



Discrete Choice Experiments on The Acceptability of Monetary-Based Health Treatments: A Replication and Extension to Deposit Contracts

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Abstract

Although incentive-based treatments can promote a range of health-related outcomes, including smoking cessation and weight loss, researchers have found that they have poor acceptability under some conditions. The present studies add to the literature by examining the current acceptability of incentive-based treatments using discrete choice experiments in which low acceptability was previously demonstrated. In Study 1, we assessed the acceptability of financial and grocery voucher incentives compared to standard treatments for smoking cessation and weight loss ($n = 51$). In Study 2, we assessed the acceptability of deposit contracts and financial incentives versus standard treatments ($n = 50$). Acceptability was measured as the proportion of participants who chose incentive-based treatments over standard treatments, evaluated across a range of effectiveness levels (10–40%). In both studies, financial incentives and standard treatments were equivalently acceptable when stated effectiveness was equal. Deposit contract acceptability was also equivalent to financial incentives and standard treatments at equal effectiveness levels. Last, the acceptability of all incentives increased as stated effectiveness increased. Our findings correspond with some recent evaluations indicating that incentive-based treatments may be more acceptable than previously shown. Future work should explore methods to increase their adoption across diverse stakeholders and settings.

Keywords Smoking cessation · Weight loss · Deposit contracts · Financial incentives · Contingency management

Monetary-based treatments, founded upon the scientific principles of behavior analysis and behavioral economics, involve delivering money to a participant contingent on one or more specified outcomes (Petry, 2011). There are two general types of monetary-based treatments: financial incentives awarded to participants from external sources (e.g., researchers, government agencies, healthcare practitioners) and deposit contracts, in which participants deposit and earn back their own money. Financial incentives and deposits can also be combined within a single treatment package, such as when deposits are matched by an outside sponsor (e.g., Donlin Washington, McMullen, & Devoto, 2016).

Decades of research have shown that both types of monetary-based treatments can be effective for promoting weight loss and smoking cessation (see Kurti et al., 2016; Sykes-Muskett, Prestwich, Lawton, & Armitage, 2015 for reviews). For example, researchers have found that financial incentives, at even modest amounts, can lead to significant weight loss for overweight and/or obese individuals when delivered contingent on weight loss (e.g., Finkelstein, Linnan, Tate, & Birken, 2007; Volpp et al., 2008). Dallery and colleagues (Dallery & Glenn, 2005; Dallery, Raiff, & Grabinski, 2013) have also demonstrated that financial incentive treatments conducted through Internet websites can be effective for promoting smoking cessation. Halpern et al. (2015) found that an employee financial incentive smoking cessation program was significantly more effective than the usual care. Deposit contracts have also been used to successfully promote smoking cessation, such as in Jeffery et al.'s (1993) large-scale deposit contract program, which helped 43% of participants across 16 employment sites quit smoking. Jarvis and Dallery (2017) also found that around 40% of participants' carbon monoxide samples met criterion for smoking abstinence following Internet-based, self-tailored deposit

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contract treatments. Deposit contract weight loss treatments have been shown effective as well (e.g., Volpp et al., 2008), and some researchers have found them to be more effective than traditional behavioral weight loss programs (e.g., Harris & Bruner, 1971).

Despite the numerous demonstrations of efficacy, researchers have found that monetary-based treatments may have low acceptability under some conditions. For example, Promberger, Brown, Ashcroft, and Marteau (2011) found that U.S. and UK respondents rated financial incentives as significantly less acceptable than standard medical treatments for weight loss, smoking cessation, and treatment adherence when respondents were asked which should be funded by a national healthcare agency. In another study, Promberger, Dolan, and Marteau (2012) assessed UK respondents' acceptability of funding for financial incentive and grocery voucher treatments to promote smoking cessation and weight loss using discrete choice experiments (DCEs). DCEs are commonly employed in health economics research and involve pitting two or more choices of treatments, services, or policies against each other based on varying attributes or characteristics (see Clark, Determann, Petrou, Moro, & de Bekker-Grob, 2014; de Bekker-Grob, Ryan, & Gerard, 2012 for reviews). Promberger et al. (2012) found that although grocery vouchers were equally or more acceptable than standard treatments, financial incentives were much less acceptable than standard treatments. Participation rates in past treatment studies have provided evidence for low acceptance of deposit contracts as well. For example, in Harris and Bruner's (1971) weight loss study, 12 of 17 participants assigned to deposit groups refused to submit a deposit, and only half of the eligible respondents in Jeffery, Gerber, Rosenthal, and Lindquist's (1983) weight loss study signed deposit contracts. In Jeffery et al.'s (1993) smoking cessation study, 72% of eligible work sites declined to participate in their deposit contract program, and only 12% of smokers at participating sites agreed. Dallery, Meredith, and Glenn (2008) also noted that several individuals declined to participate in their smoking cessation study involving deposit contracts after being informed of the procedures.

