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Jonathan de Quidt , Francesco Fallucchi, Felix Kölle, Daniele Nosenzo and Simone Quercia

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Suzanne Robey
Centre for Decision Research and Experimental Economics
School of Economics
University of Nottingham
University Park
Nottingham
NG7 2RD
Tel: +44 (0)115 95 14763
Fax: +44 (0) 115 95 14159
suzanne.robey@nottingham.ac.uk

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Bonus versus Penalty: How Robust Are the Effects of Contract Framing?

02 February 2016

Jonathan de Quidt[a], Francesco Fallucchi[b], Felix Kölle[c], Daniele Nosenzo[d] and Simone Quercia[e]

Abstract:
We study the relative effectiveness of contracts that are framed either in terms of bonuses or penalties. In one set of treatments subjects know at the time of effort provision whether they have achieved the bonus / avoided the penalty. In another set of treatments subjects only learn the success of their performance at the end of the task. We fail to observe a contract framing effect in either condition: effort provision is statistically indistinguishable under bonus and penalty contracts. We discuss possible reasons for this null result.

Keywords: contract framing; bonus; penalty; fine; loss aversion.

JEL Classification Numbers: C9; D03; J24

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[a] Institute for International Economic Studies, Stockholm University.
[b] School of Economics, University of East Anglia.
[c] Center for Social and Economic Behavior, University of Cologne.
[d] School of Economics, University of Nottingham.
[e] Institute for Applied Microeconomics, University of Bonn.

1. INTRODUCTION

While there is a large empirical literature showing that incentive pay is very effective in raising employees' performance (e.g., Lazear, 2000), recent experimental work has started paying attention to the way incentives are described to employees. This literature suggests that incentives are more effective when they are presented as penalties for poor performance rather than bonuses for good performance. For example, in one of the pioneering studies in this literature, Hannan et al. (2005) found that employees were significantly more productive when they worked under a "penalty" contract that paid a base salary of $30 minus a $10 penalty if they did not meet a production target, than under a "bonus" contract that paid a base salary of $20 plus a bonus of $10 if the target was met. Note that the two contracts are isomorphic and so the observed increase in productivity is entirely due to a *framing effect* (Tversky and Kahneman, 1981). Several other studies have confirmed the superiority of "penalty" contracts, both in the lab (Armantier and Boly, 2015; Imas et al., 2015) and in the field (Fryer et al., 2012; Hossain and List, 2012; Hong et al., 2015).

The size of this framing effect is large. Figure 1 (left panel) shows the effect sizes and confidence intervals of the three papers cited above that have studied contract framing in the lab (Hannan et al., 2005; Armantier and Boly, 2015; Imas et al., 2015).[1] The average Hedges' *g* statistic across these studies is 0.51 (Hedges, 1981). However, Figure 1 (right panel) also shows that two further studies found considerably smaller effects, which are either statistically insignificant (Grolleau et al., 2014), or only marginally significant (Brooks et al., 2012).

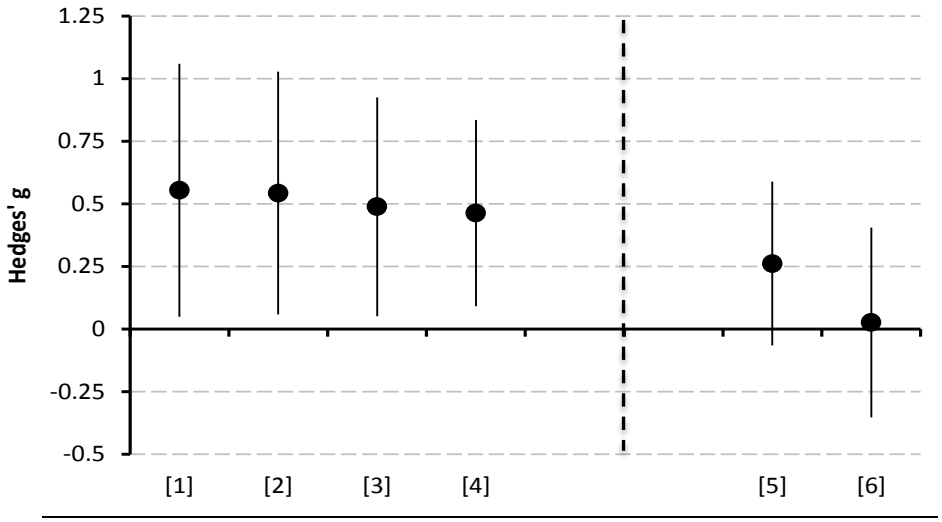
We note that one systematic difference between the experiments in the left and right panel of Figure 1 relates to whether the relation between effort and output is *deterministic* or *probabilistic*. In Brooks et al. (2012) and Grolleau et al. (2014) the effort-output relation was deterministic: for any given level of effort, subjects knew in advance (i.e. at the time of effort provision) and with certainty how this translated into monetary compensation.[2] In contrast, in the

[1] Armantier and Boly (2015) ran two experiments, one in Burkina Faso and one in Canada, and therefore we report two effect sizes. Simple effect size statistics are harder to compute for the field experiments, due to the considerably more complex experimental designs. de Quidt (2014) conducted an experiment where subjects were allowed to self-select into treatment, and therefore we do not include it in Figure 1.

[2] Brooks et al. (2012) conducted a chosen-effort experiment where subjects knew in advance whether any level of effort resulted in a bonus/penalty. In Grolleau et al. (2014) subjects were given 20 pairs of matrices containing nine

other three studies the effort-output relation was probabilistic: at the time of provision, subjects could not tell with certainty whether their effort was sufficient to receive the bonus / avoid the penalty.[3] However, there are many other differences across these studies, which makes it difficult to draw definite conclusions about the exact causes of the discrepancy in effect sizes. In this paper we report an experiment designed to test whether the effectiveness of contract framing depends on the nature of the relation between effort and output – deterministic versus probabilistic.

