

## Happiness and Productivity

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## Abstract

Some firms say they care about the happiness and ‘well-being’ of their employees. But are such claims hype? Or might they be scientific good sense? In a paid piece-rate setting, we demonstrate that human happiness boosts human productivity. In Experiment 1, a randomized controlled trial is designed. Some individuals are made happier, while those in a control group are not. The treated individuals have 12% greater productivity than the controls. This effect comes through quantity. Quality is unaffected. To check the size, external validity, and lasting nature of these kinds of influences, Experiment 2 is then constructed. Fundamental real-world shocks (bereavement and family illness) are studied. As predicted, lower happiness is associated with lower productivity. Both kinds of evidence -- ones with powerfully complementary features -- suggest the existence of a consistent pattern in human performance that is potentially exploitable in many types of organization.

*At Google, we know that health, family and wellbeing are an important aspect of Googlers' lives. We have also noticed that employees who are happy ... demonstrate increased motivation ... [We] ... work to ensure that Google is... an emotionally healthy place to work.* Lara Harding, People Programs Manager, Google.

*Supporting our people must begin at the most fundamental level – their physical and mental health and well-being. It is only from strong foundations that they can handle ... complex issues.*  
Matthew Thomas, Manager – Employee Relations, Ernst and Young.

Quotes from the report Healthy People = Healthy Profits Source: <http://www.dwp.gov.uk/docs/hwwb-healthy-people-healthy-profits.pdf>

## 1. Introduction

There is a large literature on productivity at the personal and plant level (for example, Caves 1974, Lazear 1981, Ichniowski and Shaw 1999, Siebert and Zubanov 2010, Segal 2012) and a growing one on the measurement of human well-being (for example, Van Praag and Ferrer-I-Carbonell 2004, Layard 2006, Ifcher and Zarghamee 2009, Benjamin et al. 2010). Yet economists and management scientists know comparatively little about the links between these two variables. Although workers' well-being and effort decisions are likely to be deeply intertwined, evidence is lacking on how they are causally connected.

This paper tackles the question of whether happiness induces better motivation or instead promotes less productive behavior by workers. In a setting in which people are paid in a piece-rate way -- the iconic set-up in economics -- for their efforts we find evidence consistent with large, positive causal effects from happiness upon productivity. Our study:

- (i) experimentally 'assigns' happiness in the laboratory
- (ii) exploits data on major real-life (un)happiness shocks stemming from close bereavement and family illness, of a kind that, by their nature, cannot be randomly assigned by an experimenter in a laboratory.

The first has the *advantage* that we can control the happiness shock and the *disadvantage* that we then study a small shock of a special kind in the laboratory. The second has the *disadvantage* that we cannot control the happiness shock and the *advantage* that it studies a large shock of an important kind in real life. We check for consistency between the implications of each of (i) and (ii). Our later Figures 1 and 3 illustrate the study's key results in a simple way<sup>1</sup>.

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<sup>1</sup> The relevance of this effect is witnessed by a widely advertised business-press literature suggesting that employee happiness is a common goal in firms, with the expectation that happier people are more productive. But this issue has been largely overlooked

In the first experiment, we draw upon ideas and methods used in sources such as Kirchsteiger, Rigotti and Rustichini (2006). The random assignment of happiness is undertaken using a standard method -- mood induction -- and more specifically a movie clip chosen to operate as both audio and visual stimulus. Our experimental method is also similar -- though their focus is not on productivity -- to that used in the work of Ifcher and Zarghamee (2009). We gather reported well-being data from our subjects. These data are used in supporting regressions, and verify that our mood induction procedure is successful. In the second experiment, we use reported happiness data (gathered before the experimental task was undertaken) as one independent variable.

From a theoretical point of view, our paper lends support to concepts emphasized by Kimball and Willis (2006), Becker and Rayo (2008) and Benjamin, Heffetz, Kimball and Rees-Jones (2010). A key idea is that happiness may be an argument of the utility function rather than solely a proxy for it.<sup>2</sup> Like Oswald and Wu (2010), later results suggest empirical support for the informational content of well-being data.

## 2. Background

In spite of its relevance to a wide range of settings (such as the workplace and the classroom), the concept of the ‘happy-and-thus-productive worker’ has typically been treated in the folklore of management as a claim made only by practitioners or in the popular press (Wright and Staw, 1998). Some psychologists, such as Argyle (1989), have studied cross-sectional patterns in job satisfaction. Others have addressed this by examining self-control and performance. Isen and Reeve (2005) show that positive well-being induces subjects to change their allocation of time towards more interesting tasks, and that, despite this, the subjects retain similar levels of performance in the less interesting tasks. This hints at individuals becoming better

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by the economics literature.

<sup>2</sup> A considerable literature in economics has studied happiness and wellbeing as a dependent variable – including Blanchflower and Oswald (2004), Clark et al. (2008), Di Tella et al. (2001), Frey and Stutzer (2002, 2006), Luttmer (2005), Pischke (2010), Senik (2004), Powdthavee (2010), Van Praag and Ferrer-I-Carbonell (2004), and Winkelmann and Winkelmann (1998). See Freeman (1978) and Pugno and Depedri (2009) on job satisfaction and work performance.

able to undertake repetitive tasks as they become happier -- though the authors do not discuss exactly why this might be true or how this interacts with performance-related payment. More generally, positive well-being may influence the capacities of choice and innovative content.<sup>3</sup> Such findings apply to unpaid settings.