Results from a few recent studies, however, show that monetary-based treatments may be more acceptable than previous research has indicated. For example, Giles et al. (2016) conducted a DCE assessing UK respondents' acceptability of funding for financial incentives aimed at promoting various health behaviors. The researchers pitted financial incentives, shopping vouchers, and lottery tickets against standard care and found financial incentives to be equally as acceptable as standard care for smoking cessation, physical activity, and medical screening adherence. Their results also showed that financial incentives were chosen more often than standard care for vaccination adherence. In a different type of evaluation, Raiff, Jarvis, Turturici, and Dallery (2013) used

the Treatment Acceptability Questionnaire (including questions about ease of use, helpfulness, convenience, effectiveness, and fairness) to survey smokers about their experiences following completion of an Internet-based cessation treatment with financial incentives. On a scale of 1 to 100, the average acceptability rating given for financial incentives was 80.8. In a second part of the study, the researchers used the same questionnaire to assess financial incentive and deposit contract acceptability with respondents who had not experienced the treatments but were shown videos depicting key aspects. Overall, results showed that acceptability was high for both monetary-based smoking cessation treatments (average acceptability rating = 77.9). Likewise, the majority of participants who completed Jarvis and Dallery's (2017) deposit contract smoking cessation study reported that the treatment was easy to use, helpful, convenient, and fair.

Although several researchers have assessed monetary-based health treatment acceptability, only a few, recent studies have shown them to be acceptable. Given the variety of assessment methodologies and contexts explored, however, it is difficult to determine whether improvements are due to measurement differences or a general shift in public opinion. As a preliminary step in addressing this question, we aimed to add to the literature an evaluation of current monetary-based treatment acceptability, using a systematic methodology in which acceptability was previously shown to be poor. In addition, we aimed to contribute knowledge regarding current deposit contract acceptability by utilizing the same methodology. We chose to replicate and extend the DCE conducted by Promberger et al. (2012), in which financial incentives and grocery vouchers were pitted against standard treatments for smoking cessation and weight loss. Given recent research, we hypothesized that the acceptability of funding financial incentive treatments would be equal to that of standard treatments across health behavior contexts at equal effectiveness levels. We also hypothesized that financial incentive acceptability would increase with higher levels of stated efficacy, as was demonstrated in Promberger et al. In our extension to deposit contracts, we hypothesized that they would be as acceptable as standard treatments and financial incentives, across contexts, at equal effectiveness levels. We also predicted that deposit contract acceptability would increase as stated effectiveness increased.

General Method

Overview

We conducted two DCEs to assess U.S. respondents' preferences for monetary-based treatments aimed at promoting weight loss and smoking cessation, relative to standard treatments. DCEs are based upon consumer theory and random

utility theory, which posit that choices represent preference, and any discrepancies can be explained by random factors (Lancaster, 1966). Key assumptions in DCEs are that treatment, service, and/or policy attributes can be isolated and described in such a way as to allow for their systematic evaluation, and that these attributes influence the value individuals place upon healthcare goods or services (Lancsar & Louviere, 2008; Louviere, Pihlens, & Carson, 2011). In the current studies, all treatment options differed based on three attributes: treatment type, stated effectiveness, and context.

Materials and Procedure

We developed our DCEs based on the online supplementary materials provided by Promberger et al. (2012). Respondents were allotted 15 min to complete the experiment through the Qualtrics® online survey platform. Each DCE included two sets of 13 choice pairs (one set with smoking cessation questions and the other with weight loss questions). Choice pairs were randomized within the two contexts and displayed one at a time. Each question included brief descriptions of two treatment choices: an incentive-based treatment or the constant comparator (“standard medication” in smoking cessation questions and “standard treatment” in weight loss questions). The constant comparator was always set at 10% effectiveness, which was described as being “proven to help 10 out of 100 treated.” The incentive-based treatment effectiveness levels varied across each question. The value of all treatment options (i.e., the cost of the standard treatments and the amount of the incentives) was set at \$50 in both studies, so that the incentive-based treatments varied from the constant comparator only by type and effectiveness level.

One extra choice pair (a “dominance check”) was added to both context sets, to test whether respondents attended to the relevant variables. The dominance check pitted the standard treatment at 10% effectiveness versus the standard treatment at 20% effectiveness (i.e., all other attributes of the two choices were identical). Data were excluded from respondents who did not choose the more effective standard treatment (i.e., 20% effective) or who exited the experiment before completing all discrete choice questions.

Following completion of the DCE, respondents were provided a text field where they could briefly comment on why they chose certain options (data available upon request). Respondents were then prompted to answer demographic questions about their gender, age, highest level of education completed, weight status, and smoking status. Demographic questions were identical to those in Promberger et al. (2012), except that education levels were modified to reflect the U.S. educational system. Education levels included: less than high school, high school/GED, some college, two-year college degree, four-year college degree, master’s degree, doctoral degree, and professional degree (JD/MD). Weight status options

included: “I am currently very overweight,” “I am currently slightly overweight,” “I used to be overweight but am now normal weight,” “I have never been overweight,” and “don’t know or prefer not to answer.” Smoking status options included: “I currently smoke every day,” “I currently smoke, but not every day,” “I used to smoke but have quit,” “I have never smoked,” and “I prefer not to answer.”

Participants

U.S. participants were recruited from Amazon Mechanical Turk, an online platform where individuals self-select to complete tasks and surveys in return for compensation (Amazon Mechanical Turk, 2018). Study postings were made viewable only to those deemed “Mechanical Turk Masters,” a performance-based qualification granted by Amazon. Individuals were compensated \$0.30 for their participation, which they redeemed by entering a randomly generated code (provided on the last screen of the study) into a field on the Mechanical Turk website. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Participants were informed about the procedures of the study and consented to participate by clicking “yes.”

