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ARTICLE

The effect of transparency on the temporal spillover effect of default nudges

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Abstract

Previous studies show that the effects of (non-transparent) nudges can spill over to later similar decisions without nudges. In the current study, we aimed to determine whether such nudge temporal spillover effects are affected by making nudges transparent. The latter is recommended to (partly) mitigate ethical concerns surrounding the use of nudges. In two experiments, we nudged participants to complete a longer version of a survey. Participants were randomly assigned to either a control, a non-disclosed nudge (using a default to promote taking the longer survey) condition or a disclosed nudge (in which the use of the default nudge was explained) condition. In both Study 1 ($N = 1270$) and Study 2 ($N = 1258$) we observed a temporal spillover effect of the disclosed nudge, suggesting that transparency does not negatively affect the temporal spillover effect.

KEYWORDS

choice architecture, nudge, prosocial behaviour, temporal spillover, transparency

BACKGROUND

Initial evidence suggests that the effect of a nudge on a single decision can spill over to a subsequent similar decision under the same circumstances when the nudge is no longer present (Van Rookhuijzen et al., 2021). This reaffirms the notion that the use of nudge interventions is promising, especially when taking into account that nudges affect behaviour without forbidding any options or changing economic incentives (Thaler & Sunstein, 2008, p. 6). However, the use of nudges is not free of ethical scrutiny, with concerns being risen about autonomy and manipulation (Schmidt & Engelen, 2020). A proposed solution to (partly) mitigate these concerns, is to explain the use of the nudge to the nudgee, i.e. making the nudge transparent. The current paper tries to investigate the role of transparency in the temporal spillover effect of nudges.

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Spillover effects

After the publication of Thaler and Sunstein's book 'nudge' (2008), a rapid increase in interventions aimed at changing behaviour through contextual alterations followed. This is not surprising, considering that nudges can affect a large variety of behaviours, ranging from tax compliance (Antinyan & Asatryan, 2020) to food intake (Arno & Thomas, 2016), without forbidding any options and thus maintaining the freedom to choose. Unfortunately, most nudging studies only look at the effect of a nudge on a single choice, which, for some behaviours, only is a proverbial drop in the ocean. For example, one single healthy food choice does not have much impact on overall healthy eating patterns or weight. In such cases, nudges need to be able to influence more than one choice to have a meaningful impact.

Although most studies examining the effect of nudges focus on single choices, there is growing interest in the question of whether the effects of nudges can spill over to subsequent behaviour after the nudge has been removed. General spillover effects, in which behaviour influences subsequent behaviour, are well known and documented in the broader psychological and decision-making literature (Dolan & Galizzi, 2015). However, empirical evidence examining the spillover effects of behaviour following nudges specifically is scarce. The limited evidence suggests that spillover effects following nudges are not likely (Donkers et al., 2020; Ghesla et al., 2019; Kuhn et al., 2021; Zimmermann & Renaud, 2021). However, all these studies investigated the effect of initially nudged choices on similar, but different choices, which we will call *behavioural* spillover effects. For example, Kuhn et al. (2021) successfully made use of a default nudge to promote organically produced products in a hypothetical online shop scenario. However, they did not find any spillover effects, which may have been caused by presenting participants with choices between products that were different from initially nudged.

In Van Rookhuijzen et al. (2021), however, initial evidence was found for the ability of a nudge to influence subsequent similar behaviour under the same circumstances once the nudge is removed, labelled the *temporal* spillover effect. In that study, participants had to choose between completing a normal version or a longer version of a bogus lifestyle survey. Participants were randomly assigned to a no-nudge or a default nudge condition in which the choice for the longer version was preselected. A day later, all participants were again asked to choose between taking the normal or the longer survey. However, this time the nudge was removed in the nudge group. Results showed that on both days, participants who had been nudged on the first day were more likely to choose the longer version. This suggests that nudges can have effects on similar subsequent decisions, even after the nudge is removed.