The present paper implements an empirical test that to our knowledge has not been performed before. We address a question that is of interest to economists and perhaps also to policy-makers: Does ‘happiness’ make people more productive in a paid task? The paper finds that it does. We demonstrate this in a piece-rate ‘white-collar’ setting<sup>4</sup> with otherwise well-understood properties.<sup>5</sup> The effect operates principally through a rise in sheer output rather than in the per-item quality of the laboratory subjects’ work.

Together with the works mentioned in the previous section, a number of other papers have been interested in well-being and performance. Amabile et al. (2005) uncovers evidence that happiness provokes greater creativity. The work of Wright and Staw (1998) examines the connections between worker well-being and supervisors’ ratings of workers. Depending on the well-being measure, the authors find mixed results. In contrast to our paper’s later argument, Sanna et al. (1996) suggests that those individuals in a negative mood put forth a high level of effort.<sup>6</sup> However, these results are all for unpaid activities; the laboratory subjects’ marginal wage rate is zero. Our work also relates to Dickinson (1999), who provides evidences that an increase of a piece-rate wage can decrease hours but increase labor intensity, and Banerjee and Mullainathan (2008), who consider a model where labor intensity depends on outside worries and this generates non-linear dynamics between wealth and effort. A paper by Benabou and Tirole (2002) focuses on the interactions between self-deception, malleability of memory, ability, and effort. Compte and Postlewaite (2004) extend this line of work; they seek to identify circumstances in which biased perceptions might increase welfare. The authors treat perceptions as an

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<sup>3</sup> A body of related empirical research by psychologists has existed for some years. We list a number of them in the paper’s references; these include Ashby et al. (1999), Isen (2000), and recent work by Hermalin and Isen (2008). Our study also links to ideas in the broaden-and-build approach of Frederickson and Joiner (2002) and to the arguments of Lyubomirsky et al. (2005).

<sup>4</sup> Such as Niederle and Vesterlund (2007).

<sup>5</sup> The analysis draws on a kind of mood induction procedure that is uncommon in the economics literature but is more familiar to researchers in social psychology. An exception is Kirchsteiger, Rigotti, and Rustichini (2006), who find a substantial impact in the context of gift-exchange.

<sup>6</sup> See also Baker et al. (1997), Patterson et al. (2004), Steele and Aronson (1995), and Tsai et al. (2007).

accumulation of past experiences under gradual adjustment. Benabou and Tirole (2003) provide a formal reconciliation of the importance of intrinsic motivations with extrinsic (incentivised) motivations. New work by Segal (2012) also distinguishes between two underlying elements of motivation. Such writings reflect an increasing interest among economists in how to reconcile external incentives with intrinsic forces such as self-motivation.<sup>7</sup>

Finally, Gneezy and Rustichini (2000) examine the relationship between monetary compensation and performance. They provide contrasting kinds of evidence. They show that increasing the size of monetary compensation raises performance, but they also conclude that offering no monetary compensation can be better motivation than offering some.

### 3. A Simple Model of Work and Distraction

This section suggests a potential theoretical framework. It probes the question of whether happiness can be expected to induce better intrinsic motivation or less careful behavior at work.

Our main, and simple, comparative-static result stems from a form of internal resource-allocation by a worker. A later empirical section discusses the theoretical model in the light of the answers that (a subset of) laboratory subjects gave to a questionnaire presented to them at the end of the experiment. The modeling structure is potentially complementary to Ashby et al.'s (1999) neurobiological one, where the emphasis is on a route from well-being to increased dopamine, but ours is framed in the choice-theoretic style of neoclassical economics as in Dickinson (1999) and Banerjee and Mullainathan (2008). It takes the following form.

Think of individuals as having a finite amount of energy. Within any period of time, they must choose how to distribute that across different activities. Denote  $u$  and  $v$  as two different sources of utility to the individual. Let  $e$  be the energy the worker devotes to solving tasks in the workplace. Let  $w$  be the energy the worker

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<sup>7</sup> A review paper examining the links between choices and emotional state in psychology is Diener et al. (1999).

devotes to other things – in other words to what might be called the ‘distractions’ of the world and away from the job. Let  $R$  be the worker’s psychological resources. Hence  $(e + w)$  must be less than or equal to  $R$ .

We assume that  $u$ , the utility from work, depends on both the worker’s earnings and the effort put into solving work problems. Then  $v$  is the utility from attending more broadly to the remaining aspects in life. For concreteness, we could think of this second activity as a form of ‘worrying’ about what is going on the world outside the workplace. In a paid-task setting, it might be realistic to think of a person as alternating, during the working day, between concentrating on the work task and being distracted by the rest of his or her life. There is some psychic return from the energy devoted to distraction and worry.