Design

We used $2 \times 5 \times 2$ within-subject factorial designs to evaluate the effects of treatment type, efficacy, and context on treatment acceptability. Treatment types included the incentives under evaluation within each study (noted in their respective method sections) and the standard treatment options described previously. The different stated effectiveness levels were 5%, 10%, 11%, 20%, and 40% for the incentive-based treatments. These were the same levels evaluated in Promberger et al. (2012) and are consistent with effectiveness results reported within the monetary-based treatment literature (e.g., Jarvis & Dallery, 2017; Jeffery et al., 1993). Treatment contexts included smoking cessation and weight loss. Across both studies, treatment acceptability was measured as the proportion of respondents who chose the incentive-based treatments over the standard options.

Data Analyses

We analyzed choice data from both studies in SPSS (version 24) using generalized linear mixed models, with binary logistic regression as the target distribution and relationship with the linear model. We evaluated the fixed effects of treatment type, efficacy, and context, as well as participant random effects based on demographic variables (i.e., gender, age, and

education levels). We also evaluated a potential interaction between treatment type and context. Our analyses were analogous to those Promberger et al. (2012) conducted through the R® statistical software program (M. Promberger, personal communication, February 10, 2017). We coded all choice data in a binary fashion. In one column, a choice of an incentive-based treatment, in general, was coded as 1, and a choice of a standard treatment was coded as 0. In a separate column, the specific treatment types evaluated in each study were coded as 0 or 1. The context of choices were coded as 0 or 1 in another column, and effectiveness levels were noted in an additional column. In all, these analyses estimated the relative acceptability of the incentive-based treatments to the standard treatments across contexts and effectiveness levels.

We performed separate binary logistic regressions to determine whether there were differences in choice patterns based on respondents' demographic characteristics. As in Promberger et al. (2012), we evaluated the fixed effects of smoking status in the context of smoking cessation and weight status in the context of weight loss. Individuals who reported never having smoked or never having been overweight served as the reference groups to which the other groups were compared. In these analyses, we did not include data from respondents who skipped questions related to smoking or weight status.

Study 1

Method

Study 1 was a direct replication of Promberger et al.'s (2012) Study 3 DCE, with the exception that our respondents were from the U.S. Treatment types included “cash” (financial incentives), grocery vouchers, and the standard treatment options. During the study, respondents were told that they would see pairs of treatments for either smoking cessation or weight loss, and that these differed based on type and effectiveness. Each individual choice pair was accompanied by instructions for the respondent to select the choice they felt “should be funded” (see Fig. 1 for an example of a choice pair in Study 1). As in Promberger et al., no other background information, such as the source of funding, was provided. When conducting the factor analyses, cash, 10% effectiveness, and the context of smoking cessation were set as the reference levels to which the other levels were compared.

Results

Study 1 was conducted over a period of 17 days. Of the 72 individuals who accessed the study platform, 2 failed the dominance check, and 19 did not complete the experiment. Thus,

we analyzed data from 51 respondents in Study 1. It took an average of 5 min and 29 s for respondents to complete the study, and all respondents answered every demographic question. Table 1 shows demographic information for both Study 1 and Study 2. The average age of respondents in Study 1 was about 41 years (range: 23–63 years), and there was a smaller proportion of women (33%) than of men (67%). Only 33% of respondents reported currently smoking, whereas 67% reported never having smoked or having quit smoking. About half reported being overweight (53%), whereas the others reported formerly or never being overweight (47%). A slight majority of respondents (57%) reported having obtained a four-year degree.

Figure 2 shows the DCE results for Study 1, in which treatment acceptability was measured as the proportion of respondents who chose cash or grocery vouchers over standard medication for smoking cessation or standard treatment for weight loss. The vertical dashed line depicts the effectiveness level of the standard treatments, held constant at 10%. The horizontal dashed line serves as a visual marker of equal choice proportion. Data below the line signify that standard treatments were chosen more often than cash or grocery vouchers. Data above the line signify that cash or grocery vouchers were chosen more often than the standard treatments. As predicted, we observed that incentive-based treatment acceptability increased as stated effectiveness increased. When incentives were 5% effective for promoting smoking cessation, only 2% of respondents chose cash over the 10% effective standard medication, and only 8% chose cash over standard treatment for weight loss. Low acceptability was also observed for grocery voucher incentives at the 5% effectiveness level. When incentive and standard treatment efficacies were equal at 10%, however, about half of the respondents (47%) chose cash for smoking cessation and about half (49%) chose cash for weight loss. The increase was more pronounced for grocery vouchers, with 69% choosing grocery vouchers for smoking cessation and 65% choosing them for weight loss. When incentives were 11% effective, only 1% more effective than the standard options, treatment preferences shifted in favor of both cash and grocery vouchers, across contexts. From 11% effectiveness up to 40%, most respondents preferred cash and grocery vouchers for smoking cessation and weight loss, with a slightly higher proportion choosing incentives for weight loss, and a slightly higher proportion choosing grocery vouchers overall.

