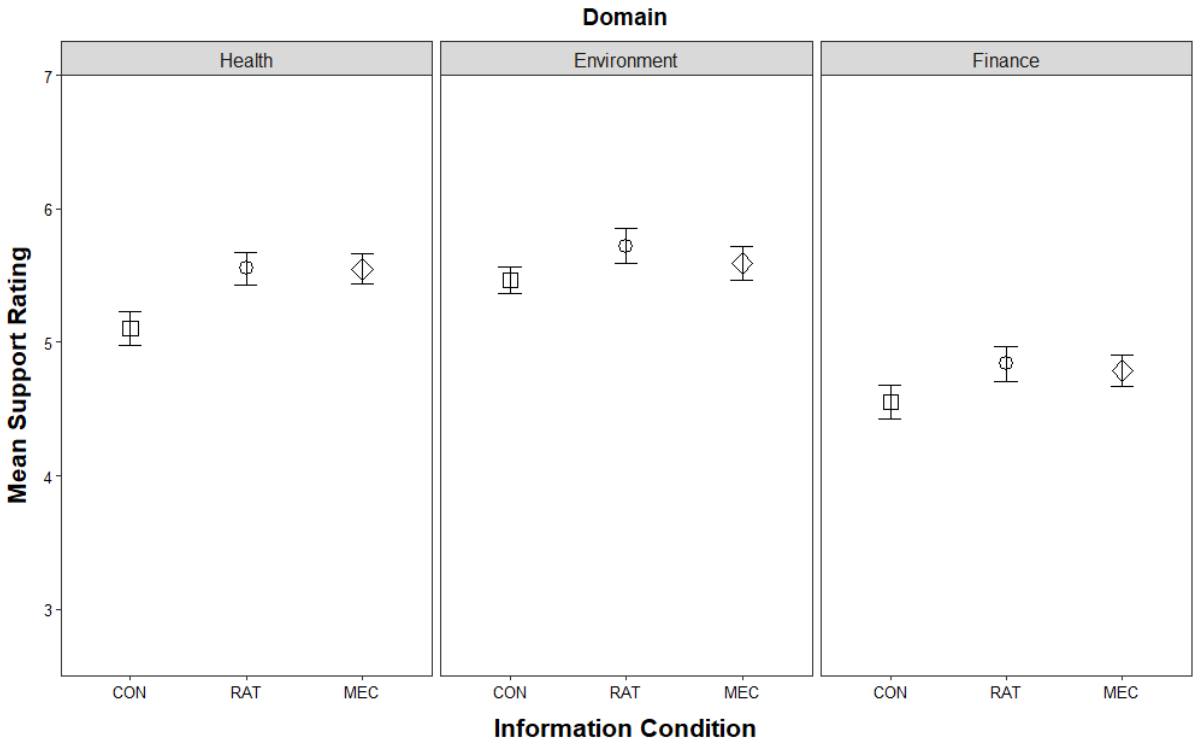

Figure 2. Mean support ratings for each domain by information condition (CON = control, RAT = rationale, MEC = mechanism). Error bars indicate standard error.

Political Orientation

Before turning to further analyses of the support ratings, we analysed the responses on the political orientation scale, which ranged from 1 (*liberal*) to 7 (*conservative*). The mean score was 3.32 (*SD* = 1.31). We also calculated Pearson correlations between political orientation scores and mean support ratings. This was to determine whether political orientation should be included as a covariate in the subsequent analyses. We found substantial evidence in favour of a small, negative correlation between political orientation scores and mean support ratings, $r(161) = -.211$, ($BF_{10} = 3.682$). This suggests that the data we observed were over three times more likely to occur if there was a correlation (alternative hypothesis) than if there was no correlation (null hypothesis). Figure 3 shows the correlation plot of mean support ratings and political orientation scores. This correlation indicates that support for the different nudges decreased as conservatism increased.

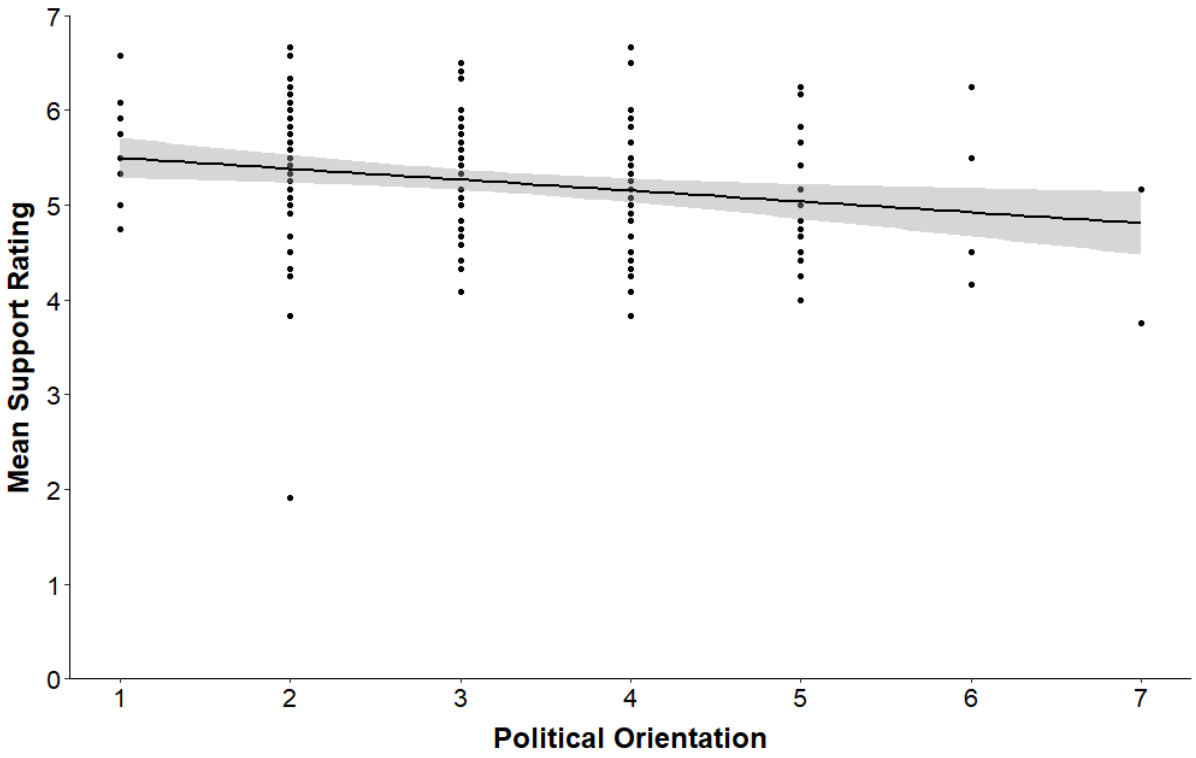

Figure 3. Correlation between political orientation scores and mean support ratings. Each point represents a single participant. Includes line of best fit (± 1 SE).

Overall Model Comparison

Following these preliminary observations, we used a Bayesian repeated measures ANCOVA to determine the best statistical model of effects that could account for the observed pattern of means. The information condition (control, rationale, mechanism) was entered as the between-subject factor, while the domain and nudge types were entered as repeated measures factors. Political orientation was entered as a covariate.

The ANCOVA provided a comparison between 38 possible models which could account for the data. These were statistical models consisting of different combinations of main effects, interactions, and the covariate. For example, one model comprised of the information (control, rationale, mechanism) and domain (health, environment, finance) main effects, and the information × domain interaction. The ANCOVA compared the evidence for each model relative to the null model, which comprised of no effects. The full model comparison is provided in Appendix B.

Inclusion effects. The overall model comparison identified the best model for explaining the observed data: a model containing all three main effects (information, domain, nudge type), two interactions (information × nudge type, domain × nudge type), and the political orientation covariate. There was decisive evidence that this model could explain the data better than the null model ($BF_{10} = 1.602 \times 10^{97}$).

To understand why this combination of effects created the best model, JASP also reported inclusion Bayes factors ($BF_{inclusion}$). An inclusion Bayes factor compares the evidence for models that include an effect with the corresponding models that exclude the effect. This provides evidence for whether an effect (e.g. the information main effect) is helpful in understanding the observed data.

For example, to calculate the inclusion Bayes factor for the information main effect, JASP first identified all models which included the information main effect but not any of its

interactions. These are referred to as *with* models. For each *with* model, JASP identified the corresponding *without* model, which was identical to the *with* model but excluded the effect of interest. An example of a *with* model comprised of the information and domain main effects. The corresponding *without* model then only contained the domain main effect. JASP compared these models to determine the Bayes inclusion factor, which indicates how many times more likely a model which included an effect could explain the data, compared to a model which excluded the effect. See Appendix C for examples of *with* and *without* models. The inclusion Bayes factors for the main effects, interaction effects, and the covariate are shown in Table 2.

Table 2.

Inclusion Bayes Factors (ANCOVA)

Effect	$BF_{inclusion}$	$BF_{exclusion}$
Main: Information	0.335	2.985
Main: Domain	1.340×10^{31}	-
Main: Nudge Type	2.439×10^{54}	-
Cov: Political Orientation	2.645	-
Int: Information × Domain	0.004	250
Int: Information × Nudge Type	11.669	-
Int: Domain × Nudge Type	3.003×10^{15}	-
Int: Information × Domain × Nudge Type	0.057	17.544

Note. Main = Main effect, Cov = Covariate, Int = Interaction effect.
$BF_{exclusion}$ values ($1 / BF_{inclusion}$) are calculated where $BF_{inclusion}$ values are below 1.

Main effects and covariate. The $BF_{inclusion}$ value for the information main effect was 0.335, which is equivalent to a $BF_{exclusion}$ of 2.985. This suggests that models which did not include the information main effect were, on average, approximately three times more likely to explain the data than models which included the information main effect. This is

substantial evidence that the information main effect should be excluded – that is, the evidence suggests that the data were not well-explained as an information main effect. However, there was decisive evidence for including the domain main effect ($BF_{inclusion}$ = 1.340×10^{31}), indicating that health and environmental nudges were supported more than financial nudges. Likewise, there was decisive evidence for including the nudge type main effect ($BF_{inclusion}$ = 2.439×10^{54}), indicating that default and framing nudges received greater support than social norm and option-related effort nudges. We also found anecdotal evidence for the inclusion of the political orientation covariate ($BF_{inclusion}$ = 2.645), supporting our earlier findings that higher levels of conservatism were associated with lower levels of support for nudging.

Interactions. The $BF_{inclusion}$ values indicated that two interactions were useful in accounting for the observed data. There was strong evidence in support of an information × nudge type interaction ($BF_{inclusion}$ = 11.669), which is consistent with the pattern of means shown previously in Figure 1. It suggests that participants in the rationale and mechanism groups were more supportive than participants in the control groups for social norm and option-related effort nudges, but not for default and framing nudges.

Additionally, there was decisive evidence in favour of a domain × nudge type interaction ($BF_{inclusion}$ = 3.003×10^{15}). As can be seen in Figure 4, environmental nudges were the least supported out of the three domains, regardless of nudge type. However, the relative level of support for health and financial nudges varied depending on the type of nudge used.