Importantly, results of the study of Van Rookhuijzen et al. (2021) showed that the temporal spillover effect may partly be attributed to a changed attitude towards the nudged behaviour. This means that nudging participants into taking the longer survey changed their attitude towards taking longer surveys, which, in turn, affected their behaviour when the nudge was removed. The theoretical basis for this can be found in Bem's Self Perception Theory (Bem, 1972) and is related to the concept of self-herding by Ariely and Norton (2008). Here, attitudes are theorized to be inferred from behaviour. That is, when people are confronted with their behaviour, and especially when one cannot find an external source to explain his or her own behaviour, they are assumed to infer attitudes by looking at behaviour just like an outside observer. This rationale also aligns with the observation that people often do not recognize that their behaviour was influenced by a nudge (e.g. Dhingra et al., 2012; Van Gestel et al., 2018), making it prone to (mis)attribution to attitudes.

Aside from a changed attitude, the desire to act consistently may also have been responsible for the observed temporal spillover effect in the study of Van Rookhuijzen et al. (2021) (Dolan & Galizzi, 2015; Falk & Zimmermann, 2013). One might simply behave as one previously behaved without any mediating cognitions. According to Andrade and Ariely (2009), such direct (or as Andrade and Ariely call them, mechanical) consistency effects are especially likely when two contexts are highly similar. This may explain why temporal, but not behavioural, spillovers following nudges have been found. Taken together, there is some initial evidence suggesting that nudges may have the potential of a small temporal spillover effect. If it is indeed the case that nudges have temporal spillover effects after being removed, this implies that even for those behaviours that need to be affected multiple times before any impact becomes noticeable, such

as healthy food choices, or contexts in which nudges cannot be sustained over time and may be removed (e.g. Van Rookhuijzen & De Vet, 2021), nudges can be promising intervention tools.

Nudge transparency

Unfortunately, however, despite promising results, the use of nudges is not uncontroversial. Concerns have been risen about nudges curtailing individuals' autonomy, being manipulative and being vulnerable to being abused in line with the goals of the nudger instead of the nudgee (for further discussion, see Schmidt & Engelen, 2020). A proposed solution to mitigate these concerns is by making nudges transparent, meaning that the intention of the nudge, and/or the way the choice architecture is designed to manipulate a choice are disclosed to the nudgee. The reasoning behind this is that such nudge transparency would prompt people to reflect on the choice they are making and to consider whether the nudge promoted a decision that is best for themselves (Hansen & Jespersen, 2013). For a long time, however, it was thought that nudging 'works best in the dark' and that transparency would even hinder nudge effectiveness through compensatory reactance (Bovens, 2009). However, empirical evidence suggests that this concern is not valid as transparency manipulations do not hamper, or even increase, the effectiveness of nudges (Bang et al., 2020; Bruns et al., 2018; Cheung et al., 2019; Kroese et al., 2016; Loewenstein et al., 2015; Michaelsen et al., 2020; Michaelsen, Johansson, et al., 2021; Paunov et al., 2019a, 2019b; Steffel et al., 2016). As making nudges transparent does not negatively impact effectiveness, and mitigates some of the ethical concerns surrounding the use of nudging (but see Wachner et al., 2020 for a study showing that ethical concerns related to nudging may not be supported by the evidence), it would seem that there are no reasons to avoid their use.

However, in view of the recent finding on the potential temporal spillover effect of nudges, a novel concern about using transparency manipulations may be that they negatively influence the temporal spillover potential of nudges. That is, it could be argued that processes responsible for the temporal spillover effect could become interrupted when the nudge is made transparent. The previously discussed attitudinal change following the nudge that (partly) explained the temporal spillover effect Van Rookhuijzen et al. (2021) may be dependent on the absence of external attributions in order to promote internal attributions to attitudes. This effect could be reduced when the nudge is made transparent. By making a nudge transparent, a clear external source for one's behaviour can be found in the nudge, which could potentially make internal attribution less likely. If this were the case, then the mechanism for the temporal spillover effect may become interrupted, resulting in an absent or less pronounced temporal spillover effect. However, if the temporal spillover effect is mainly driven by a need to act consistently, it should not be affected by transparency. Such a need is arguably not altered by whether the source of the initial behaviour is internally or externally attributed.