Now we consider an initial happiness shock,  $h$ . We assume this to be an argument of an overall utility function as proposed, for example, by Kimball and Willis (2006) or Becker and Rayo (2008). For clarity, assume separability between the two kinds of utility going to the individual.

People then optimize by solving the following problem. Choose paid-task energy  $e$  in order to

$$\text{Maximize } H(p, e, h, z, w) = u(p, e, h, z) + v(w, h) \quad (1)$$

s.t.  $R$  greater than or equal to  $e+w$ . The first-order condition for a maximum in this problem is the conventional

$$Eu_e - v_w = 0 . \quad (2)$$

One comparative-static result is of particular interest here. It is the response of productivity, given by work effort  $e$ , to a rise in the initial happiness shock,  $h$ . It is determined in a standard way. The sign of  $de^*/dh$  has the same sign as the cross partial of the maximand  $H(\dots)$ , so that:

$$\text{Sign } de^*/dh \text{ takes the sign of } Eu_{eh} - v_{wh} . \quad (3)$$

Without more restrictions, this sign could be positive or negative. A happiness shock could increase or decrease the amount of effort put into the work task.

To get insight into the likely economic outcome, consider possible forms of these functions. Let  $R$  be normalized to unity. Assume that the  $u$  and  $v$  functions are concave and differentiable; this is not strictly necessary, but it leads to natural forms of interior solutions. The analysis is straightforwardly generalized.

How might an exogenous happiness perturbation,  $h$ , enter a person's objective function?

An additive model would have the maximand

$$H = u(.) + v(.) + h$$

and this is perhaps -- we conjecture -- what many economists would write down when asked to think about exogenous emotions and choice. They might tend to view a 'happiness shock' as a vertical shift upwards in the utility function. Then, the optimal work effort  $e^*$  is independent of the happiness shock,  $h$ , so that happier people are neither more nor less productive.

Another form of utility function has a happiness shock operating within a concave structure. Hence assume that the worker solves the problem:

$$\text{Maximize } u(pe + h) + v(1 - e + h) \quad (4)$$

which is an assumption that  $h$  is now a shift variable inside the utility function itself, rather than an additive part of that function.

In this case the first-order condition takes the form

$$u'(pe + h)p - v'(1 - e + h) = 0. \quad (5)$$

In this case, the optimal level of energy devoted to solving work problems,  $e^*$ , does depend on the level of the happiness shock,  $h$ . Here the sign of  $de^*/dh$  takes the sign of  $u''(pe + h)p - v''(1 - e + h)$ . Its first element is thus negative and its second is positive. By the first-order condition, we can replace the piece rate wage term  $p$  by the ratio of the marginal utilities from working and worrying.

Then, after straightforward substitution, the sign of the comparative static response of work effort,  $e$ , with respect to the size of the happiness shock,  $h$ , is greater than or equal to zero as



$$\frac{u''(.)}{u'(.)} - \frac{v''(.)}{v'(.)} \geq 0. \quad (6)$$

These terms can be viewed as versions of the degrees of absolute risk aversion in each of two domains -- the utility from work and the utility from worrying. If the marginal utility of worry declines quickly enough as energy is transferred from working to worrying, then a positive happiness shock will successfully raise the worker's chosen productivity,  $e^*$ . As the individual become happier, that in turn allows him or her to divert attention away from other concerns of life and to focus more on the job. If condition (6) does not hold, the shock in happiness would lower the marginal utility from working and divert more energy to worry -- hence the level of effort,  $e$ , would decline.<sup>8</sup> This analytical approach, in which effort is not independent of  $h$ , potentially offers economists a way to think about the role of work-life strain. That could be conceived of as the (rational) need to devote energy and attention away from a job. Intuitively, happier workers need to do so less, and so have higher productivity.<sup>9</sup>

Finally, we might also consider what happens if the happiness shock raises the worker's responsiveness to rewards. In this case, the worker's problem becomes:

$$\underset{e}{\text{Max}} u((1+h)pe) + v(R-e) \quad (7)$$

The first-order condition now takes the form  $(1+h)pu'(\cdot) - v'(\cdot) = 0$ , from where we find that in some circumstances  $de^*/dh > 0$  and individuals are induced to work harder by the higher marginal utility generated by the reward.

#### 4. An Experimental Framework

In the experiment described next, a positive shock to happiness does appear to make individuals work harder. A version of condition (6) could be thought of as holding.<sup>10</sup> But our study can be viewed independently of a framework of the earlier form.

We start with a motivation for the choices made within the experiment's

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<sup>8</sup> Interestingly, in the empirical part of this study, some respondents used phrases like "distracting" and "relaxing".

<sup>9</sup> An empirical study has recently been published in which it has been shown, consistent with this paper's modeling structure, that happiness is correlated with concentration and unhappiness with a wandering mind: Killingsworth and Gilbert (2010).

<sup>10</sup> Because our experiment is between-subject, we cannot measure the effect of the shock on a particular subject.

design, and then provide a description of the tasks and a time-line for the trial. The experimental instructions, a GMAT MATH-style test, and the questionnaires are set out in an appendix. The structure was built around the desire to understand the productivity of workers engaged in a task for pay. The focus is the consequences, for their output, of different starting levels of happiness.