Figure 1 – Effect size of contract framing in previous lab experiments



Note: Effect sizes are computed using Hedges' g (Hedges, 1981). Bars represent 95% confidence intervals. [1] = Armantier/Boly (2015) - Burkina Faso; [2] = Hannan et al (2005); [3] = Imas et al. (2015); [4] = Armantier/Boly (2015) - Canada; [5] = Brooks et al. (2012); [6] = Grolleau et al. (2014).

One reason why the nature of the effort-output relation may moderate the influence of contract framing is related to the mechanism that has been argued to cause this effect: loss aversion. While loss aversion is a phenomenon that in principle applies to both risky and riskless choices, little is known about how it compares across these two domains. One study exploring the relation between loss aversion in riskless and risky domains is Gaechter et al. (2010). They

non-integer numbers and, in each pair, had to find two numbers that added up to ten. They were paid a piece-rate for each correctly-solved pair of matrices.

[3] In Hannan et al. (2005) effort only affected the probability of reaching a production target. In Imas et al. (2015) incentives were contingent upon meeting a target that was not specified ex-ante. In Armantier and Boly (2015) participants were recruited to spell-check a set of exam papers and bonuses/penalties depended on the quality of their spell-checking (verified ex-post by the experimenters).

show that individuals who display greater loss aversion in riskless tasks are also more loss averse in choices under risk. However, they also find some differences between the measures of loss aversion in the two domains.[4] In our experiment we include a measurement of loss aversion based on the task introduced by Gaechter et al. (2010). We will use this measurement to assess the role of loss aversion in explaining contract framing effects under deterministic and probabilistic effort technologies.

In our experiment, described in detail in the next section, subjects performed a real-effort task under either a bonus or penalty contract. Both contracts specified a base pay and an extra amount of money that subjects could earn by reaching a performance target. In the bonus contract, subjects were told that they could increase their base pay by reaching the target. In the penalty contract, they were told that the base pay could be reduced if they did not reach the target.

We implemented the bonus/penalty contracts under two conditions. In one condition, the performance target was not specified ex-ante: subjects were simply told that their performance would be compared with the average performance of participants in a previous experiment. Thus, similar to the procedure used by Imas et al. (2015), at the time of effort provision, subjects did not know with certainty whether their effort was sufficient to achieve the extra incentives. In the other condition, we announced the target to the subjects already at the beginning of the real-effort task. Thus, as in the studies by Brooks et al. (2012) and Grolleau et al. (2014), at any point during the task subjects knew whether or not the target had been reached.

We report our results in Section 3. We do not find any significant effect of contract framing. In either condition, performance in the real-effort task is statistically indistinguishable under the bonus and penalty contracts. One the one hand, this is consistent with our hypothesis that confirms that contract framing has limited effectiveness in settings where the relation between effort and output is deterministic. But on the other hand we do not find the strong positive effect of penalty contracts in settings with probabilistic effort-output relations observed by Hannan et al. (2005), Imas et al. (2015) and Armantier and Boly (2015). We discuss possible interpretations of these results in Section 4.

[4] For instance, Gaechter et al. (2010) find that the estimates of the loss aversion parameter λ are lower in the risky than riskless domain.

2. EXPERIMENTAL DESIGN

Our experiment was conducted online with 853 subjects recruited on Amazon's Mechanical Turk (MTurk).[5] The experiment consisted of 3 parts plus a questionnaire, and subjects knew this in advance, although they did not receive instructions for each part until they had completed the previous ones. Only one part, randomly selected at the end, was paid out.

In Part 1, subjects participated in the "Encryption Task", a real-effort task that consisted of encoding a series of words by substituting letters with numbers using predetermined letter-to-number assignments (Erkal et al., 2011). Subjects had 5 minutes to encode as many words as possible and were paid \$0.05 per word.[6] This part of the experiment was the same across treatments and is used to obtain a baseline measurement of subjects' ability in the task.

Part 2 varied across treatments according to a 2x2 between-subject design. In all treatments subjects had again to encode words and received a payment based on how many words they encoded within 10 minutes. In the **Bonus** treatments the payment specified a base pay of \$0.50 plus a bonus of \$1.50 if the subject encoded as many words as specified in a productivity target. In the **Penalty** treatments the payment specified a base pay of \$2.00 minus a penalty of \$1.50 if the subject did not meet the target. In the **Announced** treatments the target was announced at the beginning of the task.[7] In the **Unannounced** treatments the exact productivity target was left unspecified: subjects were just told that the target was based on the average productivity of participants in a previous study.[8] Thus, while in the Announced condition subjects knew at any point during the task whether they had met the target and thus their payment from the task, this was not the case in the Unannounced condition. The main aim of our experiment is to compare whether the effect of contract framing is moderated by the Announced/Unannounced condition.

Part 3 was again the same in all treatments. We used the lottery choice task introduced by Gaechter et al. (2010) to measure individual loss aversion. Subjects received a list of 6 lotteries and decided, for each lottery, whether to accept it (and receive its realization as a payment) or

[5] MTurk is an online labor market. The experiments were conducted using the software LIONESS (Molleman et al., 2016). Subjects were adult residents of the US. See Horton et al. (2011) for a discussion of online experiments conducted on MTurk.

[6] Subjects had to encode a word correctly before they could proceed to the next. The letter-to-number assignments were kept constant across the whole experiment. See Appendix A for instructions.

[7] We set the target at 45 words based on the results of a pilot conducted to calibrate incentives.