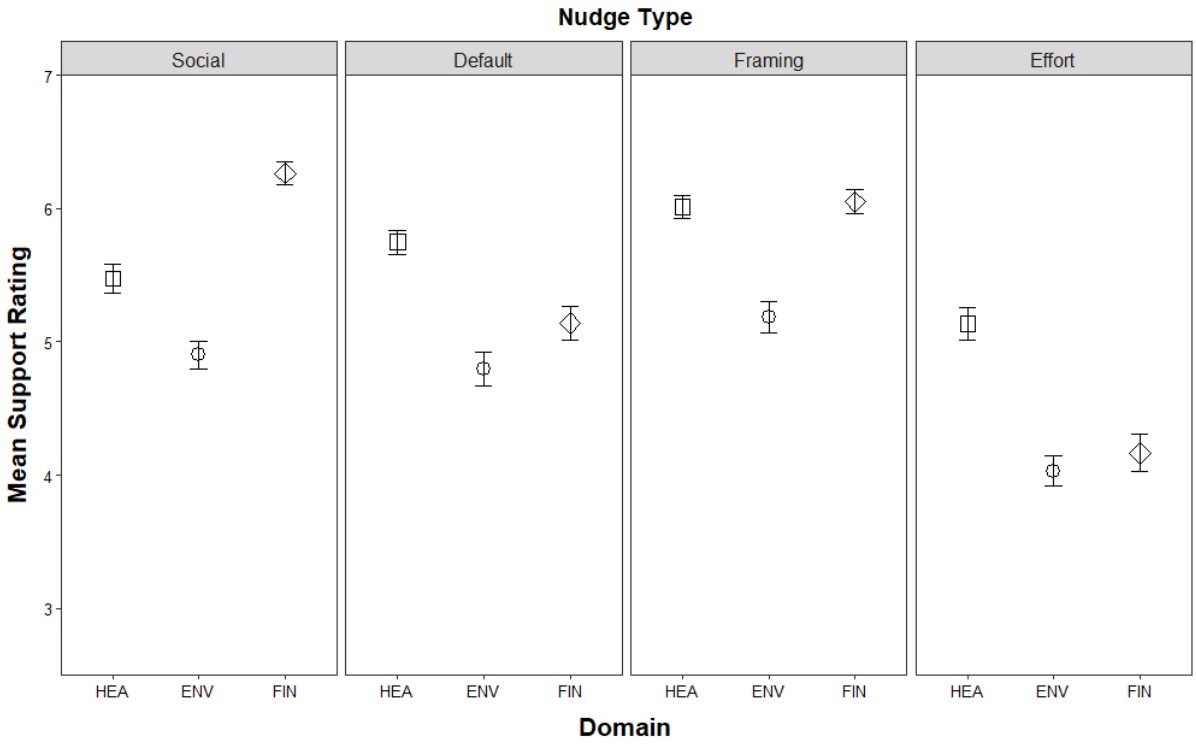

Figure 4. Mean support ratings for each nudge type by domain (HEA = health, ENV = environment, FIN = finance). Error bars indicate standard error.

There was decisive evidence against an information × domain interaction ($BF_{exclusion}$ = 250). This is consistent with the pattern of means shown previously in Figure 2. It indicates that in all three domains, participants in the rationale and mechanism groups consistently reported higher support ratings than participants in the control group.

Finally, there was strong evidence against a three-way interaction (information × domain × nudge type) ($BF_{exclusion}$ = 17.544).

Discussion for Experiment 1

Experiment 1 examined whether greater government transparency could increase public support for nudging. Our analysis revealed that providing additional policy information can be an effective way to increase support for some, but not all, nudges. In this section, we will focus on understanding the interaction we observed between the additional policy information and the type of nudge (see Figure 1). In our General Discussion, we will return to our other findings.

We found partial support for our primary hypothesis; our results suggested that the data were best explained as an interaction between information and nudge type, rather than an information main effect. Providing people with additional policy information led to greater support for social norm and option-related effort nudges but had no effect on support ratings for default and framing nudges.

There are two potential explanations for why the effectiveness of providing additional policy information varied for the different types of nudges. One explanation is that default and framing nudges are inherently more transparent than social norm and option-related effort nudges. For default and framing nudge policies, participants may have been able to infer the rationales and mechanisms from reading the policies alone. If this was the case, then the additional information we provided would have been redundant and would have added no transparency to the policy. This would explain why we observed no difference in support ratings between the control, rationale, and mechanism groups for default and framing nudges. In contrast, it may have been harder to infer the rationales and mechanisms of the social norm and option-related effort nudges. Thus, the additional policy information would have led to greater transparency, resulting in the increased support ratings we observed from the rationale and mechanism groups relative to the control group. However, to the best of our knowledge, no research has yet investigated whether some nudge types are inherently more transparent

than others. This would be an interesting future direction of research to pursue.

An alternative explanation is that the interaction was driven by ceiling effects. As seen in Figure 1, the control group showed higher levels of support for default and framing nudges. This suggests that people may naturally be more supportive of these two nudge types compared to social norm and option-related effort nudges. It is possible that this greater level of support is because default and framing nudges are inherently more transparent, thus incorporating the first explanation. However, people's preferences for different nudge types may be influenced by other factors – previous research suggests that people tend to be less supportive of interventions that they perceive as intrusive or restrictive (e.g. Diepeveen, Ling, Suhrcke, Roland, & Marteau, 2013; Hagmann, Siegrist, & Hartmann, 2018).

Ascribing the interaction to ceiling effects appears plausible – default and framing nudges, which were already well-supported, were the two nudge types where the additional policy information had little to no effect on support ratings. On the other hand, the information increased support ratings for social norm and option-related effort nudges, which were not well-supported. This explanation would reconcile our findings with our original hypothesis; providing the additional policy information was effective in increasing support for unpopular nudges, but ineffective for nudges that were already popular.

Thus, in Experiment 1, we found encouraging evidence demonstrating that providing additional policy information can be effective in increasing support for government nudge policies. In isolation, our findings from Experiment 1 suggest that governments should become more open and improve their communication around nudge policies. However, in reality, governments must consider not only the public acceptability of their nudge policies, but also the effectiveness of their policies. Consequently, our results from Experiment 1 alone are insufficient to produce useful practical recommendations. This led us to design Experiment 2, where we investigated whether nudge policies continue to be effective when

people are made aware of them. If nudges remain effective even when transparent, a strong case can be made for governments to openly communicate the rationales and mechanisms of the nudge policies they intend to implement. However, if the effectiveness of nudges diminishes when they become transparent, governments may instead need to prioritise between acceptable and effective nudges.

Experiment 2

In Experiment 2, we tested the effectiveness of social norm messages that were made transparent. We selected social norm nudges because they were one of the nudge types from Experiment 1 where we observed an increase in support ratings following our transparency manipulation. Thus, we could investigate whether the greater public support that social norm nudges gain from increased transparency comes at the expense of their ability to influence behaviour.

We designed a financial decision-making game where participants received a hypothetical income and allocated their money between spending and saving. Their objective was to earn points in the game by spending money, while keeping enough saved to cover a financial emergency. Because participants were not told when the financial emergency would occur, nor how much it would cost, participants could employ different saving strategies depending on their risk propensity.

We introduced social norm nudges by providing participants with in-game feedback comparing the amount they had saved to other participants who had previously played the game. Participants received messages in the following format: “30% of previous participants had saved more than you by this month.” These percentages were based on our control group of participants who first played the game without any social norm messages.

However, it was only in our "nudge-aware" group that we drew participants' attention to the social norm messages. Participants in this group were explicitly told during the instructions that they would receive social norm messages that were presented to encourage them to save more in the game. These instructions were provided to make the social norm nudge transparent; participants were made aware of both the nudge and its intention. On the other hand, participants in the "nudge-unaware" group also received the social norm messages but were not explicitly told that they were being nudged nor why it was occurring.

We expected that our social norm messages would encourage participants to save more money. Prior research has demonstrated that social norm nudges can be highly effective because people tend to adjust their behaviour when provided with information about the behaviour of their peers (e.g. Allcott, 2011). In previous situations, social norm nudges have been shown to influence behaviours such as electricity consumption in households (Allcott, 2011) and binge drinking in college students (Werch et al., 2000). In line with these findings, we expected that participants in the nudge-aware and nudge-unaware groups would both save more than participants in the control group.

However, we expected that making the social norm messages transparent for the nudge-aware group would reduce the effectiveness of the nudge. This is because we anticipated a degree of psychological reactance; when people feel they are being pressured towards a decision, they may actively resist this influence to preserve their sense of freedom (Brehm, 1966). For example, adolescents may find behaviours like smoking more attractive because these behaviours are prohibited by their parents and school authorities (Grandpre et al., 2003). Although we observed in Experiment 1 that participants continued to support nudges even when they understood the mechanism by which the nudge influenced people's behaviour, we expected that participants would respond differently in Experiment 2 when their own behaviour was being directly influenced. Since participants in the nudge-aware

group knew that they were being influenced towards saving more money, we expected them to resist this influence by deliberately saving less, thereby reducing the effectiveness of the social norm messages. Consequently, we hypothesised that participants in the nudge-aware group would save less money compared to the nudge-unaware group.

Method

Participants

Participants were 90 first-year psychology students (59 women) from the University of New South Wales, with an average age of 19.41 years (SD = 3.20). Participants received course credit in exchange for their participation. Additionally, they could earn money based on their performance in the experiment (M = \$3.47, SD = \$2.62). Participants were only told about the opportunity to earn money upon arrival.

Design

Experiment 2 used a between-subjects design with three information conditions (n = 30): the control, nudge-unaware, and nudge-aware conditions. Each condition played the financial decision-making game but received different levels of information. Throughout the game, participants completed multiple rounds where they received a hypothetical income and allocated money towards spending and their savings account.

In the control condition, participants only received instructions explaining how to play the game (see Appendix D). They received no further information about participants who had previously completed the game.

In the nudge-unaware condition, participants were told that they were part of the second group to play the game and that they may receive information about the first group of participants. Throughout the game, participants then received normative information which

compared the amount they had saved up with participants in the control condition. This information was presented in the same format after each round – for example: "30% of previous participants had saved more than you by this month."

In the nudge-aware condition, participants were told that they were part of the second group to play the game and that they would receive information about the first group of participants. Like the nudge-unaware condition, participants were shown an example of the normative information that would be presented throughout the game. It was explained that these were "social norm messages" that were intended to encourage them to save more money during the game. See Appendix D for the complete list of instructions provided to participants.

Materials

Participants completed the financial decision-making game using a standard desktop computer with a 1920 × 1080 resolution LCD monitor. The experiment was coded in Python 2.7 and run using the software program Spyder[3]. Participants registered their responses using a standard QWERTY keyboard and computer mouse.

The game was designed to simulate real-world decisions about spending and saving. In the context of the game, participants held a part-time job and had recently opened a savings account with $500. They first decided how much of this money to spend. Money that was spent was converted into points according to the conversion system explained below. These points were used at the end of the experiment to calculate the amount of real money participants won in exchange for their participation. Any hypothetical money that participants did not spend remained in their savings account for the next round. In each subsequent round, participants received an additional $500 into their savings account. They were again asked to

[3] The experimental code can be accessed at: https://github.com/nathanwangly/thesis2018.

decide how much money to allocate towards spending. Participants could not spend more than they had accumulated in their savings account at that point in time.

Points conversion. Participants earned points based on the amount of money they spent in that round. If a participant spent between $0 and $250 in a round, then a 1:1 conversion was applied – that is, 1 point was rewarded for every $1 they had spent. However, if the participant spent between $250 and $750 in a round, then a larger conversion rate would be applied. The more money that was spent, the larger the conversion rate. The conversion rate ranged from a minimum of 1:1 (if the participant spent $250) up to a maximum of 3:1 (if the participant spent $750), increasing non-linearly for amounts in between these two values. This rewarded riskier behaviour as participants received greater returns when spending more at once.