This study employs a task previously used in Niederle and Vesterlund (2007). Individuals are asked to add sequences of five 2-digit numbers under timed conditions. This task is simple but is taxing under pressure. We think of it as representing -- in a stylized way -- an iconic white-collar job: both intellectual ability and effort are rewarded. The laboratory subjects were allowed to use pen and paper, but not a calculator or similar.

Some way has to be found of inducing an exogenous rise in happiness. The psychology literature offers evidence that movie clips (through their joint operation as a form of audio and visual stimulus) are a means of doing so. Westermann et al. (1996) provides a meta-analysis of methods.

Therefore, to make our laboratory individuals happier, we used a 10-minute clip of sketches enacted by a well-known British comedian. In order to ensure that the movie clip and subjects were well-matched, we restricted the laboratory pool to subjects of British background, who would likely have been exposed to similar humor before.

To help to disentangle effort from ability, we used two control variables that we hoped would capture underlying ability. The variables came from (i) a brief GMAT MATH-style test (5 multiple-choice questions) along similar lines to that of Gneezy and Rustichini (2000) and (ii) information in a final questionnaire on a measure of prior exposure to mathematics.<sup>11</sup>

## 5. The Design in More Detail

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<sup>11</sup> We deliberately kept the number of GMAT MATH-style questions low. This was to try to remove any effort component from the task so as to keep it a cleaner measure of raw ability: 5 questions in 5 minutes is a relatively generous amount of time for an IQ-based test, and casual observation indicated that subjects did not have any difficulty giving some answers to the GMAT MATH-style questions, often well within the 5-minute deadline.

In Experiment 1, people were divided into two groups:

*Treatment 0*: a control group who were not exposed to a comedy film clip.

*Treatment 1*: a treated group who were exposed to the comedy clip.

The control-group individuals were never present in the same room with the treated subjects (they never overheard laughter, or had any other interaction). The experiment was carried out with deliberate alternation of the early and late afternoon slots. This was to avoid time-of-day effects.

Our main experiment took place over 4 days and 8 sessions. We then added 4 more sessions. These checked for the robustness of the central result to the introduction of an explicit payment and a placebo film (shown to the otherwise untreated group).

Accordingly, the experiment consisted of

- Day 1: session 1 (treatment 0 only), session 2 (treatment 1 only).
  - Day 2: session 1 (treatment 0 only), session 2 (treatment 1 only).
  - Day 3: session 1 (treatment 1 only), session 2 (treatment 0 only).
  - Day 4: session 1 (treatment 1 only), session 2 (treatment 0 only).
- plus
- Day 5: session 1 (treatment 1 and explicit payment), session 2 (treatment 0 and placebo clip)
  - Day 6: session 1 (treatment 0 and explicit payment), session 2 (treatment 1 and explicit payment)

Subjects were allowed to take part on only one day and in only one session.

On arrival in the lab, individuals were randomly allocated an ID, and made aware that the tasks at hand would be completed anonymously. They were asked to refrain from communication with each other. Those in treatment 1 (the Happiness Treatment subjects) were asked to watch a 10 minute comedy clip designed to raise happiness.<sup>12</sup> Those in the control group came separately from the other group, and were neither shown a clip nor asked to wait for 10 minutes.

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<sup>12</sup> The questionnaire results indicate that the clip was generally found to be entertaining and had a direct impact on reported happiness levels. More on this is in the results section.

For days 1-4, the subjects in both the movie-clip group (treatment 1) and the not-exposed-to-the-clip control group (treatment 0) were given identical instructions about the experiment. These included an explanation that their final payment would be a combination of a show-up fee (£5) and a performance-related payment to be determined by the number of correct answers in the tasks ahead. At the recruitment stage, it has been stated that subjects would make "... a guaranteed £5, and from £0 to a feasible maximum of around £20 based purely on performance". In practice, subjects received £0.25 per correct answer on the arithmetic task and £0.50 on each correct GMAT MATH answer, and this was rounded up to avoid the need to give them large numbers of coins as payment.

We used two different forms of wording:

- For days 1-4 we did not specify exact details of payments, although we communicated clearly to the subjects that the payment did depend heavily on performance.
- For days 5-6 the subjects were told the explicit rate of pay both for the numerical additions (£0.25 per correct answer) and GMAT MATH-style questions (£0.50 per correct answer).

This achieved several things. First, in the latter case we have a revealed-payment setup, which is a proxy for many real-world piece-rate contracts (days 5-6), and in the former we mimic those situations in real life where workers do not have a contract where they know the precise return from each productive action they take (days 1-4). Second, this difference provides the opportunity to check that the wording of the payment method does not have a significant effect -- essentially making one set of days a robustness check on the other. The results show that the role of happiness is not different in days 5-6 compared to days 1-4.

Following the economist's tradition, one reason to pay subjects more for every correct answer was to emphasize that they would benefit from higher performance. We could also then avoid the idea that they might be paying back effort -- as in a kind of 'reciprocity' effect -- to the investigators for the show-up fee.