[8] This is similar to Imas et al. (2015). The target was based on the average performance of subjects in the Announced condition and equal to 39 words. The value of the target was revealed to subjects at the end of the experiment.

reject it (and receive nothing). Each lottery specified a 50% probability of winning \$1.00 and a 50% probability of losing an amount of money that varied across the 6 lotteries from \$0.20 to \$1.20, in \$0.20 increments.[9] As discussed by Gaechter et al. (2010), a subject's pattern of acceptances/rejections in this task can be used to measure his/her degree of loss aversion.

Table 1 summarizes the experimental design. Sample sizes were determined using power analysis. Based on the average effect size (g = 0.51) reported across papers with probabilistic effort-output relations (Hannan et al., 2005; Armantier and Boly, 2015; Imas et al., 2015), we assigned 137 observations to each of the Bonus and Penalty treatments in the Unannounced condition. This gives us 98% power to detect the original average effect size at the 5% level of significance. We assigned our remaining resources to recruit subjects in the Announced condition. Given the resulting sample size (292 subjects in Bonus; 287 in Penalty), we have an 80% power to detect an effect size of at least 0.24 at a 5% level of significance.[10]

Table 1 – Overview of experiment and number of subjects per treatment

	Unannounced treatment	Announced treatment
Bonus treatment	Contract pays **\$0.50 + \$1.50** if subject reaches an **unspecified** performance target *(N = 137)*	Contract pays **\$0.50 + \$1.50** if subject reaches a **pre-specified** performance target *(N = 292)*
Penalty treatment	Contract pays **\$2.00 - \$1.50** if subject does not reach an **unspecified** performance target *(N = 137)*	Contract pays **\$2.00 - \$1.50** if subject does not reach a **pre-specified** performance target *(N = 287)*

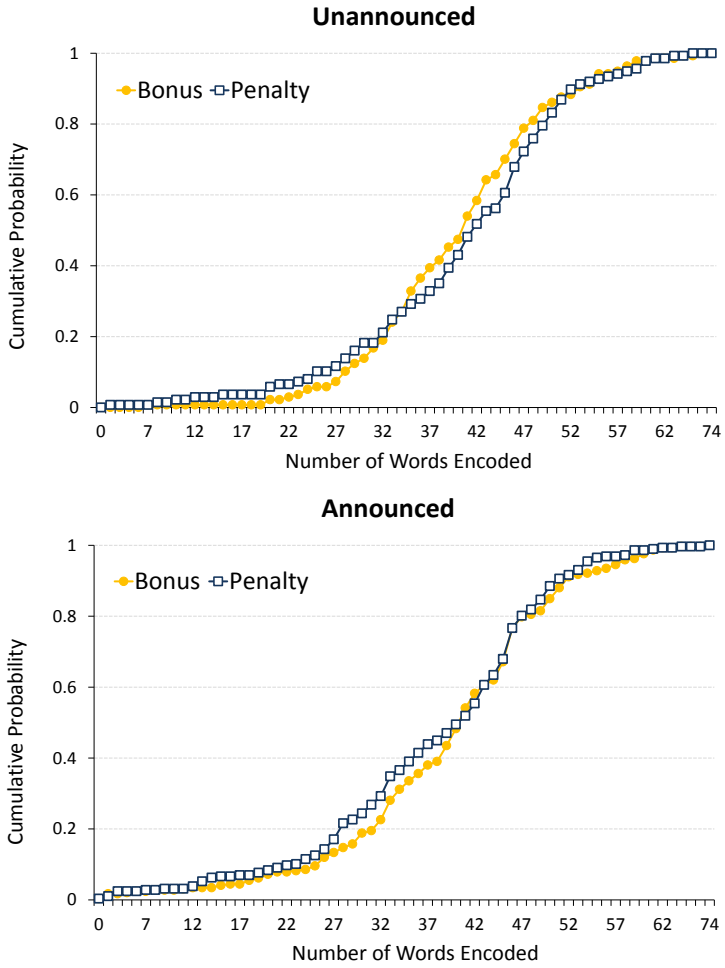
[9] In Part 3 subjects were initially given \$1.20 and losses were subtracted from this initial payment. At the end of the experiment, if Part 3 was selected for payment, one of the 6 lotteries was chosen at random and, if accepted, played out to determine the final payment.

[10] Given the average effect size of 0.14 reported in the two papers with deterministic effort-output relations (Brooks et al., 2012; Grolleau et al., 2014), the achieved power in the Announced condition is low (39%). An 80% power could only be achieved with a sample of about 800 subjects per treatment. However, this is strongly due to the fact that the effect size in Grolleau et al. (2014) is close to zero (g = 0.03). The effect size reported in Brooks et al. (2012) is 0.26, which can be detected given our sample size.

3. RESULTS

Figure 2 shows the cumulative distribution functions (CDFs) of the numbers of words encoded by participants in Part 2 of the experiment. The top and bottom panels show the CDFs of the Bonus and Penalty treatments for the Unannounced and Announced conditions, respectively.