However, if the participant spent between $750 and $5,000, they would experience diminishing returns. The conversion rate decreased non-linearly from 3:1 (if the participant spent $750) back to 1:1 (if the participant spent $5,000). For any amount greater than $5,000 that was spent in a round, a 1:1 conversion was applied[4]. This discouraged participants from saving all of their money before making a final purchase. The exact conversion system is detailed in Appendix E.

Financial emergency. To encourage participants to save, the game included a 'financial emergency' where participants were told that their home had been flooded. Participants were asked to pay the repair costs associated with the flood. If participants had enough money in their savings account to cover the cost, they won the game. Their points score was then converted into real money; they were rewarded $0.10 for every 400 points earned[5]. However, if participants could not cover the cost, they would lose the game and

[4] The highest amount spent by any participant within a round was $3,000.
[5] The maximum possible amount that could be won was $9.

receive no reward regardless of how many points they had accrued. In the practice and experimental rounds, the financial emergencies were $500 and $3,000 respectively. Prior to the financial emergency, participants were not told when it would occur, nor how much it would cost. However, participants were told prior to the experimental rounds that it would cost at least $1,500 so that they would not anchor on the $500 cost from the practice stage.

Social norm messages. In the two nudge conditions (nudge-unaware and nudge-aware), participants received normative information based on the performance of the control group. In each round, the game compared the participants' savings account balances with the account balances of all 30 control group participants. It then generated a percentage based on the number of participants in the control group who had larger savings accounts at that stage in the game. For example, suppose that after the third round, a participant had less in their savings account than 3 out of the 30 control group participants. They would receive the message: "10% of previous participants had saved more than you by this month."

Procedure

Participants were told that they would be playing a financial decision-making game where they had the opportunity to win up to $9 based on their performance. Before playing the game, demographic information was collected via the Qualtrics survey platform.

The first thirty participants were assigned to the control group. This was because the control group's data were needed for comparisons to be drawn in the two nudge conditions. The next sixty participants were randomly allocated between the nudge-unaware and nudge-aware conditions. Participants were presented with instructions on-screen (shown in Appendix D), which warned them that there would be a financial emergency but did not reveal when it would occur, nor how much it would cost.

In the practice stage, participants first completed 10 practice rounds. Participants

received $500 at the start of each round which could be spent or saved. Participants entered the amount they wanted to spend using the keyboard and clicked the 'Next' button to confirm their response. After each response, the game provided an outcome screen; participants were told how much money they had spent, how many points this had earned them, the amount of money they had accumulated in their savings account, and the total amount of points they had accrued over the course of the experiment (shown in Appendix D). For participants in the two nudge conditions, the outcome screen also presented the social norm message, comparing their savings account balance to participants in the control condition. After the 10 rounds, a practice financial emergency occurred, costing participants $500. Participants were told the game outcome, as well as how much they would have won if it had been the real experiment.

Participants then proceeded to the experimental stage. Their points total and savings account balance were both reset to zero. They were also reminded that there would be another financial emergency that would cost at least $1,500. Participants then completed 30 experimental rounds following the same process previously described for the practice rounds. Upon completion, participants in the control condition were notified of the game outcome, rewarded based on their performance, and debriefed. Participants in the two nudge conditions were asked two additional questions prior to their debrief. Firstly, to what extent they believed that the normative information they had been provided was real. Secondly, to what extent they believed that the normative information had been provided to help them in the game. Participants provided a verbal response to each question using a scale from 1 (*strongly disagree*) to 7 (*strongly agree*) before receiving their reward and being debriefed.

Results

We began our analysis by comparing participants' saving behaviour across the three information conditions. First, we compared the amount of money participants had accumulated in their savings account over the 30 experimental rounds[6] (Figure 5). Additionally, we compared the amount of money participants saved during different stages of the game. Figure 6 shows the amount saved during each block consisting of 5 rounds.

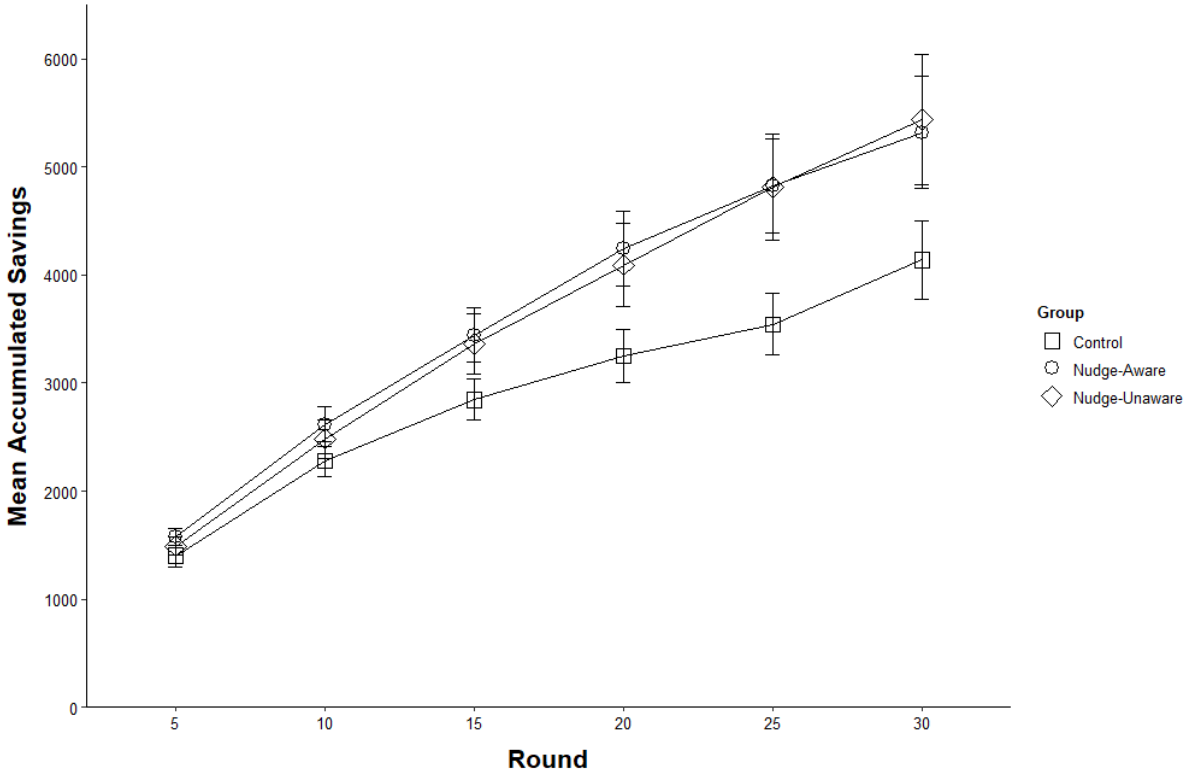

Figure 5. Mean cumulative savings for each information condition over 30 experimental rounds. Error bars indicate standard error.

[6] The maximum possible amount that could be saved was $15,000 ($500 × 30 rounds).

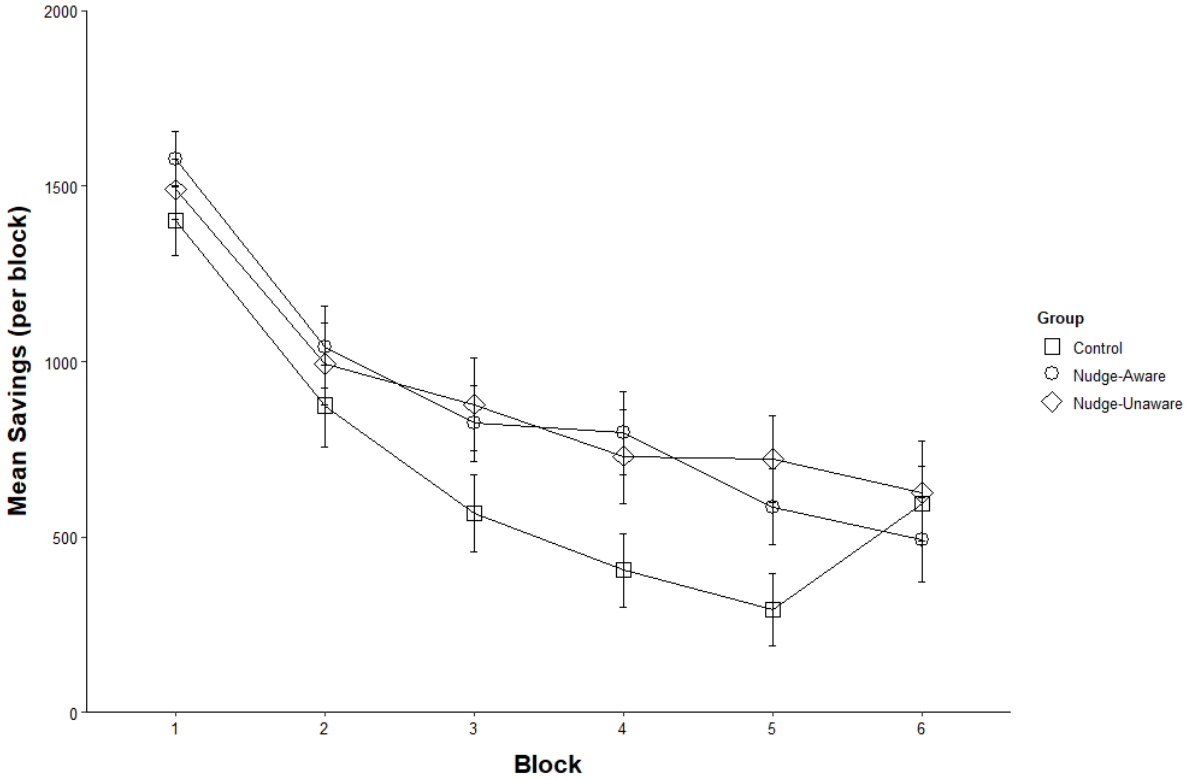

Figure 6. Mean amount saved during each 5-round block in the game. Error bars indicate standard error.

From Figure 5, it appears that participants in the two nudge groups (nudge-unaware and nudge-aware) exhibited different levels of saving compared to the control group. Figure 6 suggests that this difference may be driven by different behaviour from the groups in the middle stages of the experiment (blocks 3, 4, 5).

Thus, we used a Bayesian repeated measures ANOVA to analyse participants' saving behaviour across the experimental rounds. We entered the information group (control, nudge-unaware, nudge-aware) as the between-subject factor and the blocks as the repeated measures factor.

Overall Model Comparison

Table 3 shows the overall model comparison produced by the ANOVA, which indicated that the best model for explaining the data contained both main effects

(information, block) and the information × block interaction. There was decisive evidence that this model could explain the data better than the null model ($BF_{10} = 2.200\times10^{87}$).

Table 3.

Overall Model Comparison (ANOVA)

Model	P(M|Data)	BF_{10}	Error (%)
Null	2.383×10^{-88}	1.000	-
Information	1.400×10^{-88}	0.587	0.899
Block	0.256	1.073×10^{87}	0.385
Information + Block	0.220	9.243×10^{86}	1.126
Information + Block + Information × Block	0.524	2.200×10^{87}	1.585

Note. P(M|Data) = the likelihood of the model given the data.
Error (%) = the error associated with the BF_{10} estimate.
All models used JASP default prior odds, P(M) = 0.200.