Although nearly all respondents chose the incentive-based treatments at the 40% effectiveness level, there were a few who can be considered “non-traders.” In particular, two respondents chose the 10% effective standard options over both grocery vouchers and cash in each context, despite the incentives being described as 30% more effective. One respondent noted in their comment at the end of the study, “I don't think any of these people should be handed cash or free groceries.”

Fig. 1 Example of a discrete choice question in Study 1 where respondents were asked to choose between an incentive-based treatment (cash or grocery vouchers) and the constant comparator (standard medication or standard treatment)

Q3. Which treatment should be funded?

Treatment A	Treatment B
The patient is paid	The patient receives
<input checked="" type="radio"/> cash \$50 per month for not smoking. This intervention is proven to help 20 out of 100 treated.	<input type="radio"/> standard medication worth \$50 per month for stopping smoking. This medication is proven to help 10 out of 100 treated.

The other noted that they never chose cash because people might use it to buy cigarettes in the smoking cessation treatments or to buy junk food in the weight loss treatments. A third respondent also did not choose cash at 40% in either context and did not choose grocery vouchers at 40% in the context of weight loss, although they did choose grocery vouchers at 40% for smoking cessation. A fourth participant chose grocery vouchers at 40% in the context of weight loss, but not for smoking cessation, and they did not choose cash at 40% in either context.

Table 2 shows a summary of the generalized linear mixed model coefficients and confidence intervals at each factor level, when compared to the reference factor levels of cash, 10% effectiveness, and the context of smoking cessation. Table 2 also shows results from the interaction analysis between treatment type and context for Study 1. These analyses confirmed our hypothesis that cash would be chosen equally as often as standard treatments at equal effectiveness levels ($p = .68$). Consistent with the visual trend observed in Fig. 2, we found a statistically significant effect of treatment effectiveness on

Table 1 Respondent demographic information, including age, gender, education, and health behavior statuses, for Study 1 and Study 2

	Study 1	Study 2
Original sample <i>n</i>	72	67
<i>n</i> after exclusion (% of sample included)	51 (71%)	50 (75%)
Mean age (<i>SD</i>)	40.75 (11.32)	40.65 (10.71)
Women (<i>n</i> (%))	17 (33%)	23 (46%)
Men (<i>n</i> (%))	34 (67%)	26 (52%)
No Answer (<i>n</i> (%))	0 (0%)	1 (2%)
Education (<i>n</i> (%))		
Less than high school	1 (2%)	2 (4%)
High school / GED	2 (4%)	4 (8%)
Some College	10 (20%)	9 (18%)
2-yr Degree	6 (12%)	3 (6%)
4-yr Degree	29 (57%)	25 (50%)
Master’s Degree	3 (6%)	6 (12%)
Doctoral Degree	0 (0%)	0 (0%)
Professional Degree (JD / MD)	0 (0%)	0 (0%)
No Answer	0 (0%)	1 (2%)
Smoking Status (<i>n</i> (%))		
Currently, daily	13 (25%)	10 (20%)
Currently, but not daily	4 (8%)	2 (4%)
Have quit	12 (24%)	12 (24%)
Never	22 (43%)	23 (46%)
Prefer not to answer	0 (0%)	3 (6%)
Overweight Status (<i>n</i> (%))		
Very	5 (10%)	7 (14%)
Slightly	22 (43%)	18 (36%)
Formerly	8 (16%)	5 (10%)
Never	16 (31%)	17 (34%)
Don’t know / Prefer not to answer	0 (0%)	3 (6%)

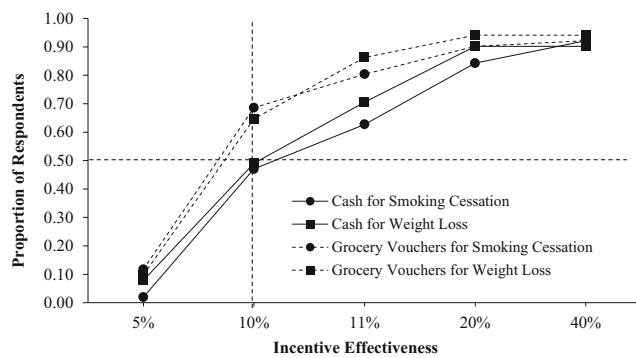


Fig. 2 Proportion of respondents in Study 1 who chose cash and grocery vouchers over standard medication for smoking cessation or standard treatment for weight loss, at each effectiveness level

choices across each level ($p < .001$), as acceptability increased with increases in effectiveness. There was also a statistically significant effect of treatment type on acceptability, with grocery vouchers chosen more often than cash overall ($p < .001$). We found no effect of context on treatment choices, however, as incentive-based treatments were chosen at a similar rate in the context of smoking cessation and weight loss ($p = .13$). We also did not find an interaction between the context of weight loss and grocery voucher treatment type ($p = .52$), demonstrating that grocery vouchers were chosen equally as often for smoking cessation.

Our analyses of participant demographics did not reveal any effects of gender, age, educational level, smoking status, or weight status on treatment acceptability. Table 3 shows the generalized linear mixed model coefficients and confidence intervals for the binary logistic regression analyses evaluating the effect of respondent's health behavior statuses in relation to choices made throughout each treatment context. As shown, respondents who reported having never smoked were equally as likely to choose incentives for smoking cessation as those who had quit smoking or who currently smoked. Likewise, respondents who had reported never being overweight were equally as likely to choose incentives for weight

loss as those who had previously been overweight or who were currently overweight.