To our knowledge, there have only been two papers (with a total of three studies) examining the role of transparency in the spillover effect (Loewenstein et al., 2015; Michaelsen, Nyström, et al., 2021). Loewenstein et al. (2015) report on a study in which both non-disclosed and disclosed defaults were used in a hypothetical scenario to nudge participants into making decisions on specific medical life-prolonging interventions. After participants in all conditions were made aware of the presence of the nudge, participants had to make the same decisions again without default. Results showed that both the non-disclosed and disclosed defaults affected both the first and second decisions, indicating that transparency did not affect the results. Similarly, in Michaelsen, Johansson, et al. (2021, study 1), participants were assigned to a non-disclosed nudge or disclosed nudge condition in which a default was used to nudge participants' decisions on whether or not to complete an additional survey without extra payment. Here, after having made their decision, the use of the nudge was disclosed to all participants after their first decision, after which they had to indicate whether they wanted to change their earlier decision. Results showed that participants in the disclosed nudge condition were more likely to complete the additional survey and that in both conditions participants generally stuck to their first decision. In contrast, in study 2 reported by Michaelsen, Nyström, et al. (2021), no support was found for any spillover effects. Here, both

non-disclosed and disclosed defaults were again used to nudge participants' decisions about whether or not to complete an additional survey without extra payment. Thereafter, participants were asked whether they would want to sign-up for a future survey for which they would also not get any extra payment (which was never administered). Although both the non-disclosed and disclosed defaults affected the first decision, no evidence was found for a spillover effect in both conditions.

Still, it is hard to draw any conclusions on the potential negative effects of transparency on the temporal spillover effect from these studies. Both the studies of Loewenstein et al. (2015) and Michaelsen, Nyström, et al. (2021) only include conditions where default nudges are administered in both experimental and control groups, limiting the extent to which conclusions can be drawn about the (spillover) effects of (transparent) nudges in contrast to having to make an active initial decision. Moreover, in Loewenstein et al. (2015) and Michaelsen, Johansson, et al. (2021, study 1), participants in all conditions were told about the use and purpose of the default nudge before they had to make the second decision, preventing this design to draw any conclusions about the effect of transparency on the spillover effect. Furthermore, Loewenstein et al. (2015) used hypothetical choice tasks. Although participants' first choice did have real consequences in the study of Michaelsen, Nyström, et al. (2021, study 2), in the second choice they were asked to make a decision that would only affect them in the future, when they still could easily opt out of their initial decision (which was never actually measured), limiting the extent to which the conclusions can be generalized to decisions bearing real-life consequences.

Current study

In the current study, we build upon previous research investigating the effect of nudge transparency on the temporal spillover effect by conducting two experiments with the inclusion of control groups and decisions with real-life consequences for participants. In both experiments, we made use of a nudge manipulation that has been previously found effective (Paunov et al., 2020; Wachner et al., 2020). Participants were asked to complete a longer survey without receiving extra reimbursement on two consecutive days. On the first day, participants (1) had to either actively choose the normal or longer survey (control condition), (2) were nudged into taking the longer version by preselecting this option (non-disclosed nudge condition) or (3) were nudged into taking the longer version by preselecting this option + were given a transparency message explaining the goal of the preselection (disclosed nudge condition). On day 2, all participants had to actively choose a version of the survey without a nudge present. We were interested in the percentage of participants in the different conditions choosing the longer survey on the second day.

STUDY 1

In Study 1¹ (preregistered at AsPredicted: #48249), we aimed to assess whether nudge transparency would influence the earlier found temporal spillover effect of a default nudge. Temporal spillover effects were assessed in both a non-disclosed and disclosed nudge condition relative to a control condition. We expected that on day 1, participants in the non-disclosed and disclosed nudge condition would choose the longer version of the survey more often than participants in the control condition. Moreover, we expected that this effect would spill over to the survey choice on day 2 in the non-disclosed nudge condition. We had no a priori expectations about whether the effect of the nudge in the disclosed nudge

¹For the sake of transparency and to avoid file-drawer problems in potential future meta-analyses, we find it important to mention that Study 1 was preceded by an earlier study, which was highly similar to Studies 1 and 2, but with some minor methodological differences (preregistered at AsPredicted: #44203). In this earlier study, we did not find any spillover effects of the nudge in both the non-disclosed and the disclosed nudge conditions. As this prohibited us from investigating the potential moderating influence of transparency on the spillover effect, this study was not included in the main body of this paper but can be found in Appendix S1.

condition would also spill over to the second day. Study 1 was approved by the Social Sciences Ethics Committee of Wageningen UR.