Like in Experiment 1, JASP also reported inclusion Bayes factors for each effect, providing evidence for whether they were helpful in accounting for the observed data (see Table 4). The $BF_{inclusion}$ value for the information main effect was 1.942, indicating that models which included the effect were, on average, almost two times more likely to explain the data than models which excluded the effect. This suggests that there was anecdotal evidence for the information main effect – that is, mean savings per block differed between the control, nudge-unaware, and nudge-aware groups. However, it can be seen from Figures 5 and 6 that this main effect was driven by differences between the two nudge groups and the control group, rather than any differences between the nudge-unaware and nudge-aware groups.

Table 4.

Inclusion Bayes Factors (ANOVA)

Effect	$BF_{inclusion}$
Main: Information	1.942
Main: Block	∞
Int: Information × Block	4.407

Note. Main = Main effect, Cov = Covariate, Int = Interaction effect.

We found decisive evidence for the block main effect ($BF_{inclusion} > 1\times10^{305}$)[7], reflecting the decrease in participants' mean savings per block as the experiment went on (see Figure 6). Finally, there was substantial evidence for the information × block interaction ($BF_{inclusion} = 4.407$). This is consistent with the pattern we observed in Figure 6 shown earlier, which indicates that participants from the two nudge groups saved more than the control group during the middle blocks of the experiment, but not during the first and last blocks.

Social Norm Messages

Our findings suggested that the social norm messages were effective in increasing participants' saving behaviour. We conducted additional analyses to investigate whether the effectiveness of the messages was influenced by how strongly participants believed and trusted in them.

We analysed the responses to the two questions posed to participants in the nudge conditions. These participants had been asked to rate the extent to which they believed that the social norm messages were based on real participant data (belief), and that the messages were provided to help them in the game (trust). Responses were recorded on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

[7] JASP reports a value of ∞ for $BF_{inclusion}$ values above 1×10^{305}.

Participants reported a mean belief score of 5.05 (*SD* = 1.49) and a mean trust score of 4.47 (*SD* = 1.54). Bayesian independent samples t-tests indicated that there was substantial evidence that the nudge-unaware and nudge-aware groups did not differ on their mean belief scores (BF_{10} = 0.306), nor their mean trust scores (BF_{10} = 0.262). This suggests that, on average, participants from both groups tended to believe that the social norm messages used real participant data but were undecided on whether they trusted the messages to help them in the game. Additionally, it suggests that the instructions provided to the nudge-aware group, which explained the intention of the messages, did not affect participants' belief or trust in the messages.

Finally, there was substantial evidence that participants' accumulated savings after 30 rounds did not correlate with their belief score, $r(58) = -.096$ (BF_{10} = 0.209), nor their trust score, $r(58) = .001$ (BF_{10} = 0.161). This indicates that the social norm messages were effective in increasing participants' savings regardless of how strongly participants believed or trusted in the messages.

Discussion for Experiment 2

Experiment 2 examined whether social norm nudges could be both transparent and effective. Our primary hypothesis was informed by Brehm's (1966) theory of psychological reactance – attempts to influence people can backfire by instead motivating them to resist the influence and preserve their sense of freedom. For example, messages intending to encourage people to become organ donors can instead have the opposite effect; these messages can lead to less favourable attitudes towards organ donations and lower intentions to become organ donors (Quick, Scott, & Ledbetter, 2011). In a similar vein, we expected that participants in the nudge-aware group, who were told that the social norm messages were provided to

encourage them to save, would instead respond by saving less.

However, we instead found that being transparent about the social norm nudges did not diminish their effectiveness. On the one hand, our results suggested that the social norm nudges were effective in encouraging participants to save more money; by the end of the experiment, participants in the two nudge groups (nudge-unaware and nudge-aware) saved approximately 25% more than participants in the control group. On the other hand, we observed similar levels of saving between the nudge-unaware and nudge-aware groups. Contrary to our primary hypothesis, this suggests that the social norm messages continued to be effective even when participants were aware that they were being nudged. In this section, we consider possible explanations for why we did not find a difference in saving behaviour between our two nudge groups.

Firstly, people may not perceive social norm messages as a threat to their freedom to make choices. Even though participants in the nudge-aware group knew that they were being encouraged to save more, they may not have felt that the messages impeded their ability to save the amount they wanted. Consequently, even when made transparent, the social norm messages may not have elicited psychological reactance, thereby accounting for the similar levels of saving between the two nudge groups. However, this explanation would contradict previous research, which has found that people tend to perceive nudges as threats to their freedom to choose (Hagman et al., 2015). In particular, social norm messages may be especially threatening because they are difficult for people to avoid or ignore – unlike less intrusive nudges, such as a poster that informs people about the benefits of saving more (Houlby & Nørnberg, 2014). Thus, it is possible, but unlikely that this explanation provides the best account for our findings.

Instead, we may have observed no differences in saving levels between the two nudge groups because our transparency manipulation was redundant. Participants in the nudge-

unaware group may have inferred the intentions behind the social norm messages despite not receiving an explicit explanation like participants in the nudge-aware group. As discussed in Experiment 1, this explanation is speculative and would require further research to substantiate that people can accurately infer the intentions behind nudges. However, it would indicate that we overestimated the effect of psychological reactance on nudged behaviour. Bruns et al. (2018) suggest that understanding and supporting the intentions behind nudges may counteract any reactance effects. This would explain why the messages did not elicit the level of psychological reactance that we had anticipated. Furthermore, it would explain why the social norm messages were still effective even when people were aware that they were being influenced. Although this explanation appears plausible, further research is needed to validate its core assumptions: that people can infer the intentions behind social norm nudges, and that supporting the intentions of a nudge mitigates potential psychological reactance effects.

Finally, the simplest explanation is that our transparency manipulation was too subtle to cause a meaningful difference between the two nudge groups. The key difference between the nudge groups was an additional instruction screen which explained the intention behind the social norm messages. Participants in the nudge-aware group may have ignored or forgotten about the additional instructions because they were inconsequential to the game. If this was the case, the fact that we observed no difference in saving levels between the two nudge groups may simply be a result of a flaw in our experimental design.

In our General Discussion, we will elaborate further on the limitations of the current experimental design. Additionally, we will propose future directions for research that will allow us to discern between these three explanations and enable us to draw stronger conclusions from our findings.

General Discussion

In this thesis, we aimed to understand the effect of transparency on behavioural nudging – the way it is perceived by the public, and its ability to influence behaviour. Previous experiments have examined what factors contribute to the acceptability of nudges (e.g. Jung & Mellers, 2016), but to our knowledge, none have tested whether proactive steps can be taken to increase public approval of nudging. In Experiment 1, we investigated whether governments could increase support for nudging by being more transparent about their policies. We followed this with Experiment 2, where we examined whether nudges would become less effective at influencing behaviour when they were made transparent. Our findings suggest that being more transparent increases the public acceptability of nudges without reducing their effectiveness. Together, our experiments provide preliminary evidence that governments should be striving to be more transparent.

We will begin our discussion by comparing the attitudes towards nudging we observed with previous findings in the literature. Following this, we review the key experimental results which demonstrate the effect of transparency on the acceptability and effectiveness of nudges. However, we recognise that we have used a novel experimental design in an area with limited existing research. As such, we conclude our discussion by considering the limitations and future directions for research that should be addressed prior to drawing practical implications from our findings.

Australian Attitudes Towards Nudging

In the Introduction, we discussed how public attitudes towards nudging can vary widely from country to country. Although our research primarily focuses on investigating the effect of transparency on nudges, it is useful to first understand how the Australian population currently perceives nudging. Such an understanding would help contextualise our

findings on transparency – for example, perhaps Australian attitudes towards nudging are already so positive that the government sees no need for greater transparency. To our knowledge, only one other study has investigated attitudes towards nudging using an Australian sample (Sunstein, Reisch, & Rauber, 2018). Thus, in addition to exploring how governments can benefit from becoming more transparent, our research also provides further insight into the types of nudges that Australian people support.

From Experiment 1, we can draw inferences on Australian attitudes towards nudging based on the support ratings provided by the control group (shown in Figures 1 and 2). Our results suggest that Australian people are generally supportive of nudges, with the control group providing most nudge policies with a support rating of 5 or greater out of 7. This is consistent with the recent finding that approximately 70% of Australian people approve of nudge policies (Sunstein et al., 2018). However, this percentage suggests that there is strong support for nudging, while our mean support rating of 5 indicates that participants only "slightly supported" the nudge policies. We attribute this discrepancy to our decision to use a different measure of attitudes towards nudging. Past surveys (e.g. Reisch & Sunstein, 2016; Sunstein et al., 2018) provided participants with a binary choice – to either approve or disapprove of a policy. In contrast, our experiment required participants to report their level of support for each policy. Our results reveal that previous surveys may overstate people's support for nudges; while people are generally supportive of nudges, this support does not appear to be as strong as previous findings might suggest.

In line with previous findings (e.g. Reisch & Sunstein, 2016), our results also show that people's attitudes towards nudge policies differ according to the type of nudge used. We found that people were more supportive of default and framing nudges, and less supportive of social norm and option-related effort nudges. The preference for framing nudges is unsurprising, given that the example policies we provided were mostly educational

campaigns – for example, an educational campaign about the dangers of failing to detect cervical cancer. People prefer these types of nudges because they are less intrusive; they equip us with information that facilitates our conscious decision-making processes (Felsen et al., 2013). In contrast, nudges which instead seek to bypass our decision-making processes tend to be met with lower levels of support (Felsen et al., 2013). This would explain why we observed less support for option-related effort nudges, which aim to capitalise on people's preference for expending less effort. Thus, the support ratings we observed for framing and option-related effort nudges were consistent with previous findings in the literature.

On the other hand, the strong support we observed for default nudges was surprising; previous studies suggest that people tend to disapprove of default nudges, using both Australian (Sunstein et al., 2018) and non-Australian samples (e.g. Jung & Mellers, 2016). However, upon closer inspection, this may be because the default nudge policies used in past studies typically resulted in a financial cost – for example, being defaulted into paying a carbon offset charge when purchasing an airline ticket (Reisch & Sunstein, 2016; Sunstein et al., 2018). In most countries, less than 50% of people approved of this policy, whereas over 70% approved of a policy that would automatically enrol people in a green energy plan (Sunstein et al., 2018). This difference in approval ratings cannot be attributed to the type of nudge nor its domain, as both policies use default nudges to serve pro-environmental purposes. Instead, people may simply dislike nudges in which the encouraged behaviour or choice incurs an explicit financial cost. Since we provided examples of default nudge policies that were non-financial (e.g. automatically enrolling children into school vaccination programs), this would explain why we observed strong levels of support that seemingly contradict previous research.

Finally, we observed the lowest support ratings for the social norm nudge policies. Interestingly, although previous studies have investigated the effectiveness of social norm

nudges (e.g. Allcott, 2011), there is little to no research examining whether people find them acceptable. As such, our findings provide the first indication that people do not support social norm nudges. One possible explanation for why people dislike social norm nudges is that they can elicit feelings of shame or embarrassment (McTernan, 2014). For example, people may feel ashamed or embarrassed when they are told that they are exercising less or saving less money in comparison to their peers. Although the ability to induce these negative feelings is likely what makes social norm nudges so effective, people may not believe that the end justifies the means. However, given that the existing research into social norm nudges is limited, further investigation is needed to corroborate our findings and to better understand what factors are driving the low level of support we observed.

Transparency in Nudges

In Experiment 1, our results provide an indication of how people currently feel about nudge policies, while also suggesting that these attitudes can be changed. We found that people provided higher ratings of support for nudge policies when they received additional information explaining why the government was implementing the policy (its rationale) or why the policy was expected to be effective (its mechanism). Interestingly, we observed no difference in support ratings between participants who received the rationale information and the mechanism information. This suggests that the exact information being provided is not necessarily important. In line with previous research, what matters is that the information successfully improves people's understanding of the policy and alleviates their uncertainties (Venkatesh et al., 2016).

