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Publication date:
2018

Document Version
Early version, also known as pre-print

[Link to publication](#)

Citation for published version (APA):

van der Swaluw, K., Lambooi, M. S., Mathijssen, J., Zeelenberg, M., Polder, J., & Prast, H. (2018). *Emotional Responses to Behavioral Economic Incentives for Health Behavior Change*. (CentER Discussion Paper; Vol. 2018-008). CentER, Center for Economic Research.

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No. 2018-008

**EMOTIONAL RESPONSES TO BEHAVIORAL ECONOMIC
INCENTIVES FOR HEALTH BEHAVIOR CHANGE**

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22 February 2018

ISSN 0924-7815
ISSN 2213-9532

Emotional responses to behavioral economic incentives for health behavior change

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ABSTRACT

Many people aim to change their lifestyle, but have trouble acting on their intentions. Behavioral economic incentives and related emotions can support commitment to personal health goals, but the related emotions remain unexplored. In a *regret lottery*, winners who do not attain their health goals do not get their prize but receive feedback on what their forgone earnings would have been. This counterfactual feedback should provoke anticipated regret and increase commitment to health goals. We explored which emotions were actually expected upon missing out on a prize due to unsuccessful weight loss and which incentive-characteristics influence their *likelihood* and *intensity*. Participants reported their expected emotional response after missing out on a prize in one of 12 randomly presented incentive-scenarios, which varied in incentive type, incentive size and deadline distance. Participants primarily reported feeling disappointment, followed by regret. Regret was expected most when losing a lottery prize (vs. a fixed incentive) and intensified with prize size. Multiple features of the participant and the lottery incentive increase the occurrence and intensity of regret. As such, our findings can be helpful in designing behavioral economic incentives that leverage emotions to support health behavior change.

Keywords: incentives; emotions; behavioral economics; health behavior; weight loss

This research is funded by the Strategic Program of the Dutch Institute for Public Health and the Environment

JEL: D91; I12;

Currently, 62% of Europeans and 74% of Americans are overweight or obese (Flegal, Carroll, Kit, & Ogden, 2012; WHO, 2015). Consequently, one of the key challenges of the modern-day health professional is effectively supporting people who wish to improve their lifestyle. A promising direction is the use of financial incentives for health behavior change (Mantzari et al., 2015). To improve their impact, behavioral economists have tested lotteries that are designed to leverage regret aversion (Volpp et al., 2008). Generally, people anticipate future regret if they expect to learn the outcome of a non-chosen opportunity (Zeelenberg, 1999). As such, regret can improve health decisions such as vaccination (Chapman and Coups, 2006; Lagoe and Farrar, 2015), use of contraceptives (Richard, de Vries, & van der Pligt, 1998; Smerecnik and Ruiters, 2010), and exercising (Abraham and Sheeran, 2003).

Volpp et al., (2008) used the psychology of regret to optimize lottery-incentives that were designed to help people attain their weight loss goal. If participants won the lottery, they could only claim their prize if they had attained their predetermined weight loss goal. The winning ticket was drawn out of all participants and non-eligible lottery winners learned what their forgone earnings would have been (i.e. counterfactual feedback). A meta-analysis by Haff et al (2015), evaluating multiple applications of the lotteries, targeted at various health behaviors, projected a pooled goal-attainment of 57.5%, opposed to 22.6% without lotteries (Haff et al., 2015).

Due to the counterfactual feedback in the lotteries, Haff and colleagues labeled the lotteries as *regret lotteries*. Likewise, in explaining the effectiveness of the lotteries, Volpp and colleagues stated that “the anticipated threat of regret” (p. 2636) could help explain why participants attained their weight loss goals. However, it remains unexplored which emotions

are expected when missing out on a prize and which incentive-characteristics influence the *likelihood* and *intensity* of these emotions.

This is important knowledge because different emotions prompt different behaviors (Frijda, 1987, 2007) and logically, incentives that leverage emotions should commit goal-striving participants to goal directed behaviors (e.g. exercising). Besides, expected emotion intensity generally increases the likelihood of goal directed behavior (Frijda, 2007; Loewenstein and Lerner, 2003). Hence, exploring which incentive-characteristics contribute to which emotional responses can contribute to the further optimization of health incentives.

The current exploration has three aims. First, we explore which emotions are expected upon missing out on of 12 different incentives. Second, we explore which incentive-characteristics influence the *likelihood* of the reported emotions. Third, we explore the incentive-characteristics that contribute to the *intensity* of reported emotions.