The subjects' first task was to answer correctly as many different additions of five 2-digit numbers as possible. Each subject had a randomly designed sequence of these arithmetical questions. Numerical additions were undertaken directly through a protected Excel spreadsheet, with a typical example as in Legend 1.

31	56	14	44	87	
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Legend 1: *Adding 2-digit Numbers under Timed Pressure*

The second element was to complete a 5-question GMAT MATH-style test. The questions were provided on paper, and the answers were inputted into a prepared protected Excel spreadsheet. The exact questions are reported in the appendix.

The final task, which was not subject to a performance-related payment (and subjects were made aware of this), was to complete a questionnaire. A copy of this is provided in the appendix. The questionnaire inquired into both the happiness level of subjects (before and after the clip for treatment 1), and their level of mathematical expertise<sup>13</sup>. The wording was designed to be straightforward to answer; anonymity was once again stressed before it was undertaken; the scale used, following the well-being literature, was a 7-point metric. In day 5 and day 6, we added extra questions (as detailed in the appendix). These were designed to inquire into subjects' motivations and their own perceptions of what was happening to them. The purpose was to try to shed light on the psychological mechanism that made our treated subjects work harder.

To summarize, the timeline for Experiment 1:<sup>14</sup>

- 1. Subjects enter and are given basic instructions on experimental etiquette.*
- 2. Subjects in treatment 1 are exposed to a comedy clip for 10 minutes, otherwise not.*

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<sup>13</sup> In this experiment, we choose not to measure the happiness level at the beginning; this is to avoid the possibility that subjects treated with the comedian clip could guess the nature of the experiment. As reported below, we can argue from the answers given to the questionnaires that we have been successful in this aim.

<sup>14</sup> The full instructions provided in the appendix provide a description of the timing.

3. *Subjects are given additional instructions, including a statement that their final payment relates to the number of correct answers, and instructed against the use of calculators or similar devices.*

4. *Subjects move to their networked consoles and undertake the numerical additions for 10 minutes.*

5. *Results are saved and a new task is initiated, with subjects undertaking the GMAT MATH-style test for 5 minutes.*

6. *Results are again saved, and subjects then complete the final questionnaire.*

7. *After the questionnaire has been completed, subjects receive payment as calculated by the central computer.*

## 6. Principal Results from Experiment 1

A group of 276 subjects participated in the experiment. Of these, 182 took part in the main experiment, while the rest participated in the sessions of day 5 and 6. A breakdown of the numbers per day and per session is contained in Table 1.

The subject pool in the main version of Experiment 1 was made up of 110 males and 72 females. Tables 2 and 3 describe the data. They summarize the means and standard deviations of the main variables (respectively for the treated and untreated subjects).

Our main dependent variable in our analysis is the number of correct additions in the allotted ten minutes. It has a mean, as shown in Table 2, of 17.91. Our key independent variable is whether or not a person observed the happiness movie clip.<sup>15</sup>

The findings of the experiment are illustrated in Figure 1. Here the square parentheses give 95% confidence levels.

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<sup>15</sup> 'Happiness before' in Table 2 is the reported level of happiness for the subjects (before they saw the clip for the treated group) on a seven point scale. The variable 'happiness after' is the level of happiness after the clip for the treated group. 'GMAT MATH' is the number of correct problems solved in that section; 'high-school-grades' is an index calculated from the questionnaire. Enjoyment-of-clip is a measure in a range between 1 and 7 of how much they said they liked the movie clip. Our movie clip is successful in increasing the happiness levels of subjects. The subjects report an average rise of almost one point on the scale of 1 to 7. Moreover, comparing the ex-post happiness of the treated subjects with that of the non-treated subjects, we observe that the average of the former is higher by 0.85 points. Using a two-sided t-test, this difference is statistically significant ( $p < 0.01$ ). Finally, it is useful to notice that the reported level of happiness before the clip for the treated group is not statistically significantly different (the difference is just 0.13) from the happiness of the untreated group ( $p = 0.20$  on the difference).

The treated group's mean performance is higher by 1.71 additions than the performance of the control group. This productivity difference is considerable; it is approximately ten percent. It is significantly different from zero ( $p=0.04$ ) on a t test.

As shown in Figure 1, both male and female groups have a similar increase in their productivity (1.90 additions for males, 1.78 for females). The effects of the movie clip on productivity do not operate exactly symmetrically. From the cumulative distributions -- see Figure 2 -- on the number of correct answers for the treated and untreated groups, it can be seen that the treatment increases the performances of low and medium performers, while the high performers are less affected.

One sub-group was noticeable in the data. Encouragingly for our account, the performance of those 16 subjects in the treated group who did not report an increase in happiness is not statistically different from the performance of the untreated group ( $p=0.67$ ). The increase in performance seems to be linked to the rise in happiness rather than merely to the fact of watching a movie clip.

These findings draw on t-tests. We also used OLS regressions.