Although we found preliminary evidence that greater transparency can improve attitudes towards nudging, the extent to which we can generalise this result remains uncertain. On the one hand, we found that the additional information consistently increased support ratings for policies in all three domains: health, the environment, and personal

finance. On the other hand, as we previously discussed, we also found that the additional information was only effective for some types of nudges – social norm and option-related effort nudges, but not default and framing nudges. While further research is still needed to test the generalisability of our findings, our results from Experiment 1 are encouraging; they indicate that people are already supportive of nudge policies, and that governments can further increase this support for nudging by being more transparent.

In Experiment 2, we then found evidence that being transparent does not diminish the effectiveness of nudging. This is a surprising result, as nudges are often thought to "work best in the dark" (Bovens, 2009, p.217). Consequently, one might be concerned that nudges would lose their ability to influence behaviour if people become aware of them. Worse yet, people may actively resist the influence by deliberately engaging in behaviours which oppose the goal of the nudge. Instead, our results suggest that these concerns are overstated.

We found that our social norm messages were effective – on average, leading participants to save 25% more in the decision-making game. This supports past studies which have shown how social norm nudges can encourage a range of behaviours, such as voting (Gerber & Rogers, 2009) and donating to charity (Frey & Meier, 2004). Additionally, it provides further evidence that people seek to behave in ways that conform to social norms (Cialdini & Goldstein, 2004).

However, we also found that drawing participants' attention to the messages made no difference to their effectiveness. This is consistent with previous research; for example, Bruns et al. (2018) showed that default nudges continued to increase donations to a climate protection fund even when participants were aware that they were being nudged. Similar results have been found in both laboratory and field experiments (Kroese, Marchiori, & de Ridder, 2016; Loewenstein, Bryce, Hagmann, & Rajpal, 2015; Steffel, Williams, & Pogacar, 2016), though these past studies have exclusively examined the effect of transparency in

default nudges. Our results from Experiment 2 suggest that these findings may extend to social norm nudges too, thus adding to the growing body of evidence that nudges can be simultaneously transparent and effective.

Combining our findings across both Experiments 1 and 2, there is preliminary evidence demonstrating the benefits of transparency for governments seeking to implement nudge policies. Our results indicate that governments who better communicate their policies – for example, by explaining the rationales or mechanisms behind their nudges – are likely to experience greater public approval. At the same time, being more transparent about nudging does not appear to diminish its effectiveness. Instead, governments who strive for greater transparency have the potential to develop nudge policies that are both well-supported and effective.

Limitations and Future Directions

Our discussions of both experiments revealed that there were competing interpretations of key results which we could not distinguish between due to limitations of our current experimental design. One of the main limitations in Experiment 1 was our lack of an information control group. Because we observed no differences in support ratings between the rationale and mechanism groups, we cannot confidently conclude that the content of the additional information we provided to participants was important. Although it may be unlikely, we cannot rule out the possibility that participants were more supportive of policies because they received more information, regardless of whether this information was relevant to the policy. While designing our first experiment, we deliberated on whether it would be worthwhile to present irrelevant information – for example, an additional statement about the weather. Ultimately, we opted not to include this information as we believed it would confuse the participants. However, given the pattern of results we observed, it would be useful to conduct a follow-up experiment with a fourth group (information control) to determine

whether the support ratings increased specifically because of the additional policy information, rather than simply any additional information.

Another limitation of Experiment 1 was our choice of measurement of attitudes towards nudging. While previous studies only provided participants with the choice between approving or disapproving of each policy (e.g. Reisch & Sunstein, 2016), we asked participants to rate their level of support using a scale from 1 (*strongly object*) to 7 (*strongly support*). As discussed earlier, one advantage of our scale is that we can distinguish between people who strongly support nudge policies and people who only slightly support them. Additionally, we provided participants with a neutral option – 4 (*neither support nor object*) – which previous studies did not allow. However, our scale makes it difficult to determine whether any differences we observe are practically important – for example, if there is a shift from slight support to strong support of a policy. For governments, these differences become meaningful when they affect their popularity and election voting patterns. As such, a future study could measure attitudes towards nudging by asking participants to vote between different political parties who vary in how transparently they communicate their policies. This would show whether being transparent about nudge policies increases a party's chances of being elected by a practically significant amount.

For Experiment 2, we discussed the possibility that our transparency manipulation was too subtle. Participants may have ignored or forgotten about the instruction screen which explained that the social norm messages were provided to encourage them to save. To increase the strength of our manipulation in a future study, we could add more frequent reminders throughout the experiment about the purpose of the social norm messages. Alternatively, we could introduce a comprehension check to confirm that participants understood the purpose of the social norm messages before they were permitted to begin the game. These adjustments would increase the saliency of our manipulation and allow us to

demonstrate that our nudge-aware and nudge-aware groups exhibited similar levels of saving because they did not mind being nudged, and not because our manipulation was weak.

Our design in Experiment 2 also lacked a direct measure for psychological reactance. As a result, we could not determine whether telling participants about the purpose of the messages elicited any psychological reactance. Since we observed no differences in saving between our two nudge groups, one possibility is that neither group experienced psychological reactance. This would support the interpretation that people do not feel that their freedom to choose is threatened by social norm nudges. Alternatively, it is also possible that both groups experienced psychological reactance, but it did not affect their behaviour to the extent we had anticipated. Incorporating a measure of psychological reactance into Experiment 2 would help distinguish between these competing interpretations. Bruns et al. (2018) measured psychological reactance by asking participants to report how strongly they felt a nudge manipulated them or threatened their freedom. Other studies of psychological reactance (e.g. Erceg-Hurn & Steed, 2011) have used the Hong Psychological Reactance Scale (Hong & Faedda, 1996) to measure people's proneness to psychological reactance.

Taking a broader perspective, one of the difficulties in drawing conclusions about nudges is that they can vary incredibly. It is difficult to know how well our experimental findings can generalise. In the case of Experiment 1, we restricted our list of nudge policies to four nudge types to simplify our analysis, despite there being many more types of nudges. Furthermore, we only provided participants with three examples of each nudge type. It is possible that our choice of nudge policies did not accurately represent the nudge type – for example, as mentioned earlier, we happened to select default nudges that were all non-financial. Because this differed from previous studies (e.g. Reisch & Sunstein, 2016), we observed contradictory results. Similarly, in Experiment 2, our findings were based on social norm nudges and may not necessarily extend to all other types of nudges. However, since our

results aligned with previous studies on default nudges (e.g. Bruns et al., 2018), this is an encouraging sign that our conclusions could generalise to more types of nudges. Thus, it will be important to replicate our findings from both experiments with more types of nudges and more examples of each nudge type – perhaps drawing from existing policies that are already being implemented around the world.

Finally, it should be considered that our findings in both experiments were based on a university student sample and may not accurately reflect the preferences of the wider Australian population. Previous surveys have used larger, more representative samples – for example, Sunstein et al. (2018) collected responses from thousands of Australian people between 18 and 65 years of age. As such, any discrepancies between our findings and previous research could be attributed to our limited sample. Additionally, there have been concerns raised that laboratory studies involving student samples may lack external validity, especially in fields like political science (Gerber & Green, 2008). Compared to the general population, university students may be more welcoming of government intervention. Alternatively, given their younger age, their attitudes may be less crystallised and hence more susceptible to being influenced. Thus, while our use of a university student sample does not invalidate our findings, it is worth noting that it may limit how strongly our findings apply to the overall Australian population.

Implications

Today's governments are tasked with a difficult challenge; not only must they design policies that will achieve results, they must also ensure that these policies are supported by the public. Despite the potential for nudge policies to produce widespread benefits for society, governments may currently underutilise or avoid the use of nudging in fear of implementing policies that receive backlash and disapproval. This conservative approach restricts the policy options available to governments and may ultimately come at the expense

of society's wellbeing.

Our experiments suggest that this approach may be overly conservative, and that governments can opt for a more proactive approach towards nudging. Our findings demonstrate that support for nudge policies is not fixed, but instead can be increased with greater government transparency. People are often left with many unanswered questions and uncertainties when they learn about new nudge policies: how the policy will directly affect them, how likely the policy is to succeed, or what societal benefits and costs the policy will bring. It is the government's responsibility to alleviate these uncertainties with more honest and open communication. This might include broadcasting public service announcements on TV and radio stations, sending letters to households, or hosting community forums. Governments who accomplish this will improve their people's understanding of the nudge policies being implemented and are likely to receive greater support. Importantly, our findings also indicate that nudging continues to be effective even when people know that they are being influenced. Governments do not need to sacrifice the effectiveness of their nudge policies to boost public acceptability. Thus, by taking the initiative to be more transparent with their people, governments have the opportunity to develop nudge policies that are both acceptable and effective; they can have their cake and eat it too.

Concluding Remarks

This thesis investigated the public acceptability and effectiveness of transparent nudges. Our first experiment provided evidence that attitudes towards nudging can be improved by explaining why a nudge policy is being implemented or why it should be effective. Our second experiment showed that, contrary to what people believe about nudges, they can continue to be effective even when people are aware that they are being influenced. Together, our experiments suggest that governments should strive to be more transparent – and that doing so will allow them to implement nudge policies that are both acceptable and effective. At the same time, we recognise that before we can draw stronger conclusions, there are limitations in our experimental design that must first be addressed, as well as future studies that test whether our findings extend to nudges in general.

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Appendix A

List of Nudge Policies

Health Nudge Policies

Social Norms

- Control: Students are required to complete an online survey about their exercise and dietary habits, which compares them with their peers.
- Rationale: This policy aims to reduce child and adolescent obesity levels in Australia, which have risen to above 25% in recent years.
- Mechanism: Research has shown that providing information about how others behave can encourage people to improve their own behaviour.

Defaults

- Control: Children enrolled in school are automatically signed up to the vaccination program unless their parents opt out.
- Rationale: This policy aims to increase child immunisation levels, which are as low as 70% in certain Australian suburbs.
- Mechanism: Previous research has found that people are more likely to participate in a program when they must opt-out of it rather than opt-in.

Framing

- Control: A public education campaign is launched about the dangers of failing to detect cervical cancer.
- Rationale: This campaign aims to increase participation in the national Cervical Screening Program which helps women detect and prevent cervical cancer in its early stages.
- Mechanism: Research has found that messages emphasising potential losses (e.g. costs of not detecting cervical cancer) are effective at promoting detection behaviours.

Option-related Effort

- Control: Supermarkets are required to keep cashier areas free of unhealthy foods (e.g. sweets).
- Rationale: This policy aims to reduce the consumption of unhealthy foods, with over 60% of Australian shoppers reporting they have impulsively purchased junk food or sugary drinks in supermarkets.
- Mechanism: Previous research has shown that making unhealthy foods less accessible increases the effort required to purchase them. This reduces the likelihood of an impulsive junk food purchase.

Environmental Nudge Policies

Social Norms

- Control: Water bills are required to provide customers with an efficiency rating and compares their water usage with neighbours.
- Rationale: This policy aims to improve the efficiency of household water usage, which accounts for 12% of Australia's overall water usage.
- Mechanism: Research has shown that providing information about how others behave can encourage people to improve their own behaviour.