Method

We described missing out on a prize in a hypothetical scenario of unsuccessful weight loss and asked participants to report their expected emotions and emotion intensity. We varied three basic incentive-characteristics that one needs to consider when designing an incentive to promote health behavior change (Adams, Giles, McColl, & Sniehotta, 2014; Halpern, Asch, & Volpp, 2012). The incentive-characteristics that were varied were incentive type, incentive size and deadline distance. As such, a 2 (lottery vs. fixed prize) \times 3 (€50 vs. €500 vs. family vacation as prize) \times 2 (6-month deadline vs. 12-month deadline) between-subjects scenario-design was used.

Participants

Data was collected through an internet survey among participants of the CentERpanel in the Netherlands. The CentERpanel consists of about 2000 households representative of the Dutch-speaking population in the Netherlands. Upon deciding to enter the CentERpanel, members are explained that their survey-responses will be used exclusively for non-commercial purposes. A total of 1369 participants between the ages of 18-65 were presented with a questionnaire. Fourteen participants were excluded due to not answering the questions and 26 were excluded because their commentary strongly indicated that they were not seriously participating. As such, the initial sample consisted of 1329 participants with a mean age of 46.4 ($SD = 12.13$) half of whom (51.9%) was female.

Procedure and Materials

All participants were asked to respond to one of 12 randomly presented scenarios in a questionnaire. All scenarios started as follows: *“Imagine that you have the goal to lose weight and that you are offered some assistance. Together with your health center you determine a 10-week target weight.”* The scenarios next systematically varied between-subjects in incentive type, size and deadline distance.

In the lottery scenarios, participants read the following text: *For commitment purposes, you are offered to participate in a free lottery with a prize of (€50 or €500 or a family vacation). You can always win the lottery, but you can only claim your prize if you achieve your target weight after 10 weeks and remain at or below this weight at the (6 or 12)-month deadline. The winning ticket is drawn out of all participants and you always get feedback on the outcome of the lottery.* Participants were next asked to what degree they would be willing to participate (1 = not at all; 6 = very much).

In the fixed prize scenarios, participants read the following scenario: *For commitment purposes you are offered a reward of (€50 or €500 or a family vacation) if you achieve your target weight after 10 weeks and remain at or below this weight at the (6 or 12)-month deadline.* Participants were next asked to what degree they would be willing to participate (1 = not at all; 6 = very much).

Next, in the lottery scenarios, participants read the following text: *Now imagine that you win the lottery. Unfortunately you cannot claim your prize because you did not achieve your target weight.*

In the fixed prize scenarios, participants next read the following text: *Now imagine that you are at the deadline and you are not rewarded because you did not achieve your target weight.*

After reading one of 12 scenarios, participants were asked to select, out of 15 randomly presented emotions, the primary emotion that they would feel at this point. We next sequentially asked participants to select the second and third emotion they would feel (based on Zeelenberg and Pieters, 2004, who assessed lottery-based emotions; see Table 1).

Participants were also asked to indicate to what degree they would feel the selected emotions (i.e. emotion intensity) and, if not selected, the degree of regret (1 = not at all; 6 = very intense). Participants were next asked to state their ‘subjective’ need to lose weight (weight loss intention; 0 = no; 1 = yes) and their current weight and height as an assessment for their ‘objective’ need to lose weight (BMI). Finally, the five-item Regret Scale (RS, $\alpha = .84$; Schwartz et al., 2002) was presented to assess a personal tendency to compare decision-related outcomes. The validated RS is often used to measure regret proneness (e.g., Saffrey, Summerville, & Roese, 2008; Spunt, Rassin, & Epstein, 2009) and had the benefit of being short while being reliable and informative.

Results

Descriptives

The mean score on willingness to participate was 3.67 ($SD = 1.68$). To increase the chance of the participants being able to truly imagine themselves in the presented scenario, subsequent analyses were performed among the subsample of participants who were willing to participate in a weight loss initiative. The central score (3 on a scale of 1 to 6) was used as a demarcation of high and low willingness. The high-willingness sample contained 763 participants (57.4%) with a willingness-score > 3 (see Table 1 for an overview), about half of whom was female (51.9%). The mean age was 45.05 ($SD = 12.22$) and mean BMI was 25.45 ($SD = 4.15$).

Table 1.
Random allocation of 763 participants to one of 12 scenarios.