Discussion

Study 1 assessed the acceptability of financial incentive treatments for promoting weight loss and smoking cessation when compared to standard treatment options. We obtained results consistent with our hypotheses, as financial incentive treatments were chosen as often as standard treatments at the same effectiveness level across contexts. Similar to previous research, increases in stated effectiveness significantly increased respondents' preferences for incentive-based treatments. As such, it may be beneficial to explore ways in which monetary-based treatment effectiveness can be highlighted more saliently when describing the treatments to patients and other stakeholders in the future. We observed an overall greater preference for grocery voucher incentives than financial incentives; however, our results provide further evidence that contingent financial incentives may be acceptable alternatives when pharmaceutical and behavioral treatments are less effective.

A limitation to our study was the small sample size of 51 respondents. Although our sample was similar to other published DCEs (de Bekker-Grob, Donkers, Jonker, & Stolk, 2015), and we found effects for treatment type and effectiveness levels, it is possible that our study lacked sufficient power to detect smaller effects. This could be one explanation for our failure to replicate Promberger et al.'s (2012) finding that cash was less acceptable than standard treatment, that there were effects of context and behavioral health statuses on choices, and that there was an interaction between context and treatment type. However, our results were consistent with the more recent DCE by Giles et al. (2016), which also revealed no statistically significant differences in acceptability between financial incentives and standard care, with 356

Table 2 Study 1 binary logistic regression results evaluating differences in choice proportions for cash versus standard treatments (intercept), fixed effects of treatment efficacy, treatment type, and context, and a potential interaction between treatment type and context

Factors / Levels	Coefficients	Confidence Intervals (95%)
Intercept (Cash, Smoking, 10%)	-0.54	[-3.08, 2.01]
5%	-4.36***	[-5.22, -3.50]
11%	1.45***	[0.86, 2.04]
20%	3.49***	[2.66, 4.31]
40%	4.08***	[3.15, 5.01]
Grocery Vouchers	1.44***	[0.79, 2.10]
Weight Loss	0.48	[-0.13, 1.08]
Grocery Vouchers x Weight Loss (Interaction)	-0.30	[-1.21, 0.61]
<i>n</i> observations (<i>n</i> respondents)		1020 (51)

*** $\leq .001$

Table 3 Study 1 binary logistic regression results for differences in choice proportions at each factor level in the context of smoking cessation and weight loss compared to the reference factor level of individuals who reported never having smoked or never having been overweight

Smoking Cessation			Weight Loss		
Factors / Levels	Coefficients	Confidence Intervals (95%)	Factors / Levels	Coefficients	Confidence Intervals (95%)
Intercept (Cash, Smoking, 10%)	-0.55	[-3.26, 2.16]	Intercept (Cash, Smoking, 10%)	-0.72	[-3.47, 2.02]
5%	-4.13***	[-5.23, -3.03]	5%	-4.11***	[-5.26, -2.96]
11%	1.02**	[0.25, 1.79]	11%	1.75***	[0.91, 2.60]
20%	2.80***	[1.80, 3.81]	20%	3.89***	[2.65, 5.14]
40%	3.78***	[2.56, 5.00]	40%	3.89***	[2.65, 5.14]
Grocery Vouchers	1.31***	[0.68, 1.95]	Grocery Vouchers	1.11***	[0.44, 1.77]
Quit Smoking	0.66	[-1.06, 2.38]	Formerly Overweight	1.48	[-1.30, 4.25]
Smoke, Not Daily Smoke Daily	-1.16	[-3.82, 1.50]	Slightly Overweight	0.94	[-0.84, 2.71]
	0.61	[-1.15, 2.37]	Very Overweight	-0.23	[-2.56, 2.11]
<i>n</i> observations		1020 (51)	<i>n</i> observations		1020 (51)
(<i>n</i> respondents)			(<i>n</i> respondents)		

** ≤ .01

*** ≤ .001

respondents. Moreover, Promberger et al. (2011) also found no effects of health behavior statuses in their survey of 188 total respondents. Related to this issue, we do not believe that differences in how the U.S. and UK healthcare systems are funded would account for our failure to replicate some of Promberger et al.'s (2012) results. As mentioned, UK respondents in Giles et al. (2016) showed equal or greater preference for financial incentive funding than standard care, and Promberger et al. (2011) found low acceptability of funding for financial incentives with both U.S. and UK respondents. Thus, it is plausible that differences between our study and Promberger et al.'s (2012), and similarities between our and Giles et al.'s, may capture a recent increase in financial incentive acceptability. Additional research should be conducted to further explore this possibility.

Study 2

Method

Study 2 involved the same procedures as Study 1 with a few exceptions. First, grocery voucher incentive treatment options were replaced with deposit contract treatments. This allowed us to evaluate the acceptability of deposit contracts relative to standard options, as well as in comparison to financial incentives (cash). Second, in Study 2, respondents were asked to select the choice they found “most acceptable,” instead of the one they felt should be funded (see Fig. 3 for an example of a choice pair in Study 2). This change was implemented

because external funding would not have applied to deposit contracts (in which participants contribute their own money), and we hoped to prevent the possibility that funding source differences could serve as a confounding variable in our assessment. Finally, in our Study 2 statistical analyses, we used deposits instead of cash as the reference level to which the other treatment type levels were compared.