Defaults

- Control: Electricity providers are required to automatically enrol new customers under a green energy plan, unless they opt for an alternative plan.
- Rationale: This policy aims to reduce Australia's reliance on non-renewable energy sources, with the average household generating over 7 tonnes of greenhouse gases per year.
- Mechanism: Previous research has found that people are more likely to choose the plan when they must opt-out of it rather than opt-in.

Framing

- Control: A public awareness campaign is launched about the benefits of taking preventative actions against climate change.
- Rationale: This policy aims to encourage Australians to implement small changes that collectively can significantly reduce individuals' annual carbon footprints.
- Mechanism: Research has found that messages emphasising potential gains (e.g. benefits of adopting climate change-friendly practices) are effective at promoting prevention behaviours.

Option-related Effort

- Control: Schools and universities are required to hold quarterly electronic waste drop-offs/collections.
- Rationale: Australians generate over 140,000 tonnes of e-waste each year, with the majority ending up in landfills. This initiative aims to promote proper recycling of e-waste materials, reducing the leaching of toxic materials into nearby waterways.
- Mechanism: Previous research suggests that increasing the convenience of the collections lowers the effort required to participate. This will increase the likelihood of people recycling.

Financial Nudge Policies

Social Norms

- Control: Bank statements are required to compare consumers' savings and spending levels to others in similar income brackets.
- Rationale: This policy aims to encourage Australians to save more, with household saving rates declining over the last 10 years.
- Mechanism: Research has shown that providing information about how others behave can encourage people to improve their own behaviour.

Defaults

- Control: The default superannuation contribution is increased from 9.5% to 10.5%. Employees can opt out to keep the original contribution rate of 9.5%.
- Rationale: By increasing Australians' superannuation savings, this policy aims to improve the quality of life for retirees and reduce their reliance on government pensions.
- Mechanism: Previous research has found that people are more likely to increase their contribution when they must opt-out of it rather than opt-in.

Framing

- Control: People with outstanding fines will be issued personalised texts, which include their name and the amount owed.
- Rationale: This change aims to encourage Australians to repay state-issued fines on time.
- Mechanism: Research has found that by including personalised information, the message feels more personally relevant and the likelihood of compliance increases.

Option-related Effort

- Control: Credit card companies are required to reduce the credit limits on their cards. Spending above the limit requires consumers to complete an application and is subject to their approval.
- Rationale: This policy aims to promote financially responsible use of credit cards, with Australia's total credit card debt rising to over $32 billion.
- Mechanism: Previous research suggests that the effort required to complete the application will deter people from increasing their card limits. This will reduce the amount spent on their credit cards.

Appendix B

Overall Model Comparison

Model	P(M|Data)	BF_{10}	Error (%)
Dom + Nudge + Dom×Nudge + Pol + Info + Nudge×Info	0.535	1.602e97	20.403
Dom + Nudge + Dom×Nudge + Info + Nudge×Info	0.208	6.235e96	2.247
Dom + Nudge + Dom×Nudge + Pol	0.146	4.359e96	3.274
Dom + Nudge + Dom×Nudge	0.044	1.324e96	1.211
Dom + Nudge + Dom×Nudge + Pol + Info	0.043	1.284e96	2.172
Dom + Nudge + Dom×Nudge + Info	0.021	6.223e95	1.906
Dom + Nudge + Dom×Nudge + Pol + Info + Dom×Info + Nudge×Info	0.002	6.131e94	3.761
Dom + Nudge + Dom×Nudge + Info + Dom×Info + Nudge×Info	0.001	3.152e94	4.333
Dom + Nudge + Dom×Nudge + Pol + Info + Dom×Info	2.028e-4	6.073e93	4.513
Dom + Nudge + Dom×Nudge + Pol + Info + Dom×Info + Nudge×Info + Dom×Nudge×Info	1.208e-4	3.618e93	4.419
Dom + Nudge + Dom×Nudge + Info + Dom×Info	9.935e-5	2.975e93	1.931
Dom + Nudge + Dom×Nudge + Info + Dom×Info + Nudge×Info + Dom×Nudge×Info	5.568e-5	1.668e93	1.556
Dom + Nudge + Pol + Info + Nudge×Info	1.279e-16	3.830e81	4.286
Dom + Nudge + Pol	7.968e-17	2.386e81	1.914
Dom + Nudge + Info + Nudge×Info	6.531e-17	1.956e81	1.786
Dom + Nudge	2.509e-17	7.513e80	1.505
Dom + Nudge + Info + Pol	2.278e-17	6.823e80	4.502
Dom + Nudge + Info	1.117e-17	3.345e80	1.493
Dom + Nudge + Pol + Info + Dom×Info + Nudge×Info	5.984e-19	1.792e79	5.948
Dom + Nudge + Info + Dom×Info + Nudge×Info	2.794e-19	8.367e78	2.355
Dom + Nudge + Pol + Info + Dom×Info	1.007e-19	3.015e78	4.702
Dom + Nudge + Info + Dom×Info	5.026e-20	1.505e78	2.291
Nudge + Pol	9.199e-48	2.755e50	1.783
Nudge + Pol + Info + Nudge×Info	5.637e-48	1.688e50	2.313
Nudge + Info + Nudge×Info	3.178e-48	9.518e49	4.088
Nudge	3.083e-48	9.234e49	0.653
Nudge + Info + Pol	2.420e-48	7.246e49	1.978
Nudge + Info	1.255e-48	3.758e49	0.920
Dom + Pol	3.277e-71	9.815e26	2.005
Dom	1.154e-71	3.457e26	1.323
Dom + Pol + Info	8.081e-72	2.420e26	1.888
Dom + Info	4.503e-72	1.349e26	1.471
Dom + Pol + Info + Dom×Info	2.871e-74	8.599e23	2.826
Dom + Info + Dom×Info	1.542e-74	4.563e23	1.420
Pol	9.131e-98	2.735	1.489
Null Model	3.339e-98	1.000	0.000
Pol + Info	2.113e-98	0.633	2.807
Info	1.210e-98	0.362	0.981

Note. Info = Information, Dom = Domain, Nudge = Nudge Type, Pol = Political Orientation.

Appendix C

Example of With and Without Models (Information Main Effect)

With Model	P(M|Data)	Without Model	P(M|Data)
Info	1.210e-98	Null	3.339e -98
Info + Pol	2.113e -98	Pol	9.131e-98
Info + Dom	4.503e -72	Dom	1.154e -71
Info + Nudge	1.255e -48	Nudge	3.083e -48
Info + Dom + Pol	8.081e -72	Dom + Pol	3.277e -71
Info + Nudge + Pol	2.420e -48	Nudge + Pol	9.199e-48
Info + Dom + Nudge	1.117e -17	Dom + Nudge	2.509e -17
Info + Dom + Nudge + Pol	2.278e -17	Dom + Nudge + Pol	7.968e -17
Info + Dom + Nudge + Dom * Nudge	0.021	Dom + Nudge + Dom * Nudge	0.044
Info + Dom + Nudge + Pol + Dom * Nudge	0.043	Dom + Nudge + Pol + Dom * Nudge	0.146

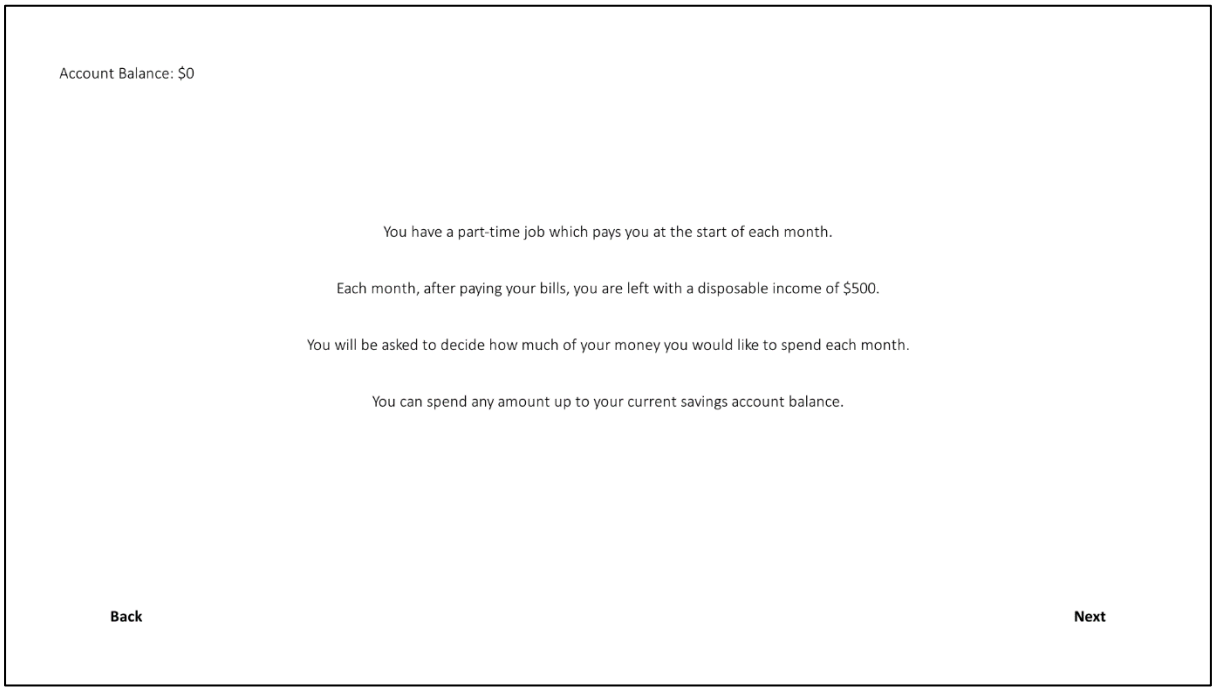
Appendix D

Financial Decision-Making Game Instructions

Starting screen for all participants

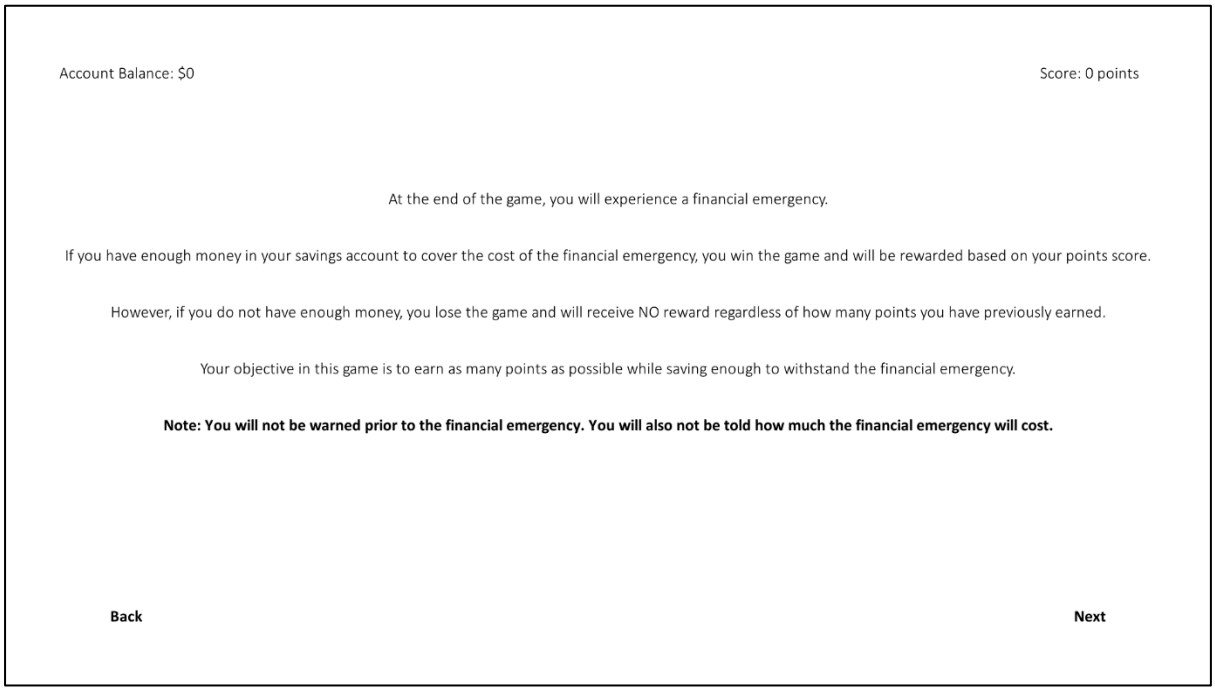
Instructions 1

Instructions 2



Instructions 3

Financial Emergency Instructions



Nudge Instructions (Nudge-Unaware)