Materials and methods

Participants

The software G*Power 3.1.9.2. was used to compute the required sample size. To detect a small effect ($w = 0.1$, based on an earlier study we conducted using the same manipulation Van Rookhuijzen et al. (2021)) of the type of nudge on the decision to choose the normal or longer survey on the first and second day with a power of 0.90 a sample size of 1266 was recommended. We recruited 10% ($N = 127$) extra participants on the first day, to account for possible drop-out.

The online platform Prolific Academic was used to recruit participants. Inclusion criteria were (1) being aged 18 or older, (2) speaker of the English language, (3) having two or more previous submissions on Prolific Academic, (4) a 95% or more approval rate on Prolific Academic and (5) having indicated to be willing to participate in research in which one will initially be unaware of its purpose. Moreover, we encouraged participants to solely participate on a desktop computer to keep the circumstances of both choices as similar as possible. Participants were rewarded with £2.00 for their participation, which covers the minimum required amount of compensation set by Prolific for completing two 12-min long surveys. In other words, all participants were thus compensated at a higher than usual payment.

The survey on day 1 was completed by 1392 participants, of whom 1270 participants also completed the survey on day 2. Participants were randomly assigned to the control condition ($N = 413$, 32.5%), the non-disclosed nudge condition ($N = 425$, 33.5%) or the disclosed nudge condition ($N = 432$, 34.0%). The average age of the participants was 30.00 ($SD = 10.91$) years, with 54.2% males, 45.4% females and 0.5% indicating 'other'. Most participants (38.7%) indicated a high school diploma or a bachelor's degree (37.7%) as their highest-achieved education. Participants mostly indicated the UK (32.7%) or Poland (11.7%) as their nationality, although as many as 59 different nationalities were mentioned among participants.

Design

The experiment used a 3 (between-subjects factor = Condition: control vs. non-transparent nudge vs. transparent nudge) \times 2 (within-subject factor = Days 1 vs. 2) mixed design with survey choice (normal/longer) as a dependent variable.

Procedure

Participants filled in a survey on two consecutive days. On day 1, participants started by giving informed consent for their participation, after which some demographics were asked. After that, participants were randomly assigned to one of the three conditions in which they were asked to indicate whether they were willing to fill in a longer version of the survey without receiving additional payment. Our manipulation consisted of different ways in which this question was presented in different conditions (see *Manipulation*). Next, participants had to fill in a bogus survey.

On the second day, participants were again asked about some demographics and they were again presented with a choice between a normal and a longer version of a survey and had to indicate which version of the survey they wanted to fill in. However, this question was now similarly presented in all conditions as in none of the conditions a nudge was present. After that, participants again had to fill in

a bogus survey. The survey ended by thanking participants for their participation and by debriefing them about the real purpose of the study, after which they could leave any remaining comments.²

Measures and materials

Demographics

At the beginning of the surveys on both days, participants were asked to provide demographics, including age, gender, nationality and their highest level of education.

Manipulation

We used a similar paradigm as Wachner et al. (2020). On the first day, all participants were asked whether they wanted to complete a normal, 7-min version of the survey, or whether they would be willing to complete a longer, 12-min version of the survey. Participants were informed that there was no additional reimbursement for the longer version of the survey, but that it would help researchers with improving future surveys. Participants in the control condition had to actively choose between the normal and longer survey. In the non-disclosed nudge condition, taking the longer survey was promoted by preselecting it and making it bold. The disclosed nudge condition was similar to the non-disclosed nudge condition, with the addition of the text: 'Please note the preselected default option. It is meant to encourage people to choose the longer version of this questionnaire. People are usually unaware of its influence'. (identical to the *purpose + unawareness* condition in Wachner et al. (2020)). On the second day, all participants were again asked whether they wanted to complete the normal or longer survey without receiving extra reimbursement. However, in all three conditions, participants had to actively choose which version they wanted to complete without the use of a nudge and transparency message.

Bogus surveys

After participants indicated which version they wanted to complete, a bogus survey which was said to be about 'lifestyle, personality and eating behaviour' had to be completed to divert participants from the real aim of the study and to have them actually fill in a normal or longer version (the longer version was estimated to take five more minutes than the normal version) on both days. Items were made up or taken from existing questionnaires.