Table 7 presents equations for the log of the number of correct additions. 'Treatment' is whether the person was exposed to the happiness shock. The variable called 'Change-in-Happiness' is the difference in reported happiness before and after the clip; 'GMAT MATH' is a test score. 'High School Grades' measures school performance. 'Day 2', 'Day 3' and 'Day 4' are day-of-the-week dummies.

Consistent with the t-test on the means, the subjects' levels of performance are markedly better in the treated sessions. In the first column of Table 7, this holds when we control for the subjects' characteristics and for periods. The coefficient of 0.118 implies that the happiness treatment increases people's productivity by approximately 12%. In column 2 of Table 7, the performances are increasing in the rise in elicited happiness (for the case of untreated subjects, by definition, Change-in-Happiness = 0). Importantly, this result still holds if we restrict the analysis to the

treated subjects alone, as in column 3. The size of the productivity boost is then slightly smaller (than in column 2 of Table 7) at approximately eight and a half percentage points.

Because of the skewness in human performance data, it is natural to estimate in logarithms. As a check, however, Table 8 re-estimates the regressions of Table 7 with a dependent variable defined on absolute values rather than log values. The variable ‘Treatment’ in column 1 remains substantial and positive at 1.136. It remains statistically significant if, in column 2 of Table 8, we exclude the performance outliers (here we drop two extreme laboratory subjects, who had respectively 2 and 43 correct additions). The coefficient on the variable Change-in-Happiness is statistically significantly different from zero irrespective of whether or not in Table 8 the two outliers are retained.

Might this pattern in the data be in part a kind of reciprocity effect? Are these laboratory subjects ‘repaying’, or somehow trying to please, the investigators? Such difficulties are not uncommon in economics experiments. However, it is not applicable in the current setting. In this experiment, people are paid more for every addition they solve. That money goes to them, so that, if anything, they know that extra productivity hurts rather than aids the investigators.<sup>16</sup>

Alternatively, laboratory subjects might wish to reciprocate the expected payments made by experimenters by doing as the experimenter wishes. To partially address this, we added direct questions to the questionnaires in days 5 and 6, asking subjects: “Did you try your best when asked to add numbers?”; “If so, why? If not, why not?”; “Did you feel that first observing the video clip made you better or worse at adding up numbers?”; and “Can you say why you believe that?” Among the treated subjects, out of 48 answers only 31% thought the clip had a good effect, for 23% this effect was bad, while 42% felt it was irrelevant. The number of subjects who declared that the clip had beneficial consequences was not statistically larger than the

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<sup>16</sup> Notwithstanding this point, even if the mood-induction procedure did enhance productivity in the experiment through some feeling of reciprocity on the part of the subjects, this would not be in contrast with our hypothesis. Subjects became happier after the clip, assuming against our previous argument that they wanted to reciprocate by working harder. This feeling would always result through a positive increase of  $u(\cdot)$ , the utility from working. This mechanism would result in a positive transfer of  $e$  from worrying to working. The difference would be that  $h$  would act to increase  $u(\cdot)$  through reciprocity rather than directly.



number of subjects who felt the effect likely to be bad ( $p=0.22$ ). Furthermore, among the 25 subjects who were shown a placebo film -- discussed later -- the answers were similar (bad 44%, good 24%, indifferent 32%). The difference between subjects who thought that the placebo film had a positive influence is not statistically different from the number of subjects thinking that the real treatment had a positive effect ( $p=0.26$ ). This points towards subjects not being able to assess the impact of the clip, and not being sure whether we as experimenters were using the clip to aid or hinder them.

Did subjects perhaps convince themselves that the fact of watching a clip per se might enhance performance? We discuss this later, and find that it is unlikely to be true. Individuals who are treated with a placebo clip do not perform significantly differently from individuals who are untreated (if anything, they do fractionally worse on the additions task). It appears, therefore, that positive emotion invigorates human beings. Yet the mechanism is unclear. Does happiness have its effect on labor productivity through greater numbers answered or through greater accuracy of the average answer? This distinction is of interest. It might even be viewed as one between industry and talent -- between the consequences of happiness for pure effort compared to effective skill.

To inquire into this, we estimated a different regression equation. Table 9 takes *attempted additions* (in log terms) as the dependent variable. Attempted additions rise by slightly more than 9% after the happiness treatment.

Table 10 runs a different regression. This is an equation for 'precision', namely, the *ratio of correct-answers to attempted-answers*. In Table 10, neither Treatment nor Change-in-Happiness is statistically significantly different from zero. Therefore the happiness treatment acts as an upward intercept shifter in the attempts equation; the treatment itself does not provide extra precision.

## 7. Checks

We performed a set of tests of robustness. Detailed results from these, with tables, are in the appendix.

First, we examined sub-samples of data. The positive effect on productivity was visible in a robust way. This can be seen in the first part of the appendix. In the raw data of Table A2, the productivity boost from the happiness treatment is observable in seven of the eight sub-trials. The single exception is for males in Session 2, and that result is driven by one outlier -- the individual in the sample who scored an extraordinary 43 correct answers. Tables A3 and A4 give regression results for further breakdowns of the data. The continued robustness of the main finding is evident.