Lottery	€ 50	€ 500	Vacation
6 month-deadline	$n = 61$	$n = 49$	$n = 51$
12 month-deadline	$n = 43$	$n = 54$	$n = 57$
Fixed incentive	€ 50	€ 500	Vacation
6 month-deadline	$n = 62$	$n = 88$	$n = 76$
12 month-deadline	$n = 58$	$n = 78$	$n = 86$

Example: scenario 1 described a lottery with a €50 prize and a 6-month deadline.

Table 2 provides an overview of the stated emotions. Six emotions were mentioned by more than 20% of participants and were considered for further analysis.

In the lottery scenarios, 76.5% expected feeling disappointment and 51.7% of the participants expected feeling regret when missing out on their prize. A total of 24.9% stated feeling both regret and disappointment (first, second or third mentioned emotion) when deprived of their prize. Guilt was reported by 40.3% and 28% expected feeling shame. Irritation was expected by 29.5% of participants and sadness by 22.5%.

In the scenarios that described being withheld of a fixed incentive, 82.2% expected feeling disappointment and 46.5% expected feeling regret. Guilt was reported by 41.1% of

participants and 35.5% expected irritation. Shame and sadness were reported by 27% and 24.5% respectively when missing out on a fixed incentive.

Table 2.
Stated emotions when missing out on a prize

	First Emotion		Second Emotion		Third Emotion		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Lottery								
Disappointment	157	49.8	58	18.4	26	8.3	241	76.5
Regret	52	16.5	64	20.3	47	14.9	163	51.7
Guilt	27	8.6	46	14.6	54	17.1	127	40.3
Shame	26	8.3	26	8.3	36	11.4	88	28
Sadness	16	5.1	30	9.5	25	7.9	71	22.5
Irritation	11	3.5	40	12.7	42	13.3	93	29.5
Anger	7	2.2	15	4.8	17	5.4	39	12.4
Pride	7	2.2	10	3.2	8	2.5	25	7.9
Relief	5	1.6	8	2.5	18	5.7	31	9.8
Happiness	3	1	6	1.9	8	2.5	17	5.4
Jealousy	3	1	2	0.6	4	1.3	9	2.9
Disgust	1	0.3	3	1	9	2.9	13	4.2
Envy	0	0	4	1.3	11	3.5	15	4.8
Fear	0	0	1	0.3	0	0	1	0.3
Elation	0	0	2	0.6	10	3.2	12	3.8
Fixed								
Disappointment	279	62.3	60	13.4	29	6.5	368	82.2
Guilt	42	9.4	76	17	66	14.7	184	41.1
Regret	35	7.8	96	21.4	79	17.6	210	46.8
Shame	22	4.9	45	10	54	12.1	121	27
Irritation	20	4.5	65	14.5	74	16.5	159	35.5
Sadness	19	4.2	39	8.7	52	11.6	110	24.5
Pride	8	1.8	5	1.1	14	3.1	27	6
Anger	7	1.6	26	5.8	23	5.1	56	12.5
Relief	7	1.6	7	1.6	27	6	41	9.2
Disgust	4	0.9	6	1.3	6	1.3	16	3.5
Elation	3	0.7	11	2.5	5	1.1	19	4.3
Fear	1	0.2	2	0.4	2	0.4	5	1
Happiness	1	0.2	8	1.8	6	1.3	15	3.3
Envy	0	0	0	0	7	1.6	7	1.6
Jealousy	0	0	2	0.4	4	0.9	6	1.3

Note: Participants were sequentially asked to state their first, second and third emotional response to a lost prize.

Likelihood of emotions

Logistic regression analyses were performed to determine the incentive-characteristics that contribute to the likelihood of the emotions. Only the first-chosen emotion was used (0 = not

mentioned first, 1 = mentioned first), so that the model would distinctively predict the emotion of interest.

In six independent analyses, disappointment, regret, guilt, shame, sadness and irritation were used as dependent variables respectively. The incentive-characteristics from the scenarios, age, sex, the RS, objective- and subjective need to lose weight were entered as independent variables.

None of the incentive-characteristics significantly influenced the likelihood of guilt, shame, sadness or irritation (results not further displayed). In contrast, the likelihood of regret and disappointment was influenced by the incentive-characteristics and therefore reported in Table 3.

Table 3.
Characteristics influencing the likelihood of Regret & Disappointment, logistic regression.