Data preparation

As preregistered, we only included participants in the analyses when they completed the surveys on both days. They were contacted when answers on demographic variables were not identical for both days (e.g. two different ages). 'Other' entries for education were transformed into one of the listed options. Cells with less than five observations were set to missing when chi-square tests were conducted.

Results

Confirmatory analyses

Randomization check

ANOVA and chi-square tests were conducted to check for unintended differences in demographics across the experimental conditions. Results did not indicate that statistically significant differences were present between the conditions regarding age ($F(2) = .754, p = .471$), gender ($\chi^2(2) = .761, p = .683$), nationality

²After completing the survey on day 2, participants were asked about the extent to which they thought the preselection influenced their decision of choosing the normal or longer version of the survey. However, since this variable was only measured for exploratory purposes, results will not be presented here but can be found in Appendix S2.

($\chi^2(22) = 20.340, p = .562$) and level of education ($\chi^2(8) = 2.871, p = .942$), consistent with successful randomization.

Manipulation

Figure 1 displays the percentages of participants opting for either version of the survey on days 1 and 2 in the control, non-disclosed and disclosed nudge conditions. On day 1, the longer survey was chosen by 40.7% of the participants in the control condition, 44.7% of the participants in the non-disclosed nudge condition and 56.9% of the participants in the disclosed nudge condition. To test the effect of the nudge and disclosed nudge on day 1, a chi-square test with condition (control/non-disclosed nudge/disclosed nudge) as the independent variable and survey choice day 1 (normal/longer) as the dependent variable was conducted, which was significant ($\chi^2(2) = 24.486, p < .001, \varphi = .139$). Post hoc chi-square tests between the different conditions were then conducted. These showed no significant difference between the control and non-disclosed nudge conditions on survey choice day 1 ($\chi^2(1) = 1.389, p = .239$). However, significant differences were found between the control and disclosed nudge conditions ($\chi^2(1) = 22.356, p < .001, \varphi = .163$) and the non-disclosed and disclosed nudge conditions ($\chi^2(1) = 12.839, p < .001, \varphi = .122$). This means that participants in the disclosed nudge condition were more likely to choose the longer version on day 1 than in the control and non-disclosed conditions. However, no significant differences were found between the control and non-disclosed nudge conditions.

Temporal spillover effect

On day 2, the longer survey was chosen by 35.4% of the participants in the control condition, 38.4% of the participants in the non-disclosed nudge condition and 46.5% of the participants in the disclosed nudge condition. To test whether the different conditions differed on survey choice day 2, a chi-square test with condition (control/non-disclosed nudge/disclosed nudge) as the independent variable and survey choice day 2 (normal/longer) as a dependent variable was conducted, which was significant ($\chi^2(2) = 11.841, p = .003, \varphi = .097$). Post hoc chi-square tests between the different conditions were then conducted. These showed no significant difference between the control and non-disclosed nudge conditions on survey choice day 2 ($\chi^2(1) = .811, p = .368$). However, significant differences were found between the control and disclosed nudge conditions ($\chi^2(1) = 10.898, p = .001, \varphi = .114$) and the non-disclosed and disclosed nudge conditions ($\chi^2(1) = 5.860, p = .015, \varphi = .083$). This means that participants in the disclosed nudge condition more often chose the longer version on day 2 than participants in the control and non-disclosed nudge conditions, indicating that the effect of the transparent nudge that was observed on day 1 spilled over to day 2.

Mediation effect of survey choice day 1

To test for an indirect effect of condition on survey choice day 2 through survey choice day 1, three mediation analyses were conducted (see Iacobucci, 2012). The mediation analysis with the control and non-disclosed nudge conditions yielded a Z-mediation value of 1.17, which was not significant ($p = .242$). The mediation analysis with the control and disclosed nudge conditions resulted in a significant

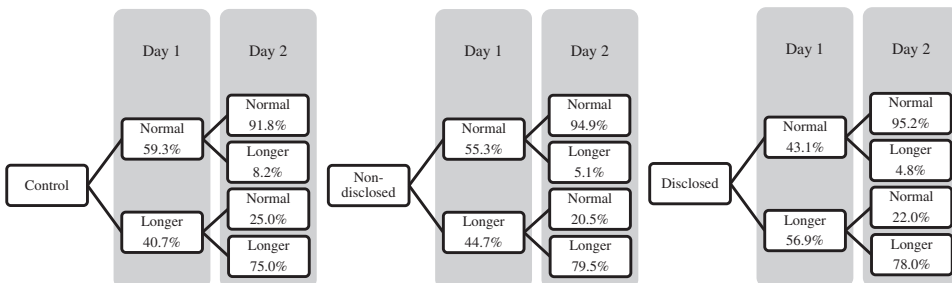


FIGURE 1 Percentages of participants opting for the normal and longer versions of the survey on days 1 and 2 in Study 1.