Results

Study 2 was conducted over a period of 44 days. Of the 67 individuals who accessed the study platform, 5 failed the dominance check and 12 did not complete the experiment. Thus, we analyzed data from 50 respondents in Study 2. Like Study 1, it took an average of 5 min and 26 s for participants to complete Study 2. One respondent in Study 2 did not report age, gender, education level, smoking status, or weight status, and one did not report smoking status or weight status. One respondent reported weight status but not smoking status, and one reported smoking status but not weight status. As shown in Table 1, the average age of respondents was about 41 years in Study 2 (range: 24–69 years), and there was a near equal proportion of women and men (46% and 52%, respectively). Only 24% of respondents reported currently smoking, whereas 70% reported never having smoked or having quit smoking. Three respondents (6%) selected “Prefer not to answer” in regard to smoking status. Exactly half reported being overweight (50%), whereas the others reported formerly or never being overweight (44%) or selected “Don’t know/Prefer not to answer” ($n = 3$). Exactly half of the respondents (50%) reported having obtained a four-year degree. Overall,

Fig. 3 Example of a discrete choice question in Study 2 where respondents were asked to choose between an incentive-based treatment (deposits or cash) and the constant comparator (standard medication or standard treatment)

Q27. Which treatment is most acceptable?

Treatment A

The patient receives

standard medication

worth \$50 per month for stopping smoking.

This medication is proven to help **10 out of 100 treated.**

Treatment B

The patient deposits

cash

\$50 per month and gets their deposit back if they don't smoke.

This intervention is proven to help **10 out of 100 treated.**

respondents' demographic and health behavior measures were similar in Study 1 and Study 2.

Figure 4 displays the proportion of respondents who chose cash or deposits over standard medication for smoking cessation or standard treatment for weight loss in Study 2. Consistent with Study 1, preferences for incentive-based treatments in Study 2 increased as stated effectiveness increased. At 5% effectiveness, only 8% of respondents chose cash for smoking cessation, 8% chose cash for weight loss, 8% chose deposits for smoking cessation, and 10% chose deposits for weight loss. We found that a small majority of the respondents chose cash in Study 2 when it was 10% effective for smoking cessation (57%) and weight loss (61%). Likewise, about half of the respondents chose deposits for smoking cessation (57%) and weight loss (53%) when deposits were equally as effective as standard treatments. As in Study 1, when the incentive-based treatments were 11% up to 40% effective in Study 2, most respondents chose both incentives instead of the standard options. Nearly all participants chose cash and deposits when they were 40% effective, and there were no visual differences in choice proportion trends between cash and deposits across contexts or effectiveness levels.

In Study 2, there were two respondents who could be considered “non-traders,” in that they chose the standard options

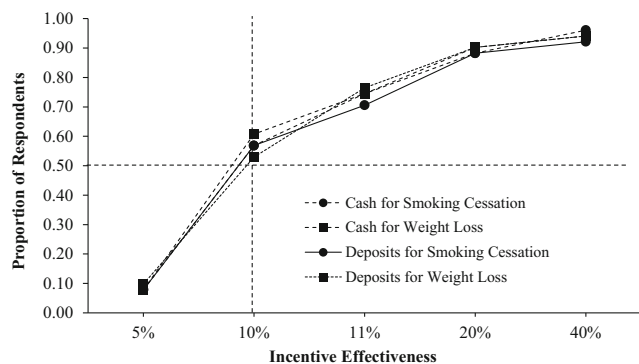


Fig. 4 Proportion of respondents in Study 2 who chose cash and deposits over standard medication for smoking cessation or standard treatment for weight loss, at each effectiveness level

over at least one of the incentives across contexts, at the highest effectiveness level of 40%. One of those respondents never chose cash or deposits for smoking cessation or weight loss. They noted in their comment at the end of the study, “I don’t agree with using money in any way when it comes to treating health problems, regardless of what is being treated.” The other respondent chose cash at 40% effectiveness across contexts; however, they did not choose deposits for smoking cessation or weight loss. That respondent noted that they did not like the idea of a person having to deposit money as part of a treatment.

Table 4 shows the binary logistic regression coefficients, the corresponding confidence intervals, and the interaction analysis for Study 2. Recall that deposits, smoking cessation, and 10% effectiveness served as the reference factor levels in these analyses. Consistent with our original hypothesis, we found that deposit acceptability was similar to that of the standard treatments when they were equally effective (i.e., at 10%; $p = .70$). Moreover, we found that there was no effect of treatment type in Study 2, such that deposits and cash were chosen equally as often overall ($p = .51$). In Study 2, we again found a statistically significant effect of stated treatment effectiveness upon respondents’ choices across every level, with both cash and deposit acceptability increasing as effectiveness increased. Context again had no effect on acceptability, and respondents chose incentives equally for weight loss and smoking cessation ($p = .51$). Likewise, we found no effects of respondents’ genders, ages, or education levels on treatment choices in Study 2. Finally, there was no interaction between treatment type and context ($p = .82$), as respondents chose cash equally as often for weight loss as for smoking cessation. These findings corresponded with those in Study 1.