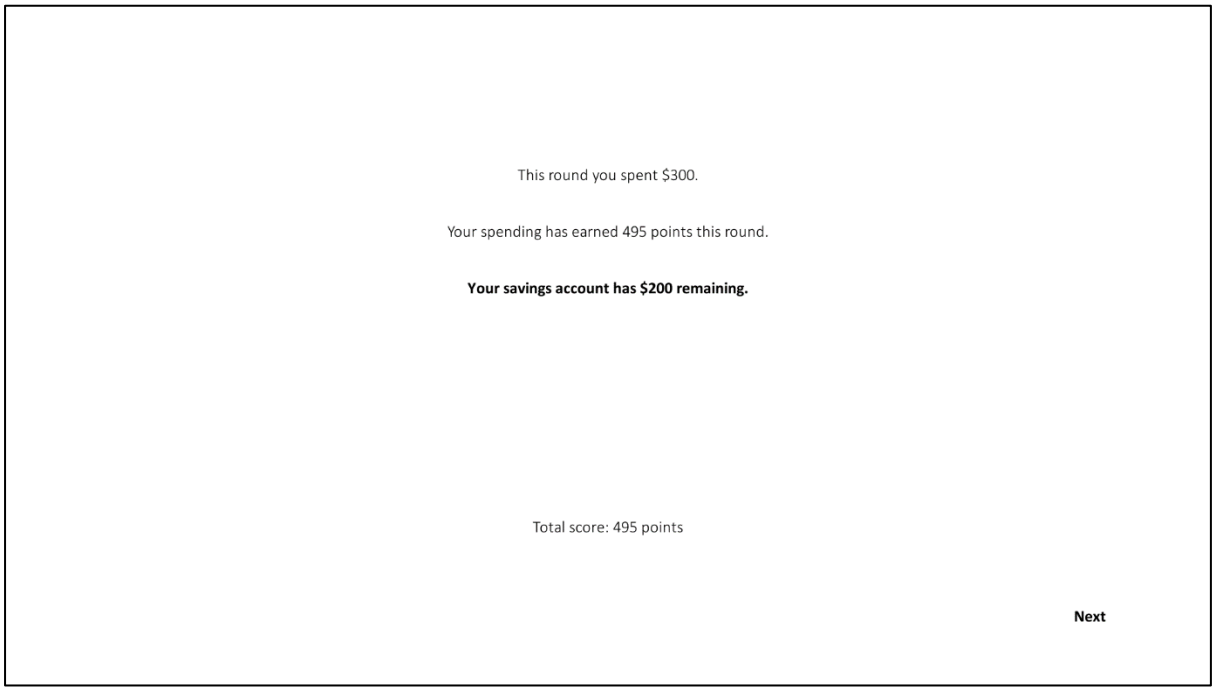
Nudge Instructions (Nudge-Aware)

Social Norm Instructions (Nudge-Aware)

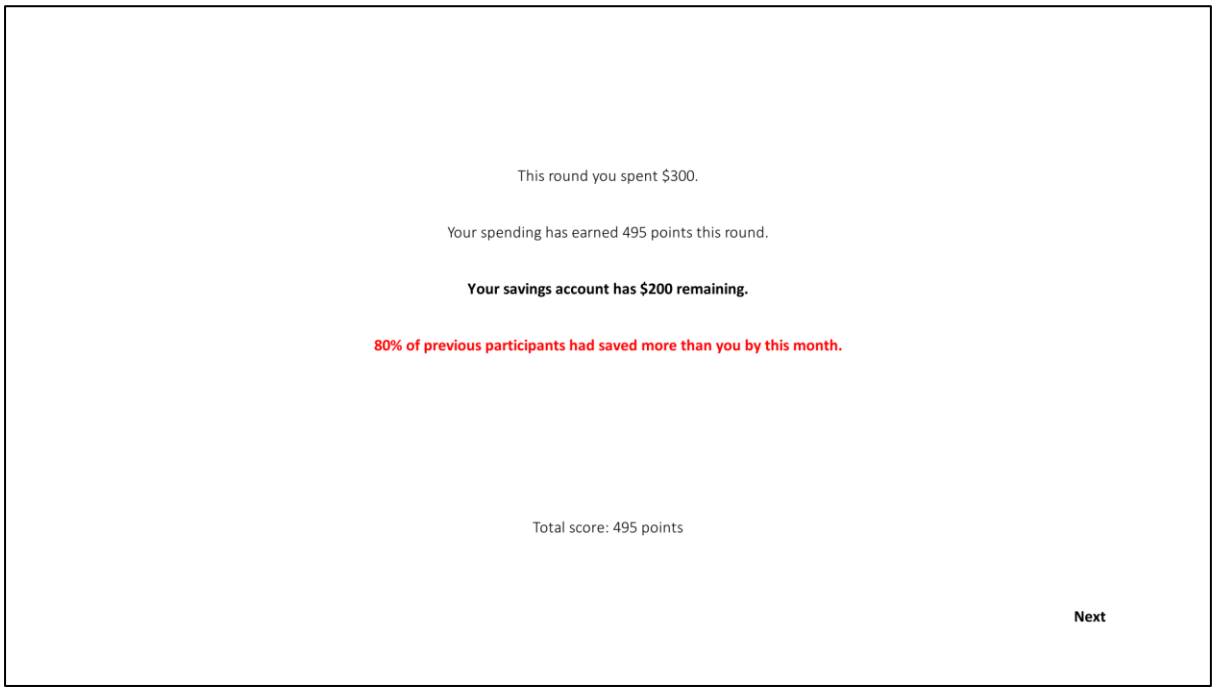
Practice Round Start

Decision Screen

Round Outcome (Control)



Round Outcome (Nudge-Unaware, Nudge-Aware)



Financial Emergency Occurrence

Account Balance: $200

Score: 495 points

FINANCIAL EMERGENCY!

Oh no! There was a severe storm and your house was damaged due to a flood.

Hopefully you have saved enough to cover the repair costs!

Next

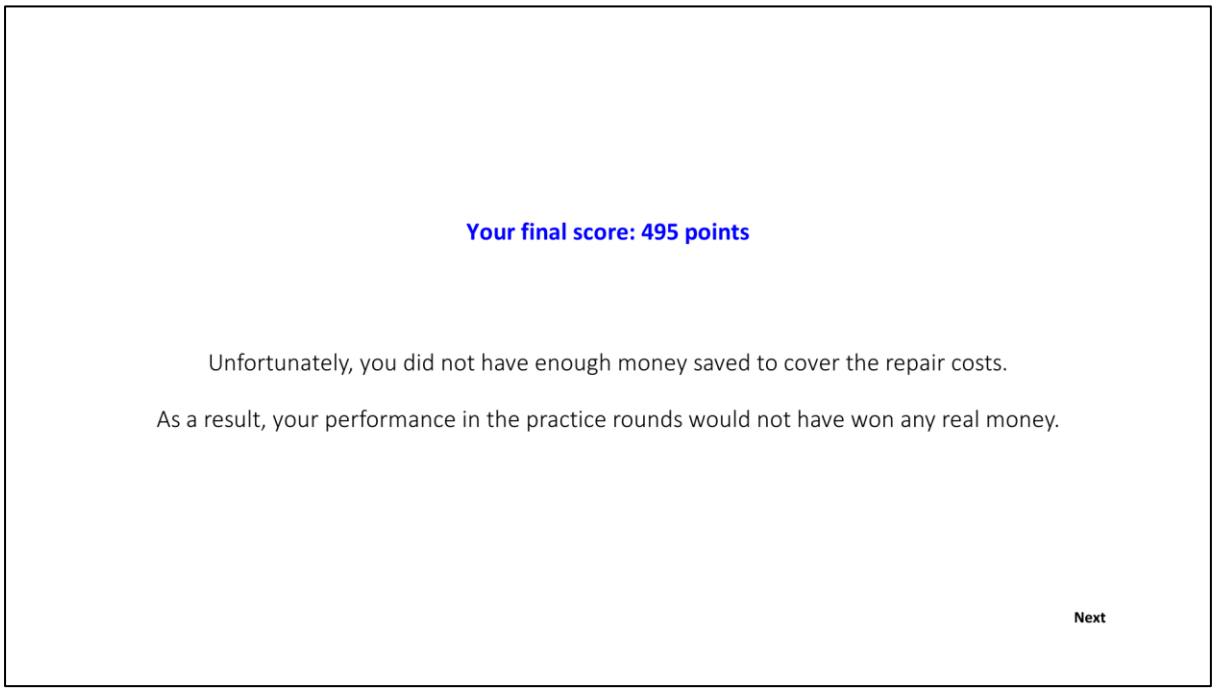
Financial Emergency Calculation

The repair bill comes to a total of $500.

Your account balance:	**$200**
Repair cost:	**$500**
Your remaining balance:	**- $300**

Next

Game Outcome



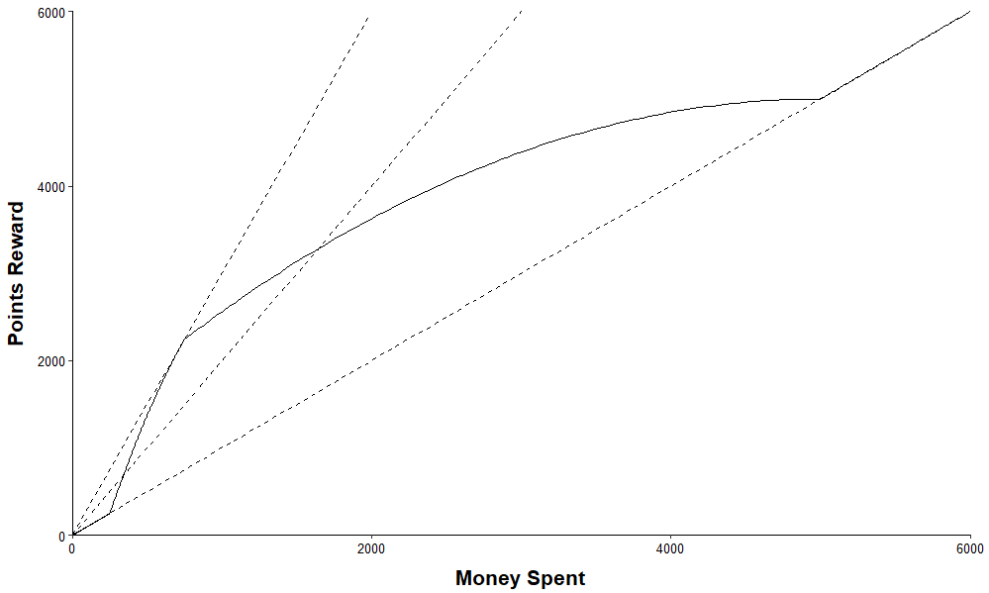
Appendix E

Points Conversion System

The number of points participants received was calculated based on the amount of money they spent within that round. The number of points awarded increased with the amount of money spent. The following conversion system was used:

Amount Spent (S, in dollars)	Points Conversion (P)
$0 \leq S \leq 250$	S
$250 < S \leq 750$	$-\frac{1}{500}(S^2 - 3000S + 562500)$
$750 \leq S < 5000$	$-\frac{1}{72250}(11S^2 - 110000S - 86250000)$
$S > 5000$	S

The graph below shows the conversion between money spent and points awarded. The solid line is a visual representation of the conversion system above. The three dashed lines represent 1:1, 2:1, and 3:1 conversion rates (from least steep to most steep). The maximum conversion rate of 3:1 was achieved when spending exactly $750.