Figure 2 – Performance across treatments



In both conditions, the CDFs of Bonus and Penalty overlap substantially, indicating very small differences in performance across treatments. In the Unannounced condition, subjects in the Penalty treatment encoded on average 41 words (std. dev. = 11.5) compared to 40 words (std. dev. = 9.78) in Bonus. The difference is statistically insignificant ($p = 0.407$ using a two-sided Mann-Whitney test; $p = 0.513$ using a two-sided Kolmogorov-Smirnov test; tests based on 137 observations per treatment). In the Announced condition, subjects in the Penalty treatment

encoded on average fewer words (38; std. dev. = 12.4) than in Bonus (39; std. dev. = 12.0). This difference is also insignificant (p = 0.291 using a two-sided Mann-Whitney test; p = 0.383 using a two-sided Kolmogorov-Smirnov test; tests based on 292 and 287 observations in Bonus and Penalty).[11]

We further analyze performance in Part 2 using multivariate regression analysis. Table 2 reports separate OLS regressions for the Unannounced and Announced conditions. For each condition, we have two models. In Model I we regress performance (measured as number of words encoded in Part 2) on a treatment dummy (equal to 1 for subjects in the Penalty treatment), a control of individual ability (measured as number of words encoded in Part 1), a gender dummy, age, and a self-assessment of risk attitudes (measured using the SOEP general risk question; Dohmen et al., 2011). In Model II we add a variable measuring subjects' degree of loss aversion ("Loss Averse") and an interaction between this variable and the Penalty treatment dummy. The Loss Averse variable is constructed using the number of lotteries that a subject rejected in Part 3 of the experiment: the most loss averse subjects rejected all 6 lotteries and the least loss averse rejected none.[12]

Starting with Model I, the regressions confirm that the overall effect of contract framing is small and statistically insignificant in both the Unannounced and Announced conditions. Among the controls, subjects' ability in the encoding task is strongly and positively associated with performance in Part 2. In the Announced condition, older subjects tend to encode fewer words, although the effect is small and only marginally significant.

The results of Model II show that in the Unannounced condition the effect of loss aversion on performance differs across the Bonus and Penalty treatments. In Bonus loss aversion has a small, negative (-0.02), but statistically insignificant (p = 0.957) effect on performance. In

[11] We also looked at differences in success at reaching the target across Penalty and Bonus treatments. In the Unannounced condition, 53% of subjects in Penalty reached the (ex-ante unspecified) target of 39 words versus 47% of subjects in Bonus. The difference in statistically insignificant according to a χ^2-test (p = 0.263). In the Announced condition, the target of 45 words was reached by 49% of subjects in Penalty and 51% of subjects in Bonus. The difference in insignificant (χ^2-test, p = 0.722). It is somewhat puzzling that in both Announced treatments we observe about 23% of subjects encoding more than 45 words. This suggests that subjects' effort in the experiment may not be entirely driven by monetary payoff considerations, but also by additional motives (e.g. intrinsic motivation; task enjoyment; etc.).

[12] We also constructed a version of the Loss Averse variable that excluded subjects with multiple switch-points between accepting and rejecting lotteries (8% of subjects had multiple switch-points). The results are similar to those shown in Table 2.

Penalty, in contrast, the effect of loss aversion is positive (-0.02 + 1.06) and significant at the 5% level (F-test, p = 0.010), i.e., the more loss averse a subject is, the higher her performance. These results are consistent with Imas et al. (2015), who also find no significant effect of loss aversion on performance in the Bonus condition and a positive significant effect in the Penalty condition. We observe the same pattern in the Announced condition, although here the effect of loss aversion is statistically insignificant in both the Bonus (p = 0.548) and Penalty treatments (F-test, p = 0.111). Overall, these findings suggest that loss aversion moderates the effect of contract framing on performance: only the most loss averse individuals may be affected by the framing of the contract.

Table 2 – OLS regressions of performance across treatments

	Unannounced treatment		Announced treatment	
	Model I	Model II	Model I	Model II
Penalty	0.19 (0.76)	-3.67* (2.06)	-0.19 (0.75)	-2.92 (1.88)
Loss Averse	-	-0.02 (0.31)	-	-0.21 (0.34)
Penalty * Loss Averse	-	1.06** (0.49)	-	0.76 (0.48)
Num. Words in Part 1	1.49*** (0.07)	1.49*** (0.07)	1.46*** (0.07)	1.46*** (0.07)
1 if Female	0.98 (0.80)	0.83 (0.80)	-0.44 (0.77)	-0.40 (0.77)
Age	-0.02 (0.04)	-0.03 (0.04)	-0.06* (0.03)	-0.06* (0.03)
Risk Loving	0.09 (0.14)	0.15 (0.14)	-0.06 (0.13)	-0.03 (0.14)
Constant	14.02*** (2.41)	14.17*** (2.62)	16.11*** (2.25)	16.60*** (2.63)
R^2	0.653	0.662	0.470	0.473
N	271	271	573	573

Note: Dependent variable is the number of words encoded in Part 2 of the experiment. For 5 subjects (2 in Unannounced; 3 in Announced) we have missing data on some questionnaire measurements and so they drop out of the regression analysis. Significance levels: *** = 1%; ** = 5%; * = 10%.

4. DISCUSSION AND CONCLUSION

Our experiment fails to replicate the effect of contract framing on performance that has been identified in previous studies (Hannan et al., 2005; Fryer et al., 2012; Hossain and List, 2012; Armantier and Boly, 2015; Hong et al., 2015; Imas et al., 2015). In our experiment, a first set of treatments implements a setting similar to Imas et al. (2015): subject participate in a real-effort task and their performance is compared against an ex-ante unspecified target that is based on the average performance of participants in a previous experiment. Subjects who reach the target are paid an additional amount of money, and the pay-for-performance incentives are framed either as "bonuses" or "penalties" for reaching / not reaching the target. While Imas et al. (2015) find that subjects work harder under penalties, we find that average performance is statistically indistinguishable between bonus and penalty frames.

Our second set of treatments implements a setting similar to Brooks et al. (2012) and Grolleau et al. (2014): the performance target is announced to subjects at the beginning of the real-effort task and therefore at any point during the task subjects know whether they have achieved the bonus / avoided the penalty. Brooks et al. (2012) and Grolleau et al. (2014) find small or no effect of contract framing on performance in this setting. We also find that performance is unaffected by contract framing in this condition.