Z-mediation value of 4.51 ($p < .001$). Lastly, the mediation analysis with the non-disclosed and disclosed nudge conditions also resulted in a significant Z-mediation value of 3.48 ($p < .001$). This means that survey choice day 1 mediated the effect of condition on survey choice day 2 comparing the control and non-disclosed conditions with the disclosed nudge condition, but not comparing the control condition with the non-disclosed condition.

Discussion

Results from Study 1 show that the nudge manipulation was only able to affect the decision to choose the longer survey on the first and second day when its aim was disclosed to participants. Although in the study of Van Rookhuijzen et al. (2021) the nudge manipulation was also successful when the aim of the nudge was not disclosed, the results of Study 1 do suggest that nudge transparency does not (negatively) affect the temporal spillover effect of nudges.

STUDY 2

The results of Study 1 suggest that transparency does not influence the temporal spillover effect of nudges. However, because the nudge manipulation (and the temporal spillover effect) in the non-disclosed nudge condition was not significant, no conclusions can be drawn about the spillover effect of the transparent nudge relative to the spillover effect of the non-transparent nudge. Therefore, the methods of Study 1 were replicated in Study 2 (preregistered at AsPredicted: #51288) to be able to draw more definitive conclusions. Study 2 was approved by the Social Sciences Ethics Committee of Wageningen UR.

Materials and methods

Participants

Sample size calculation, inclusion criteria and participant recruitment were identical to Study 1. The survey on day 1 was completed by 1389 participants, of whom 1258 participants also completed the survey on day 2. Participants were randomly assigned to the control condition ($N = 418$, 33.2%) the non-disclosed nudge condition ($N = 422$, 33.5%) or the disclosed nudge condition ($N = 418$, 33.2%). The average age of the participants was 27.30 ($SD = 9.58$) years, with 61.4% males, 37.8% females and 0.8% indicating 'other'. Most participants (46.7%) indicated a high school diploma or a bachelor's degree (30.8%) as their highest-achieved education. Participants mostly indicated Poland (26.9%) or the UK (21.1%) as their nationality, although as many as 61 different nationalities were mentioned among participants.

Design, procedure and measures and materials

The design, used procedure, measures, and materials and data preparation were identical to Study 1.

Results

Confirmatory analyses

Randomisation check

ANOVA and chi-square tests were conducted to check for unintended differences in demographics across the experimental conditions. Results did not indicate that statistically significant differences were

present between the conditions regarding age ($F(2) = 407.064, p = .109$), gender ($\chi^2(2) = 1.193, p = .551$), nationality ($\chi^2(18) = 13.523, p = .760$) and level of education ($\chi^2(8) = 6.136, p = .632$), consistent with successful randomisation.

Manipulation

Figure 2 displays the percentages of participants opting for the normal and longer versions of the survey on days 1 and 2 in the control, non-disclosed and disclosed nudge conditions. On day 1, the longer survey was chosen by 36.8% of the participants in the control condition, 49.1% of the participants in the non-disclosed condition and 55.0% of the participants in the disclosed nudge condition. To test whether both nudges had the intended effect on a choice on day 1, a chi-square test with condition (control/non-disclosed nudge/disclosed nudge) as the independent variable and survey choice day 1 (normal/longer) as the dependent variable was conducted, which was significant ($\chi^2(2) = 28.833, p < .001, \varphi = .151$). Post hoc chi-square tests between the different conditions were then conducted. These showed significant differences between the control and non-disclosed nudge conditions ($\chi^2(1) = 12.775, p < .001, \varphi = .123$) and between the control and disclosed nudge conditions ($\chi^2(1) = 27.820, p < .001, \varphi = .182$), but not between the non-disclosed and disclosed nudge conditions ($\chi^2(1) = 3.000, p = .083$). This means that the nudge indeed had the intended effect, both with and without a transparency message.