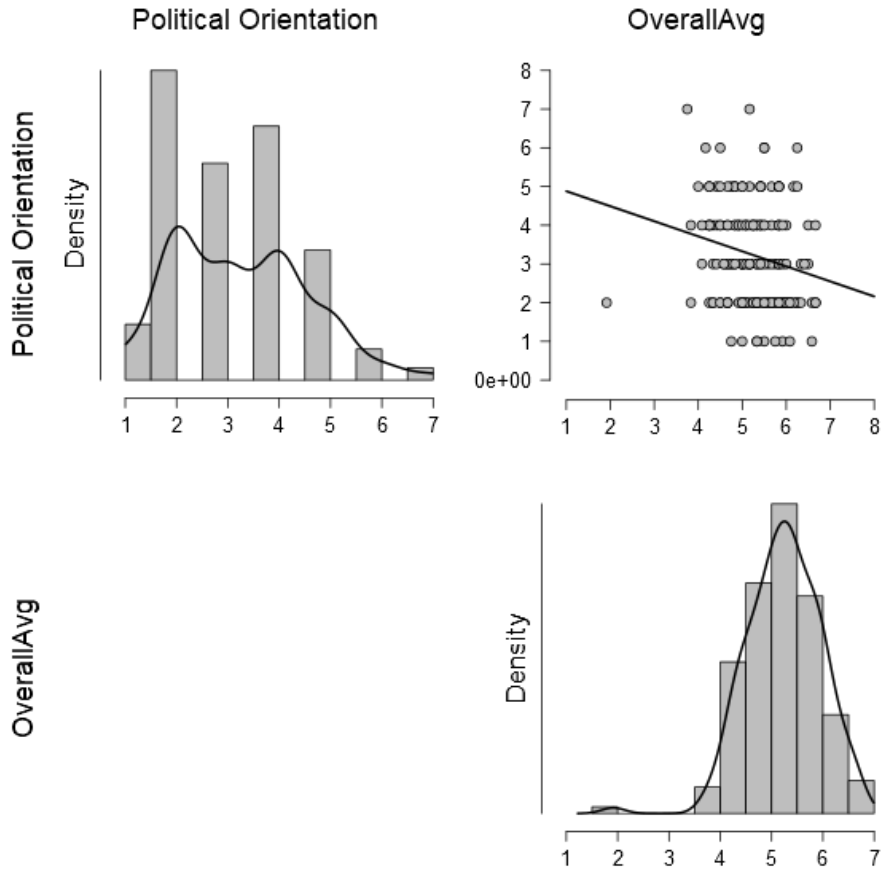
Appendix F

JASP Output for Experiment 1

Bayesian Pearson Correlations

		Political Orientation	OverallAvg
Political Orientation	Pearson's r	—	
	$BF_{1\ 0}$	—	
OverallAvg	Pearson's r	-0.211	—
	$BF_{1\ 0}$	3.682	—

Correlation Plot



Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Null model (incl. subject)	0.026	3.339e -98	1.235e -96	1.000	
Domain	0.026	1.154e -71	4.270e -70	3.457e +26	1.323
Nudge Type	0.026	3.083e -48	1.141e -46	9.234e +49	0.653
Domain + Nudge Type	0.026	2.509e -17	9.282e -16	7.513e +80	1.505
Domain + Nudge Type + Domain ✻ Nudge Type	0.026	0.044	1.711	1.324e +96	1.211
Condition	0.026	1.210e -98	4.477e -97	0.362	0.981
Domain + Condition	0.026	4.503e -72	1.666e -70	1.349e +26	1.471
Nudge Type + Condition	0.026	1.255e -48	4.643e -47	3.758e +49	0.920
Domain + Nudge Type + Condition	0.026	1.117e -17	4.132e -16	3.345e +80	1.493
Domain + Nudge Type + Domain ✻ Nudge Type + Condition	0.026	0.021	0.785	6.223e +95	1.906
Domain + Condition + Domain ✻ Condition	0.026	1.524e -74	5.638e -73	4.563e +23	1.420
Domain + Nudge Type + Condition + Domain ✻ Condition	0.026	5.026e -20	1.860e -18	1.505e +78	2.291
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition	0.026	9.935e -5	0.004	2.975e +93	1.931
Nudge Type + Condition + Nudge Type ✻ Condition	0.026	3.178e -48	1.176e -46	9.518e +49	4.088
Domain + Nudge Type + Condition + Nudge Type ✻ Condition	0.026	6.531e -17	2.416e -15	1.956e +81	1.786
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Nudge Type ✻ Condition	0.026	0.208	9.728	6.235e +96	2.247
Domain + Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition	0.026	2.794e -19	1.034e -17	8.367e +78	2.355
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition	0.026	0.001	0.039	3.152e +94	4.333
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition + Domain ✻ Nudge Type ✻ Condition	0.026	5.568e -5	0.002	1.668e +93	1.556
Political Orientation	0.026	9.131e -98	3.378e -96	2.735	1.489
Domain + Political Orientation	0.026	3.277e -71	1.213e -69	9.815e +26	2.005
Nudge Type + Political Orientation	0.026	9.199e -48	3.404e -46	2.755e +50	1.873
Domain + Nudge Type + Political Orientation	0.026	7.968e -17	2.948e -15	2.386e +81	1.914
Domain + Nudge Type + Domain ✻ Nudge Type + Political Orientation	0.026	0.146	6.302	4.359e +96	3.274
Condition + Political Orientation	0.026	2.113e -98	7.816e -97	0.633	2.807
Domain + Condition + Political Orientation	0.026	8.081e -72	2.990e -70	2.420e +26	1.888
Nudge Type + Condition + Political Orientation	0.026	2.420e -48	8.953e -47	7.246e +49	1.978
Domain + Nudge Type + Condition + Political Orientation	0.026	2.278e -17	8.430e -16	6.823e +80	4.502
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Political Orientation	0.026	0.043	1.657	1.284e +96	2.172
Domain + Condition + Domain ✻ Condition + Political Orientation	0.026	2.871e -74	1.062e -72	8.599e +23	2.826
Domain + Nudge Type + Condition + Domain ✻ Condition + Political Orientation	0.026	1.007e -19	3.725e -18	3.015e +78	4.702
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition + Political Orientation	0.026	2.028e -4	0.008	6.073e +93	4.513
Nudge Type + Condition + Nudge Type ✻ Condition + Political Orientation	0.026	5.637e -48	2.086e -46	1.688e +50	2.313
Domain + Nudge Type + Condition + Nudge Type ✻ Condition + Political Orientation	0.026	1.279e -16	4.732e -15	3.830e +81	4.286
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Nudge Type ✻ Condition + Political Orientation	0.026	0.535	42.546	1.602e +97	20.403
Domain + Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition + Political Orientation	0.026	5.984e -19	2.214e -17	1.792e +79	5.948

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition + Political Orientation	0.026	0.002	0.076	6.131e +94	3.761
Domain + Nudge Type + Domain ✻ Nudge Type + Condition + Domain ✻ Condition + Nudge Type ✻ Condition + Domain ✻ Nudge Type ✻ Condition + Political Orientation	0.026	1.208e -4	0.004	3.618e +93	4.419

Note. All models include subject.

Analysis of Effects

Effects	P(incl)	P(incl|data)	$BF_{Inclusion}$
Domain	0.263	3.319e -16	1.340e +31
Nudge Type	0.263	1.389e -16	2.439e +54
Condition	0.263	0.064	0.335
Political Orientation	0.500	0.726	2.645
Domain ✻ Nudge Type	0.263	1.000	3.003e +15
Domain ✻ Condition	0.263	0.003	0.004
Nudge Type ✻ Condition	0.263	0.746	11.669
Domain ✻ Nudge Type ✻ Condition	0.053	1.765e -4	0.057

Note. Compares models that contain the effect to equivalent models stripped of the effect. Higher-order interactions are

Appendix G

JASP Output for Experiment 2

Model Comparison

Models	P(M)	P(M|data)	BF M	BF 10	error %
Null model (incl. subject)	0.200	2.383e -88	9.531e -88	1.000	
Block	0.200	0.256	1.373	1.073e +87	0.385
Group	0.200	1.400e -88	5.599e -88	0.587	0.899
Block + Group	0.200	0.220	1.130	9.243e +86	1.126
Block + Group + Block ✻ Group	0.200	0.524	4.407	2.200e +87	1.585

Note. All models include subject.

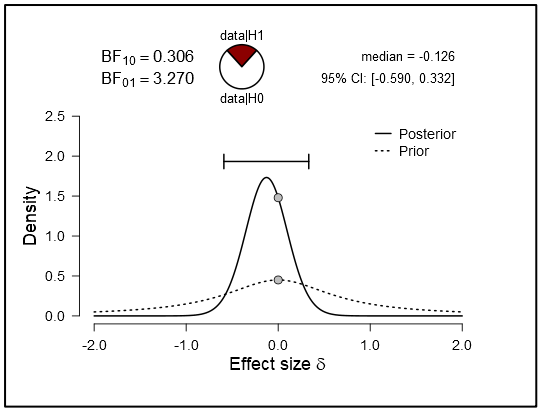
Analysis of Effects

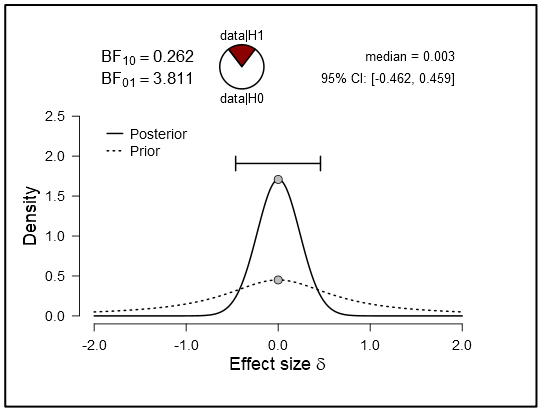
Effects	P(incl)	P(incl|data)	BF Inclusion
Block	0.600	1.000	∞
Group	0.600	0.744	1.942
Block ✻ Group	0.200	0.524	4.407

Bayesian Independent Samples T-Test

	BF1 0	error %
norm_rating1	0.306	0.003
norm_rating2	0.262	0.003

Inferential Plots





Bayesian Pearson Correlations

		savings_e30	norm_rating1	norm_rating2
savings_e30	Pearson's r	—		
	$BF_{1\ 0}$	—		
norm_rating1	Pearson's r	-0.096	—	
	$BF_{1\ 0}$	0.209	—	
norm_rating2	Pearson's r	0.001	0.205	—
	$BF_{1\ 0}$	0.161	0.536	—

Correlation Plot