What are the possible reasons why we fail to replicate a contract framing effect in our study? First of all, we emphasize that, given the average effect size observed in the literature (about 0.5), our study is highly powered, and so the null result is not due to a lack of power to detect an effect of such size.[13] Thus, one way to interpret our results is that there is no effect of framing on effort provision. However, this conclusion is conditional on the true magnitude of the effect being indeed as large as reported in previous studies. Moreover, this leaves unexplained why several previous studies did find a significant contract framing effect.

We believe that a more plausible interpretation of our results is that the "true" effect of contract framing is simply smaller than previously reported, at least in our setting. There are a number of reasons why this may be the case. First, at a general level, it may be difficult to

[13] As explained in Section 2, this is certainly true for the Unannounced condition, where our power is 98% given the average effect size observed in previous studies. For the Announced condition our study has 80% power to detect an effect similar in size to that observed by Brooks et al. (2012). Grolleau et al. (2014) observe an effect size close to zero, and our study does not have power to identify such a small effect.

experimentally design a framing manipulation strong enough to shift people's reference points. For instance, in our penalty treatment we did not physically endowed subjects with money that they could then lose, which may have weakened the pull of loss aversion. However, it is also true that physical endowments were not used in some of the previous studies who reported a significant framing effect (e.g., Hannan et al., 2005; Hossain and List, 2012), so this is unlikely to be the only reason why the underlying effect may be smaller.

Another possibility is that the magnitude of the effects is task- or subject-pool specific. On the one hand, the superiority of penalty contracts has been consistently observed across a variety of effort tasks and subject pools, which would speak against this conjecture.[14] On the other hand, de Quidt (2014) reports an experiment conducted on MTurk using a task that is fairly similar to the one used here (subjects were asked to transcribe text strings comprised of random combinations of letters, numbers and punctuation). Although he does find a significant contract framing effect, his reported effect size is smaller (about 0.2) than that reported in previous lab experiments.[15] While the effect size observed in our study (Unannounced condition) is much smaller than this (about 0.09), taken together our findings may suggest a task- or subject-pool (MTurkers) specificity of contract framing effects.

One final explanation for the small effect size observed in our study may be found in the argument proposed by Armantier and Boly (2015). They show that if agents are loss averse *and* have diminishing sensitivity over gains and losses, the relation between incentives framing and effort provision is non-monotonic and displays an inverse U-shape. As the base pay increases (i.e. as a larger share of the incentives is being described as entitlements that could be lost), effort initially increases, but it then decreases as the individual becomes less sensitive to income (because of diminishing sensitivity). Thus, penalty contracts may be ineffective or even counterproductive if they set unrealistically large income targets. It is possible that in our setting the influence of diminishing sensitivity may be particularly strong, and this could explain the absence of an effect. While with our data we cannot test whether this conjecture is supported, this could be an interesting avenue to explore in future research.

[14] For example, previous lab studies have used chosen-effort tasks (Hannan et al., 2005; Brooks et al., 2012), and various real-effort tasks, such as a slider task (Imas et al., 2015), or a spell-checking task (Armantier and Boly, 2015). Moreover, contract framing effects have been observed among university students, members of the general population, as well as workers in actual labor markets.

[15] However, in his study subjects could self-select into treatment, which may affect the estimate of the effect size.

REFERENCES

Armantier, O., and A. Boly. 2015. Framing of Incentives and Effort Provision. *International Economic Review* 56(3), 917–938.

Brooks, R.R.W., A. Stremitzer, and S. Tontrup. 2012. Framing Contracts - Why Loss Framing Increases Effort. *Journal of Institutional and Theoretical Economics* 168(1), 62–82.

Dohmen, T.J., A. Falk, D. Huffman, U. Sunde, J. Schupp, and G.G. Wagner. 2011. Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences. *Journal of the European Economic Association* 9(3), 522–550.

Erkal, N., L. Gangadharan, and N. Nikiforakis. 2011. Relative Earnings and Giving in a Real-Effort Experiment. *American Economic Review* 101(7), 3330–48.

Fryer, R.G.J., S.D. Levitt, J.A. List, and S. Sadoff. 2012. Enhancing the Efficacy of Teacher Incentives through Loss Aversion: A Field Experiment. NBER Working Paper No. 18237.

Gaechter, S., E.J. Johnson, and A. Herrmann. 2010. Individual-level loss aversion in riskless and risky choices. CeDEx Discussion Paper 2010-20, University of Nottingham.

Grolleau, G., M.G. Kocher, and A. Sutan. 2014. Cheating and loss aversion: do people lie more to avoid a loss? LMU Discussion Papers in Economics 2014-42.

Hannan, L.R., V. Hoffman, and D. Moser. 2005. Bonus versus Penalty: Does Contract Frame Affect Employee Effort? In *Experimental Business Research: Economic and Managerial Perspectives*, ed by. Amnon Rapoport and Rami Zwick, 2:151–169. Holland: Springer.

Hedges, L.V. 1981. Distribution Theory for Glass's Estimator of Effect size and Related Estimators. *Journal of Educational and Behavioral Statistics* 6(2), 107–128.

Hong, F., T. Hossain, and J.A. List. 2015. Framing manipulations in contests: A natural field experiment. *Journal of Economic Behavior & Organization* 118, 372–382.

Horton, J.J., D.G. Rand, and R.J. Zeckhauser. 2011. The online laboratory: conducting experiments in a real labor market. *Experimental Economics* 14(3), 399–425.

Hossain, T., and J.A. List. 2012. The Behavioralist Visits the Factory: Increasing Productivity Using Simple Framing Manipulations. *Management Science* 58(12), 2151–2167.