Second, an extra trial was done in which a 'placebo' film -- a moderately interesting but not intrinsically happy clip -- was shown to a control group. This was to ensure that our productivity findings were not an outcome that any film might be produce. The film clip was "Computer Graphic" on James Gross's resources site: [http://www-psych.stanford.edu/~psyphy/movs/computer\\_graphic.mov](http://www-psych.stanford.edu/~psyphy/movs/computer_graphic.mov).

This movie clip depicts patterns of colored sticks. These appear and disappear randomly on screen. The film is considered "neutral" by social psychologists. By setting the process to repeat, it was possible to play this clip for the appropriate length of time. Importantly, the productivity of individuals was not increased by showing them this placebo film. In Table 11, column 1, it can be seen that the number of correct additions was only marginally affected (not in a statistically significant way).

Third, a trial was done in which individuals were told an explicit monetary amount -- £0.25 -- for each correct answer. The purpose here was to check that having a specified marginal payment did not alter the tenor of the findings. Column 1 of Table 11 shows that this affected productivity in a non-significant way (p value 0.21).

## 8. Subjects' Self-Perceptions

Towards the end of our early experimental trials, it became clear that the main result was occurring again and again -- appearing even in sessions with the fewest subjects. We therefore decided to attempt to probe, in a qualitative way, what might be happening.

In the light of 73 questionnaires completed by the subjects on days 5 and 6, we can ask which of the earlier theoretical ideas are consistent with the subjects' own perceptions. In general, no laboratory subject declared that the treatment induced greater focus, while 10 percent of the treated subjects found the comedy clip distracting (this is significantly different from 0, with  $p=0.01$ ). Moreover, subjects disagreed on the effect of the treatment on performance: out of 48 answers, the effect was fairly evenly spread across those who felt it positive, negative, or irrelevant.

### 9. Real-Life Happiness Shocks and Productivity in a Second Experiment

Is it possible to provide a check on the real-world and external validity of the previous result?

To do so, we designed Experiment 2. For this, a different set of laboratory subjects were used. We built on the simple idea that Nature assigns major life-shocks that cannot for ethical reasons be assigned by any laboratory investigator.

Once again, subjects did the timed-additions task. They were asked at the end of their session to complete a questionnaire (reported in the appendix). This had supplementary questions designed to find out whether they had experienced at least one of the following *bad life events*: close family bereavement, extended family bereavement, serious life-threatening illness in the close family, and/or parental divorce. Later we use the acronym *BLE*. Although we did not know it when we designed our project, the idea of examining such events has also been followed in interesting work on CEOs by Bennedsen et al. (2010), who suggest that company performance may be impeded by traumatic family events.

One feature is important. We asked subjects to report their level of happiness right at the start of the session (that is, prior to any of these questions about life events and prior to any explanation of the tasks to be performed). This was to avoid so-called 'priming' of the individuals. The basic design was kept identical to the main

experiment under explicit payment. Subjects were paid 25 pence per correct addition.

To summarize the timeline for Experiment 2:<sup>17</sup>

1. *Subjects enter and are given basic instructions on experimental etiquette.*
2. *Subjects move to their networked consoles and are asked to report their level of happiness.*
3. *We announce the payment method (25 pence per correct addition), instruct subjects against the use of calculators or similar devices and then subjects undertake the numerical additions for 10 minutes.*
4. *Results are saved, and the GMAT MATH-style test is initiated for 5 minutes, with the explicit payment rate again announced in advance (50 pence per correct answer).*
5. *Results are again saved, and subjects are asked to complete the final questionnaire in privacy and without time pressure.*
6. *After the questionnaire is completed, subjects receive payment as calculated by the central computer.*

Throughout Experiment 2, anonymity and privacy were stressed.

This experiment took place over 2 days and 8 sessions:

- Day 1 (October 2009), 4 sessions lasting approximately 45 minutes each.
- Day 2: (November 2009), 4 sessions lasting approximately 45 minutes each.

Only subjects who had not been in the main Experiment 1 were permitted to take part in this real-life happiness shock experiment, and they were allowed to participate on only one day and in a single session.

A group of 179 subjects participated in this Experiment 2. A detailed breakdown of the numbers per day and per session is contained in Table 12.

For the empirical work, we define a Bad Life Event (BLE) to be either bereavement or illness in the family.<sup>18</sup> Given the smaller numbers, the data suggested

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<sup>17</sup> The full instructions given in the appendix provide a description of the timing.

<sup>18</sup> In the questionnaire, we also asked about parental divorce, but it turned out to have an ambiguous effect on the subject according to the gender of the subject.

that it was appropriate to aggregate these happiness-shock events by using a single variable BLE. Table 13 summarizes the means and standard deviations of the variables.

Here we are thinking of Nature as having dealt randomized shocks to some, but not all, of the laboratory subjects. In effect, we exploit that variation.

It may be worth emphasizing the similarity of the laboratory subjects who took part in these additions experiments. They are young men and women who attend one of the elite English universities with required entry grades amongst the highest three or four universities in the country. Compared to any random slice of an adult population, they are rather homogenous individuals. Those among them who have experienced family illness or bereavement are, to the outside observer, approximately indistinguishable from the others.