Our additional binary logistic regression analyses for Study 2 revealed that smoking status and weight status had no effect upon treatment choices in the context of smoking cessation or weight loss (see Table 5). We found that treatment choices were similar for individuals who reported never having smoked as those who had quit or who currently smoked, and for those who reported never having been overweight as those

Table 4 Study 2 binary logistic regression results evaluating differences in choice proportions for deposits versus standard treatments (intercept), fixed effects of treatment efficacy, treatment type, and context, and a potential interaction between treatment type and context

Factors / Levels	Coefficients	Confidence Intervals (95%)
Intercept (Deposits, Smoking, 10%)	0.49	[-2.01, 2.99]
5%	-5.05***	[-6.13, -3.98]
11%	1.39***	[0.81, 1.98]
20%	3.27***	[2.49, 4.06]
40%	4.68***	[3.54, 5.75]
Cash	0.22	[-.43, 0.87]
Weight Loss	0.22	[-0.43, 0.87]
Cash x Weight Loss (Interaction)	-0.11	[-1.04, 0.82]
<i>n</i> observations (<i>n</i> respondents)		1000 (50)

*** ≤ .001

who reported being formerly or currently overweight, across contexts.

Discussion

In Study 2, we assessed the acceptability of deposit contract treatments for promoting weight loss and smoking cessation, when compared to standard treatment options. As predicted, our analyses revealed that deposit contract treatments were chosen equally as often as standard treatments at the same level of stated effectiveness across the two contexts. This finding corresponds with recent research, which has shown deposit contract treatments to be rated positively. In Study 2, we also assessed financial incentive acceptability and replicated our finding of no difference between cash and standard options

when both were equally effective. This result is particularly interesting, given that the question prompt, and presumably the context of acceptability, differed between Study 1 and Study 2. Whereas Study 1 mentioned acceptability of funding for treatments, Study 2 simply asked respondents to choose based on “acceptability.” Thus, it is possible that respondents view different types of acceptability similarly, or that the question prompt simply did not influence their choice preferences. The same limitation regarding our sample size in Study 1 applied to Study 2, although our replication of financial incentive acceptability across studies lends additional support for the possibility that incentive acceptance is currently similar to that of standard treatment options. Additional systematic evaluations should be conducted, however, to evaluate the replicability of our deposit contract acceptability results.

Table 5 Study 2 binary logistic regression results for differences in choice proportions at each factor level in the context of smoking cessation and weight loss compared to the reference factor level of individuals who reported never having smoked or never having been overweight

Smoking Cessation			Weight Loss		
Factors / Levels	Coefficients	Confidence Intervals (95%)	Factors / Levels	Coefficients	Confidence Intervals (95%)
Intercept (Deposits, Smoking, 10%)	1.13	[-1.51, 3.77]	Intercept (Deposits, Smoking, 10%)	0.17	[-2.51, 2.85]
5%	-4.86***	[-6.27, -3.45]	5%	-4.02***	[-5.18, -2.86]
11%	1.13**	[0.31, 1.94]	11%	1.37***	[0.57, 2.17]
20%	2.83***	[1.80, 3.86]	20%	3.19***	[2.11, 4.27]
40%	4.24***	[2.81, 5.68]	40%	4.21***	[2.82, 5.61]
Cash	0.33	[-0.32, 0.97]	Cash	0.05	[-0.58, 0.68]
Quit Smoking	-1.67	[-3.67, 0.33]	Formerly Overweight	0.44	[-1.75, 2.63]
Smoke, Not Daily Smoke Daily	-1.27	[-5.14, 2.59]	Slightly Overweight	0.14	[-1.52, 1.79]
	-1.20	[-3.06, 0.66]	Very Overweight	0.48	[-2.01, 2.96]
<i>n</i> observations (<i>n</i> respondents)		940 (47)	<i>n</i> observations (<i>n</i> respondents)		940 (47)

** ≤ .01

*** ≤ .001

General Discussion

We have contributed further evidence that individuals find financial incentives equally as acceptable as standard treatments for promoting smoking cessation and weight loss when asked to choose between the two. This finding is inconsistent with past results (Promberger et al., 2011; Promberger et al., 2012), yet it corresponds with more recent evaluations of financial incentive acceptability (Giles, Robalino, Sniehotta, Adams, & McColl, 2015; Giles et al., 2016). We also found that deposit contracts were equally as acceptable as standard treatments, which parallels recent deposit contract acceptability studies (Raiff et al., 2013). Although our methodology precludes definitive conclusions about the factors leading to the differences between past and current findings, one explanation could be that monetary-based treatment acceptability has improved. Given the decades of research in which monetary-based interventions have been shown effective, it would be logical and beneficial to see increases in their favorability and adoption over time.