Imas, A., S. Sadoff, and A. Samak. 2015. Do People Anticipate Loss Aversion? *Management Science, forthcoming*.

Lazear, E.P. 2000. Performance Pay and Productivity. *The American Economic Review* 90(5), 1346–1361.

Molleman, L., A.A. Aréchar, and S. Gächter. 2016. Conducting interactive decision making experiments online. Unpublished manuscript, University of Nottingham.

de Quidt, J. 2014. Your Loss Is My Gain: A Recruitment Experiment With Framed Incentives. Manuscript, Stockholm University.

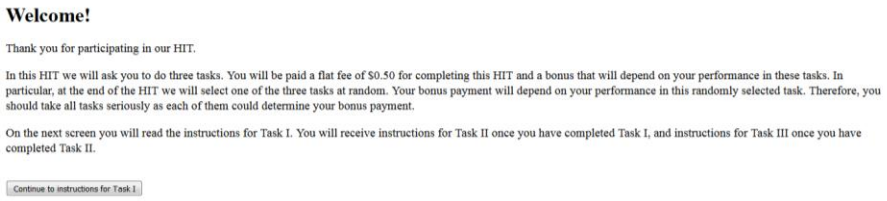
Tversky, A., and D. Kahneman. 1981. The Framing of Decisions and the Psychology of Choice. *Science* 211(4481), 453–458.

SUPPLEMENTARY MATERIAL (NOT FOR PUBLICATION)

APPENDIX A: EXPERIMENTAL INSTRUCTIONS

[Common to all treatments]

Screen 1: introduction



Welcome!

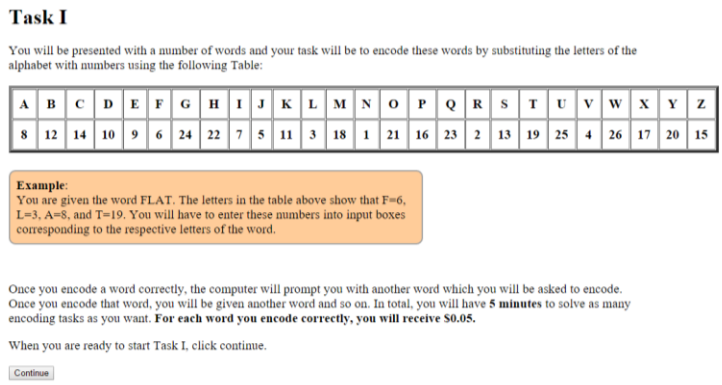
Thank you for participating in our HIT.

In this HIT we will ask you to do three tasks. You will be paid a flat fee of $0.50 for completing this HIT and a bonus that will depend on your performance in these tasks. In particular, at the end of the HIT we will select one of the three tasks at random. Your bonus payment will depend on your performance in this randomly selected task. Therefore, you should take all tasks seriously as each of them could determine your bonus payment.

On the next screen you will read the instructions for Task I. You will receive instructions for Task II once you have completed Task I, and instructions for Task III once you have completed Task II.

Continue to instructions for Task I

Screen 2: Part 1 instructions



Task I

You will be presented with a number of words and your task will be to encode these words by substituting the letters of the alphabet with numbers using the following Table:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

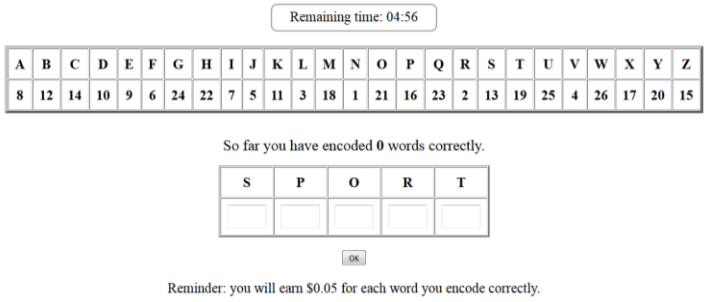
Example:
You are given the word FLAT. The letters in the table above show that F=6, L=3, A=8, and T=19. You will have to enter these numbers into input boxes corresponding to the respective letters of the word.

Once you encode a word correctly, the computer will prompt you with another word which you will be asked to encode. Once you encode that word, you will be given another word and so on. In total, you will have **5 minutes** to solve as many encoding tasks as you want. **For each word you encode correctly, you will receive $0.05.**

When you are ready to start Task I, click continue.

Continue

Screen 3: Part 1



Remaining time: 04:56

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

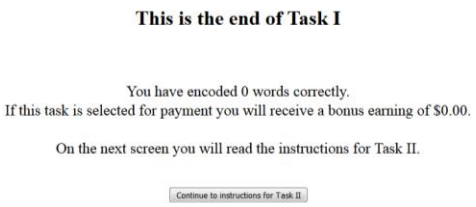
So far you have encoded **0** words correctly.

S	P	O	R	T

OK

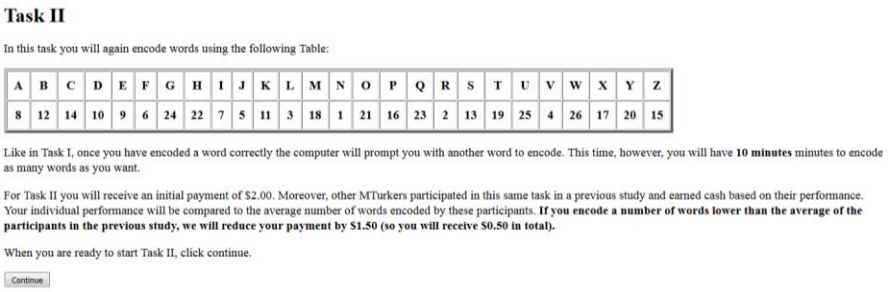
Reminder: you will earn $0.05 for each word you encode correctly.