	Regret		Disappointment			
	OR	95% C.I.	OR		95% C.I.	
		Lower	Upper	Lower	Upper	
Lottery vs. Fixed	2.55**	1.44	4.52	0.63*	0.44	0.92
12 vs. 6 months	1.04	0.59	1.82	0.94	0.65	1.36
€500 vs. €50	2.10	0.97	4.54	0.82	0.52	1.29
Vacation vs. €50	2.42*	1.13	5.21	0.87	0.55	1.37
Age	1.08	0.80	1.45	1.00	0.82	1.21
Female vs. Male	1.02	0.58	1.79	0.89	0.62	1.29
BMI	0.96	0.69	1.35	0.89	0.72	1.11
Intention	2.07*	1.09	3.95	0.95	0.63	1.44
Regret Scale	0.87	0.65	1.17	0.88	0.72	1.06
Constant	0.04			1.85		

Nagelkerke R²: Regret = .09. Disappointment = .03

Cox & Snell R²: Regret = .05. Disappointment = .02

*Significant at $p < .05$

**Significant at $p < .01$

Missing out on the lottery prize elicited regret significantly more often than being deprived of the fixed incentive (OR = 2.59, $p = .001$, 95% CI, 1.47 to 4.58). Losing the vacation (vs. €50) also significantly increased the likelihood of regret (OR = 2.42, $p = .02$, 95% CI, 1.13 to 5.20), and losing €500 (vs. €50) did not significantly increase the likelihood of regret at $p < 0.05$ (OR = 2.10, $p = .06$, 95% CI 0.97 to 4.54).

The objective need to lose weight (BMI) did not yield a significant parameter in predicting regret (OR = 0.96, $p = .82$, 95% CI, 0.67 to 1.35), whereas the subjective need to lose weight (intention) lead to a higher frequency of reported regret (OR = 2.07, $p = .03$, 95% CI, 1.09 to 3.95).

The likelihood of disappointment increased when the incentive was fixed opposed to a lottery (OR = 0.63, $p = .02$, 95% CI, 0.44 to 0.92).

Intensity of emotions

Six independent linear regression analyses were performed to assess the different incentive-characteristics that intensify the emotions. The intensity of the emotions was used as dependent variable. The incentive-characteristics, age, sex, objective- and subjective need to lose weight and the RS were entered as independent variables.

None of the incentive-characteristics significantly influenced the intensity of guilt, shame or irritation. The intensity of sadness increased significantly as a result of losing a family vacation (B = .41, SE = .20, $p = .04$).

Results of the regressions of disappointment and regret are displayed in Table 4. The intensity of regret increased significantly when the lost incentive was lottery-based opposed to fixed (B = .35, SE = .13, $p < .01$). Regret also intensified when the prize was €500 (B = .37, SE = .16, $p = .02$) or a vacation, (B = .48, SE = .16, $p < .01$). Women (B = .43, SE = .13, $p < .01$) and participants with a personal proneness to feel regret (B = .16, SE = .07, $p = .01$) further expected feeling more intense regret.

Table 4. *Characteristics influencing the intensity of Regret & Disappointment, OLS regression.*

	Regret		Disappointment	
	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>
Lottery vs. Fixed	0.35**	0.13	-0.21*	0.10
12 vs. 6 months	-0.07	0.12	-0.12	0.10
€500 vs. €50	0.37*	0.16	0.10	0.12
Vacation vs. €50	0.48**	0.16	0.12	0.12
Age	0.04	0.07	-0.18**	0.05
Female vs. Male	0.43**	0.13	0.30**	0.10
BMI	-0.04	0.02	0.00	0.06
Intention	0.19	0.14	0.30**	0.11
Regret Scale	0.16*	0.07	0.03	0.05
Constant	3.20	0.15	4.83	0.12

R²: Regret = .08 Disappointment = .10

*Significant at $p < .05$

**Significant at $p < .01$

The intensity of disappointment increased when the incentive was fixed opposed to lottery-based ($B = -0.21$, $SE = .10$, $p = .04$). Incentive size did not significantly affect the intensity of disappointment. Additionally, women ($B = .30$, $SE = .10$, $p < .01$), relatively younger participants ($B = -0.18$, $SE = .05$, $p < .01$) and participants who intended to lose weight ($B = .30$, $SE = .11$, $p < .01$) reported more intense disappointment when missing out on their prize.