One limitation to our studies was that we did not evaluate the extent to which our results correspond with treatment choices that patients (or other invested parties) would make in real-world situations. We measured treatment acceptability by assessing respondents' choices given descriptions of hypothetical scenarios (often referred to as "stated preferences"). Although DCEs have become popular tools for assessing treatment acceptability, there has continued to be a shortage of empirical evaluations on the external validity of their predictions (comparing stated preferences versus observed behavior), especially in the area of health (de Bekker-Grob et al., 2012; Lancsar & Louviere, 2008; Ryan & Gerard, 2003). To our knowledge, no study has evaluated the external validity of DCEs for predicting choices regarding monetary-based health treatments involving financial incentives or deposit contracts. The validation studies that have been conducted for other treatments and commodities have also shown mixed results. For example, Krucien, Gafni, and Pelletier-Fleury (2015) compared patients' stated preferences for sleep apnea treatments (based on the results of a DCE) to patients' actual treatment choices. The authors found that aggregate comparisons revealed no differences between patients' DCE results and their observed behavior, whereas comparisons at the individual level showed discrepancies. In contrast, Mohammadi et al. (2017) found that patients' DCE-derived preferences for tuberculosis treatment corresponded with their observed behavior at the individual level, but not at the aggregate level. Several researchers have begun exploring factors that may contribute to these discrepancies, however, and we are likely to see more activity in this area as calls to action are heeded (see Rakotonarivo, Schaafsma, & Hockley, 2016 for a review).

Although there is need for additional research on the predictive validity of DCE results, as Giles et al. (2016) noted, they provide a feasible, preliminary methodology for

assessing relevant factors in the absence of large-scale, systematic evaluations. For example, in Halpern et al.'s (2015) smoking cessation study, 90% of participants assigned to receive financial incentives accepted the treatment, but only 13.7% of those assigned to deposit contracts accepted. In contrast, Donlin Washington et al. (2016) reported that every prospective participant in their physical activity deposit contract treatment was willing to make a deposit. Conducting a fine grain analysis of the potentially relevant variables that contributed to these differences would be cumbersome and costly within an applied setting. The advantage of DCEs is that multiple treatments can be evaluated simultaneously across numerous attribute dimensions in an efficient manner. In Giles et al.'s DCE, for example, incentive value, incentive eligibility, and the provision of supplementary treatment information were found to significantly impact financial incentive acceptability. Other potential factors include fair exchange, design and delivery, cost-effectiveness, recipient characteristics, and impact on individuals and society (Giles et al., 2015). These and other attributes could also be evaluated in the context of deposit contract treatments. For example, it follows that a deposit contract may be unacceptable if the deposit requirement is too high; however, parametric analyses of deposit amount acceptability have yet to be conducted. Moreover, it is possible that individuals may differ in how much they are willing to deposit, based on factors such as socioeconomic status, personal financial histories, etc.

In a recent review, Salloum, Sherkman, Louviere, and Chambers (2017) found that there has been an increase in the number of DCE evaluations assessing stakeholder acceptability for various health-related treatments over the past decade. Further research is needed, however, to identify and evaluate variables influencing public health policy decision making concerning monetary-based treatments. For example, some government agencies have recommended monetary-based treatments (also referred to as "contingency management" treatments) for promoting abstinence from alcohol and illicit substances (National Institute on Drug Abuse, n.d.; Public Health England, n.d.). However, most have yet to explicitly recommend them for smoking or weight loss, despite evidence showing monetary-based treatments to be more effective than standard care in promoting these health behaviors (see Giles, Robalino, McColl, Sniehotta, & Adams, 2014 for a systematic review and meta-analysis). Medications and counseling have continued to be regarded as the gold-standard options for smoking cessation (Tobacco Use & Dependence Clinical Practice Guideline Panel, Staff, & Consortium Representatives, 2000; Fiore et al., 2008), but most people who quit smoking report using other methods (Centers for Disease Control & Prevention [CDC], 2017a). As smoking remains the leading cause of preventable death in the United States (CDC, 2017b), policymakers may need to reconsider their traditional treatment recommendations.

Agencies are beginning to place greater emphasis on behavioral treatments for promoting weight loss, as opposed to medications or psychotherapy (U.S. Department of Health & Human Services, 2017). However, with over 70% of the U.S. adult population currently overweight or obese (CDC, 2017c), more changes may be needed.

In the meantime, some researchers have teamed up with companies to develop monetary-based health programs that are available commercially to the public. For example, researchers at Brown Medical School helped create DietBet, which is an online deposit contract weight loss game that has attracted over 522,000 players since its inception (DietBet, 2017). Leahey and Rosen (2014) evaluated the effectiveness of DietBet with 39,387 players and found that 43.6% achieved their weight loss goal. This team also developed QuitBet (2016), which uses the same methodology to promote smoking cessation, as well as StepBet (2017), which targets physical activity. Another commercial deposit contract program, “stickK,” has facilitated over 360,000 monetary commitments for targets such as physical activity, weight loss, and smoking cessation (stickK.com, 2017). Moreover, several other monetary-based programs are accessible through mobile phone applications, such as Pact (2015) and Charity Miles (n.d.), which target physical activity. The rise of these commercial programs signals that there are many more factors and contexts to be explored when it comes to monetary-based health treatments. For example, convenience may be a factor that increases their acceptability in the context of technology-based delivery, but low credibility associated with technology-based treatments may also have negative effects (e.g., Musiat, Goldstone, & Tarrrier, 2014). The potential effects of other factors, such as Gamification, tailoring, and social support, also merit further evaluation.

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Compliance with Ethical Standards

Conflict of Interest Lisa M. Stedman-Falls, Jesse Dallery, and Ramzi G. Salloum each declare that they have no conflicts of interest.

Ethical Approval All procedures involving human participants were in accordance with the ethical standards of the University of Florida’s Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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