Temporal spillover effect

On day 2, the longer survey was chosen by 33.5% of the participants in the control condition, 40.5% of the participants in the disclosed nudge condition non-disclosed nudge condition and 47.8% of the participants in the disclosed nudge condition. To test whether the different conditions differed on survey choice day 2, a chi-square test with condition (control/non-disclosed nudge/disclosed nudge) as the independent variable and survey choice day 2 (normal/longer) as the dependent variable was conducted, which was significant ($\chi^2(2) = 17.856, p < .001, \varphi = .119$). These showed significant differences between the control and non-disclosed nudge conditions ($\chi^2(1) = 4.449, p = .035, \varphi = .073$) and between the control and disclosed nudge conditions ($\chi^2(1) = 17.846, p < .001, \varphi = .146$). Moreover, a significant difference was found between the non-disclosed and disclosed nudge conditions ($\chi^2(1) = 4.570, p = .033, \varphi = .074$). This means that the effect of the nudge, both with and without transparency message spilled over to day 2.

Mediation effect of survey choice day 1

To test for an indirect effect of condition on survey choice day 2 through survey choice day 1, three mediation analyses were conducted (see Iacobucci, 2012). The mediation analysis with the control and non-disclosed nudge conditions resulted in a significant Z-mediation value of 10.47 ($p < .001$), the mediation analysis with the control and disclosed nudge conditions resulted in a significant Z-mediation value of 5.03 ($p < .001$). However, the mediation analysis with the non-disclosed and disclosed nudge conditions was not significant ($Z\text{-mediation} = 1.73, p = .084$). This means that the nudge (whether non-transparent or transparent) influenced survey choice on day 1, which, in turn, influenced survey choice day 2. This

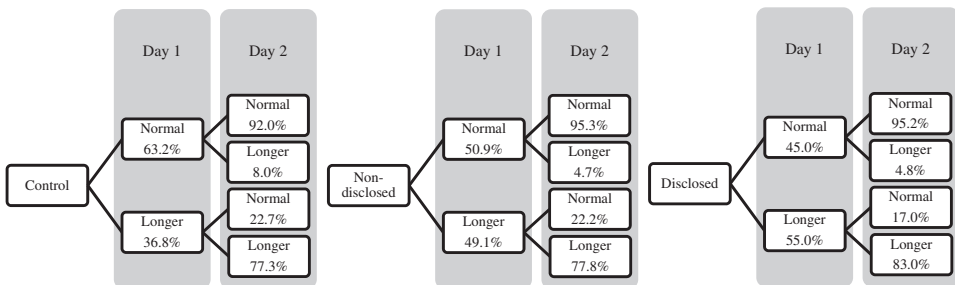


FIGURE 2 Percentages of participants opting for the normal and longer versions of the survey on days 1 and 2 in Study 2

mediation effect was not found when comparing the non-disclosed nudge condition with the disclosed nudge condition, which is most likely the result of the non-significant difference between these conditions on survey choice day 1.

Discussion

Results from Study 2 demonstrate that the nudge manipulation was able to influence the decision to choose the longer survey in both the non-disclosed and disclosed nudge conditions. This effect spilled over to the next day in both conditions, with an even higher effect in the disclosed nudge condition than in the non-disclosed nudge condition. These results support our conclusion from Study 1: There is no indication that transparency would (negatively) affect the temporal spillover effect. In contrast, it may even aid the temporal spillover effect.³

GENERAL DISCUSSION

In this study, we investigated the effect of making a default nudge transparent on its potential to spill over to a similar later choice. To this end, we conducted two experiments in which we assessed whether the effect of a transparent default nudge promoting prosocial behaviour also affected behaviour on the following day after the nudge had been removed. Taken together, we could not find any evidence indicating that making nudges transparent negatively affects the temporal spillover effect. In fact, the results of our studies even show that transparency may aid in increasing initial nudge effectiveness as well as temporal spillover effectiveness.