Discussion

The aims of the current study were to explore 1) which emotions would be expected upon missing out on a prize and which incentive-characteristics would contribute to the 2) likelihood and 3) intensity of reported emotions. After reading one of 12 incentive-scenarios, participants primarily report feelings of disappointment and regret when missing out on a prize and to a lesser extent irritation, guilt, shame and sadness.

Regret

A lottery design (versus a traditional fixed incentive) increased the likelihood and intensity of regret, which helps substantiate the label *regret lotteries*. Besides, the expected intensity of

regret increased with both increases in size of the loss and the likelihood of regret increased if participants imagined losing a family vacation (vs. €50). This pattern is in line with economic regret theory (Bell, 1982), in which regret is described as the discrepancy between the current situation and ‘what would have been’. As such, a higher discrepancy results in more regret. The finding that losing a family vacation increases the likelihood and intensity of regret can also be interpreted in line with regret literature by Janis and Mann (1977) and Zeelenberg (1999) who theorized that socially important outcomes can intensify regret along with a simple increase in size of a bad outcome.

Deadline distance did not affect the likelihood or intensity of regret. This mirrors results from a meta-analysis in which inaction-regret influences behavior independent of the distance of the negative outcome (Brewer, DeFrank, & Gilkey, 2016). Still, it remains an interesting open question if deadline distance does not matter for incentives to evoke expectations of future regret and decision-making in field settings.

Participants-characteristics were also found to influence expected regret. The subjective need to realize weight-loss appears more relevant in eliciting regret than an objective need to lose weight: people who intend to lose weight, experience regret sooner (and more intense disappointment), whereas people with a higher BMI do not. This finding resembles the function of emotions as personal indicators of goal importance (Frijda, 2007; Zeelenberg, Nelissen, Breugelmans, & Pieters, 2008) and as such supports the idea that emotions can be used for goal commitment.

Regret and Disappointment

Regret is a universal emotion, experienced similarly across different cultures and while it is related to disappointment, the emotions also have some distinct antecedents and consequences (Breugelmans, Zeelenberg, Gilovich, Huang, & Shani, 2014). Disappointment is an emotional reaction to disconfirmed expectations (Bell, 1985; Loomes and Sugden, 1986). As regret, disappointment is a counterfactual emotion and can arise when comparing one's current situation to 'what could have been'. However, in the evaluation of a negative outcome, regret is more closely related to self-agency than disappointment (Frijda, 1987). Thus, people who feel regret feel more responsible for their bad situation than disappointed people. Therefore, it has been argued that disappointment is a broader response to an unfavorable outcome than regret (Zeelenberg, Van Dijk, Manstead, & van der Pligt, 1998). Put differently, regret is a more centered emotion and stems from the realization that a disappointing outcome resulted from one's own behavior.

Our findings reflect this reasoning by demonstrating that the situational conditions leading to more (intense) regret are more specific than those that result in disappointment.

Disappointment is reported broadly, while regret increases in more specific incentive-conditions. The present findings may therefore help in designing incentives that aim to leverage regret aversion.

Another feature that could help explain why disappointment is reported broadly in the current study is the contingency of the prize. For someone who did not achieve a target weight, reflecting on decisions that contributed to this outcome may be difficult because weight loss is no single decision, but a delayed outcome of a sequence of decisions.

We mainly focused on the characteristics of the incentive and not the target outcome. Future research could extend our findings by also varying the target outcome (e.g. gym attendance

versus food intake) and reveal whether a lottery prize contingent on a specific behavior influences emotional responses to a loss.

A limitation of this study is that participants were asked to report (the intensity of) their expected emotions, but did not have to make an actual decision. We aimed to increase the practical relevance of our findings by selecting the subsample of participants who would actually be willing to participate in the presented program and by controlling for multiple covariates. Although ample research has shown that expected (intensity of) emotions influence(s) decision-making (Frijda, 2007; Loewenstein and Lerner, 2003; Zeelenberg and Pieters, 2004), it remains uncertain if participants in our study would also act on their expected negative emotions.

Conclusion

Emotions can improve the effectiveness of health incentives (Haff et al., 2015). Therefore, it can be useful to have an indication of the emotional responses to different incentive designs. We explored emotional responses to missing out on a prize due to unsatisfactory weight loss, previously presented as *regret lotteries*. Disappointment is broadly experienced and several aspects of the participant and the lottery incentive were found to increase the occurrence and intensity of regret. The present findings may be helpful in designing lottery-based commitment programs to promote health behavior change. More research on the behavioral contingency of the prize would further improve the potential for effective commitment.

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