Screen 4: Part 1 feedback

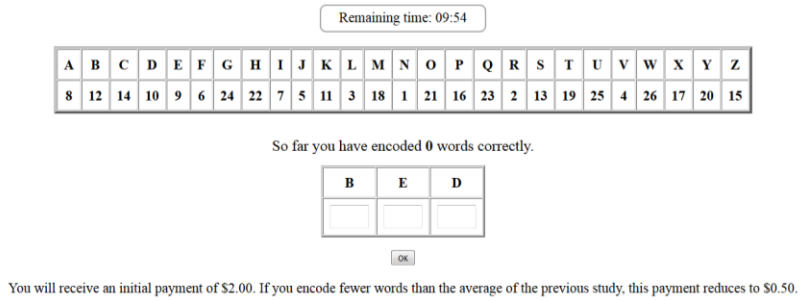


[Unannounced Fine]

Screen 5: Part 2 instructions

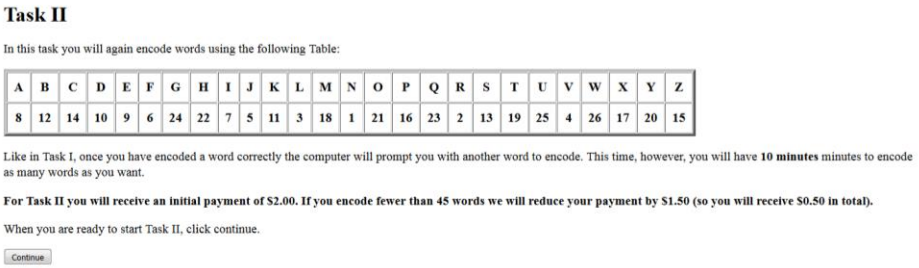


Screen 6: Part 2



[Announced Fine]

Screen 5: Part 2 instructions



Task II

In this task you will again encode words using the following Table:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

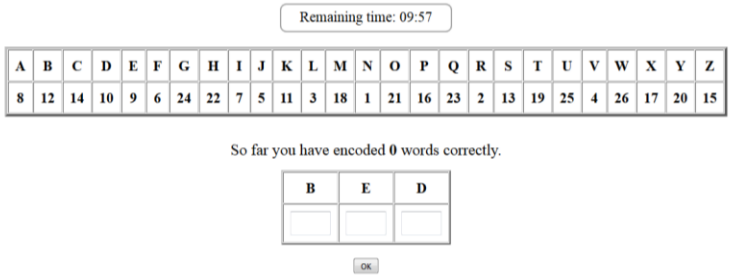
Like in Task I, once you have encoded a word correctly the computer will prompt you with another word to encode. This time, however, you will have **10 minutes** minutes to encode as many words as you want.

For Task II you will receive an initial payment of $2.00. If you encode fewer than 45 words we will reduce your payment by $1.50 (so you will receive $0.50 in total).

When you are ready to start Task II, click continue.

Continue

Screen 6: Part 2



Remaining time: 09:57

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

So far you have encoded **0** words correctly.

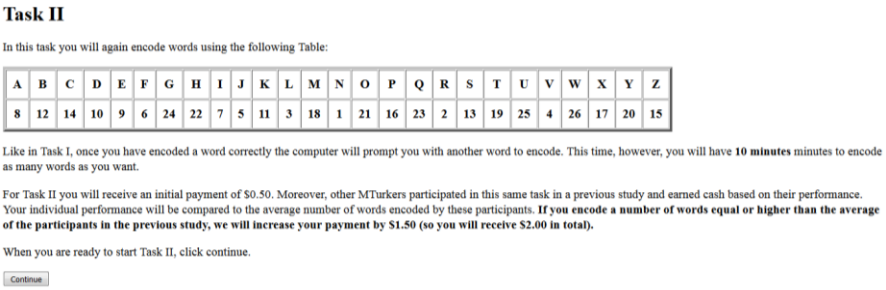
B	E	D

OK

You will receive an initial payment of $2.00. If you encode fewer than 45 words, this payment reduces to $0.50.

[Unannounced Bonus]

Screen 5: Part 2 instructions



Task II

In this task you will again encode words using the following Table:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

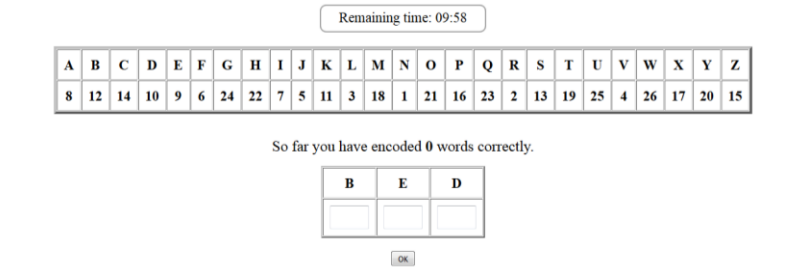
Like in Task I, once you have encoded a word correctly the computer will prompt you with another word to encode. This time, however, you will have **10 minutes** minutes to encode as many words as you want.

For Task II you will receive an initial payment of $0.50. Moreover, other MTurkers participated in this same task in a previous study and earned cash based on their performance. Your individual performance will be compared to the average number of words encoded by these participants. **If you encode a number of words equal or higher than the average of the participants in the previous study, we will increase your payment by $1.50 (so you will receive $2.00 in total).**

When you are ready to start Task II, click continue.

Continue

Screen 6: Part 2



Remaining time: 09:58

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

So far you have encoded **0** words correctly.