As discussed in the introduction, we theorized that the processes responsible for nudges' temporal spillover effects may be reduced by making them transparent. More specifically, we argued that the mis(attribution) of behaviour to positive internal states as a mechanism (partly) responsible for the temporal spillover effect, may be reduced or even absent when nudges are made transparent, revealing to participants that their behaviour may have been influenced by factors other than their own beliefs and cognitions. However, since we observed a temporal spillover with both non-disclosed and disclosed nudges, our results do not support this line of reasoning. It seems then, that consistency effects play an important role in explaining the spillover effect, whether or not people are made aware of the nudge. Regardless of the source of what was driving the behaviour, people have a tendency to be consistent and their behaviours. Alternatively, it may have been possible that despite our transparency manipulation, participants underestimated the effect the nudge had on their behaviour (see, e.g. Van Gestel et al., 2018).

In any case, whatever the underlying mechanism(s) responsible for the temporal spillover of non-transparent and transparent nudges may be, results of our mediation analyses underline the importance of a focus on the initial behaviour of people, whether or not this was influenced by a nudge since these first choices will act as an anchor for future behaviour. To change behaviour, it seems that it is of less importance *how* the behaviour is initially changed because once it is changed, the behaviour serves as input for later decisions. However, it is also important to note that the spillover effect of the nudge was not as strong as its initial effect. Clearly, future research is required to assess whether and to what extent the spillover effect persists over time. Interestingly, the effects of the disclosed nudge were more pronounced than that of the non-disclosed nudge. Although it was clearly communicated to participants that they would not receive any extra payment, they may have felt an implicit demand to comply with the request to complete the longer survey. This demand may have been even more pronounced in the disclosed nudge condition, where participants were again told that it was encouraged to complete the longer survey. This could have led to increased compliance on the first day in the disclosed nudge

³A pooled analysis that can be found in Appendix S3 using the individual data from Study 1, Study 2 and the earlier Study that is mentioned in footnote 1 also confirms these findings.

condition and subsequently on the second day. More research is needed to investigate the role of experienced demand in the (spillover) effect of transparent nudges.

Limitations and limitations for future research

Although the current study supports the practice of disclosing the intention and the manner in which behaviour change is pursued when nudges are used to affect behaviour, there are still some limitations that warrant further investigation. First of all, effect sizes of the initial nudge effect as well as of the temporal spillover effect in both the transparent and non-transparent conditions were small. This may be partly due to the specific context and the behaviour that was nudged. Future research should be conducted investigating whether more effective nudges also lead to bigger temporal spillover effects and whether this holds true for both non-transparent and transparent nudges.

Secondly, in both studies, we only used one type of nudge on one type of behaviour once, with 1 day in between measurements under highly controlled circumstances. These results cannot readily be generalized to other types of nudges and (real-life) situations. For example, in the control condition, participants had to actively choose a survey version, while the default may have led to more automatic decision-making. Therefore, different processes may have been responsible for the initial and subsequent choice for the different conditions. Other types of nudges may still require more active decision-making, which may result in different (spillover) effects. Therefore, more research is needed to address the extent, and under which circumstances, to which transparent nudges can be used to influence behavioural patterns in real-life situations.

CONCLUSION

Nudge transparency is often opted as a solution for many of the ethical concerns surrounding the use of nudges to affect behaviour. The current study shows that transparent nudges might even be more effective than non-transparent nudges and that this effect continues once the nudge, and its transparency message, are removed, countering Bovens' (2009) assumption that nudges 'work best in the dark'. Although transparent nudges may not be completely void of all ethical scrutiny, this study shows that it does not harm immediate nudge effectiveness or temporal spillover effects. This suggests that more attention should be given to nudging transparency in policy-making. However, research on the effectiveness, processes and boundary conditions of transparent nudges is in its infancy. Future research should unravel whether this advice holds for all nudges in all circumstances.

AUTHOR CONTRIBUTIONS

Merije van Rookhuijzen: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; visualization; writing – original draft. **Emely de Vet:** Conceptualization; funding acquisition; methodology; supervision; writing – review and editing. **Marieke A. Adriaanse:** Conceptualization; funding acquisition; methodology; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

None to declare.

OPEN RESEARCH BADGES

This article has earned a Preregistered Research Designs badge for having a preregistered research design, available at <https://aspredicted.org/rc75z.pdf>; <https://aspredicted.org/cq987.pdf>.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study will, after acceptance, be published in an online public repository. Both studies were preregistered at AsPredicted (#48249 and #51288 respectively).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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