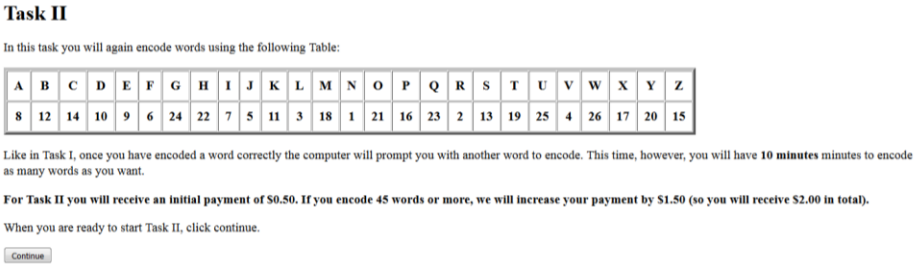
B	E	D

OK

You will receive an initial payment of $0.50. If you encode more words than the average of the previous study, this payment increases to $2.00.

[Announced Bonus]

Screen 5: Part 2 instructions



Task II

In this task you will again encode words using the following Table:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

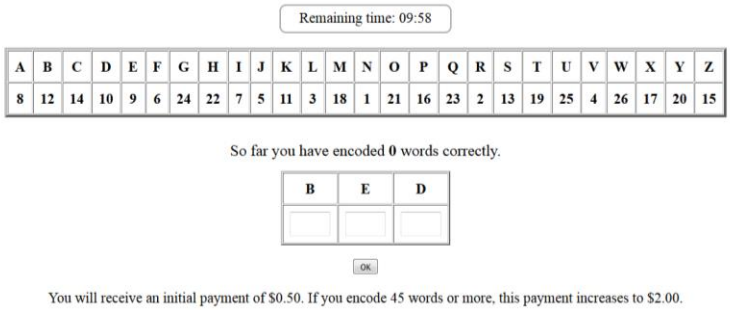
Like in Task I, once you have encoded a word correctly the computer will prompt you with another word to encode. This time, however, you will have **10 minutes** minutes to encode as many words as you want.

For Task II you will receive an initial payment of $0.50. If you encode 45 words or more, we will increase your payment by $1.50 (so you will receive $2.00 in total).

When you are ready to start Task II, click continue.

Continue

Screen 6: Part 2



Remaining time: 09:58

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8	12	14	10	9	6	24	22	7	5	11	3	18	1	21	16	23	2	13	19	25	4	26	17	20	15

So far you have encoded **0** words correctly.

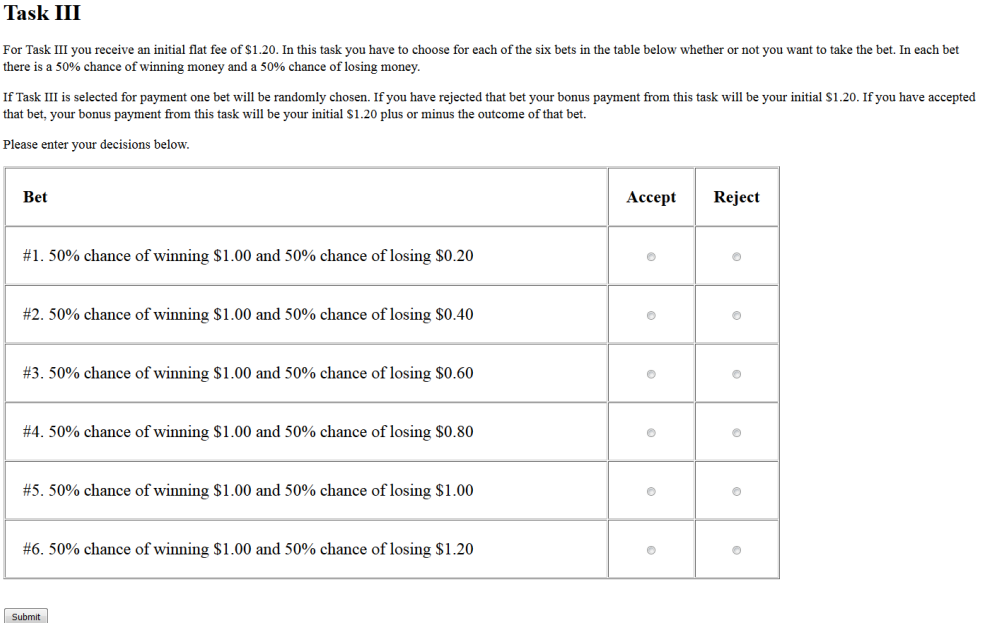
B	E	D

OK

You will receive an initial payment of $0.50. If you encode 45 words or more, this payment increases to $2.00.

[Common to all treatments]

Screen 7: Part 3



Task III

For Task III you receive an initial flat fee of $1.20. In this task you have to choose for each of the six bets in the table below whether or not you want to take the bet. In each bet there is a 50% chance of winning money and a 50% chance of losing money.

If Task III is selected for payment one bet will be randomly chosen. If you have rejected that bet your bonus payment from this task will be your initial $1.20. If you have accepted that bet, your bonus payment from this task will be your initial $1.20 plus or minus the outcome of that bet.

Please enter your decisions below.

Bet	Accept	Reject
#1. 50% chance of winning $1.00 and 50% chance of losing $0.20	○	○
#2. 50% chance of winning $1.00 and 50% chance of losing $0.40	○	○
#3. 50% chance of winning $1.00 and 50% chance of losing $0.60	○	○
#4. 50% chance of winning $1.00 and 50% chance of losing $0.80	○	○
#5. 50% chance of winning $1.00 and 50% chance of losing $1.00	○	○
#6. 50% chance of winning $1.00 and 50% chance of losing $1.20	○	○

Submit