The first column of Table 14 reports a happiness equation. It gives the statistical impact of a BLE in each year from 0 to 5 (as declared at the end of the experiment) upon the individuals' levels of happiness (as declared at the beginning of the experiment). At -0.88 in the upper left-hand column, for example, it is large and negative. *Therefore, although our subjects may not be aware of it, their happiness answers at the start of the experiment are correlated with whether later they report that a BLE has recently occurred in their family.* The pattern in the coefficients is consistent with hedonic adaptation -- an effect that is positive, significant, and declining through time. The consequence of a bad life event is empirically strong if it happened less than a year ago, and becomes insignificantly different from zero after approximately 3 years.

The intriguing 'diminishing' effect of a Bad Life Event appears also in the second column of Table 14, which shows the effect of the Years-Since-Bad-Life-Event variable YBLE, set to  $\text{Log}(\text{Year of the Bad Life Event}+0.01)$  if the bad life event occurred, and  $\text{Log}(N+0.01)$  otherwise, where in that case we set the number of

years to  $N=10$ .<sup>19</sup> Consistent with hedonic adaptation, the coefficient on YBLE of 0.13 is positive and statistically significantly different from zero.<sup>20</sup>

These experimental results are consistent with a range of hedonic adaptation findings in the survey-based statistical research literature on the economics of human well-being (e.g. Clark et al. 2008).

In column 3 of Table 14, we aggregate the bad life events into the last two years; as expected, the sign is then negative and significant (the coefficient is -0.43). Column 4 performs a robustness check. As can be observed from the data description, 25 subjects who declared at least one BLE did not report the exact year of it.<sup>21</sup> In order to explore whether these missing data points could somehow bias our results, we (conservatively) assumed that the bad life event for which the time was not reported was older than 2 years. Therefore, we set BLE1=0 either when subjects did not report any bad life event or they did not report the year. The coefficient on BLE1 is slightly smaller than the coefficient of BLE, but it remains statistically significant at the five percent level.

However, we are especially interested in the effects of a bad life event upon human performance.

The first regression in Table 15 presents the impact of BLE on productivity. Having had a bad life event in the previous two years is associated with lower performance on the additions task. The size of the productivity effect is large; it is more than 10%; it is statistically significant at better than the five per cent level.

Furthermore, as can be seen from column 2 in Table 15, the effect of the elapsed-years variable YBLE is also as might be expected from the results on hedonic adaptation. Its coefficient, 0.65, is positive and statistically significantly different from zero. The size of the deleterious effect of a Bad Life Event upon subjects'

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<sup>19</sup> This is not a crucial issue but literally implies that we think even the luckiest subjects will get a bad life event once every decade. Empirically, we asked subjects to report the events that happened in the last 5 years. Even setting  $N$  equal to 6, for the case of no bad life event, does not change the results substantively.

<sup>20</sup> Results of regressions 1 to 3 provide a form of indirect evidence about the genuine information content in well-being survey responses.

<sup>21</sup> We did not want to monitor the writing of the questionnaire in any way, since a concern was to guarantee the privacy of the subjects.

productivity is thus a declining function of the elapsed time since the event.<sup>22</sup>

These findings from Experiment 2 are strongly redolent of Experiment 1's outcome. In the present case, of course, the shock is negative rather than positive, and it is of a much more important kind. We are here studying genuinely black events in people's lives. What emerges in these data is that there are long-lasting (though time-declining) consequences.

To help the comparison with earlier Experiment 1, Table 15 also gives a regression with a log specification on the correct additions (column 3); here BLE is borderline significant around the 5 percent level. We also provide the size of the effect for attempts and precision (columns 4 and 5). As in the previous experiment, these regression results suggest that the negative effect of a BLE passes through the subject by them making fewer attempts rather than being less precise. We also report as a robustness check (column 6 of Table 15) the effect of BLE1 (where, as said before, the Bad Life Events whose year was not reported were considered older than 2 years). The coefficients on BLE and BLE1 are similar. Finally, for completeness, Table 16 reports the effect of happiness on performance in two econometric specifications. We draw in part upon IV estimation rather than a direct approach as above, and we use bad-life-event variable BLE (column 2) and the log of years-since-event YBLE (column 3) as instruments. The coefficient in an OLS productivity equation is positive, although small and not statistically significant. It becomes large -- unsurprisingly, given the sample, significance is only at the ten percent level -- when the level of happiness is instrumented with BLE and YBLE. The large coefficients on the instrumented happiness variables in these additions equations correspond to 5 fewer correct answers. These results are complementary to, and empirically consistent with, the ideas of Experiment 1.

## 10. Conclusions

This paper provides evidence consistent with the idea that there are important links between human happiness and human productivity. It is, to our knowledge, the

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<sup>22</sup> Interestingly, if we use the non-logged YBLE as regressor (not reported), the coefficient generally becomes non-significant, which implies a concave, declining effect with year of the BLE.

first such evidence for a classic piece-rate-wage setting. Figures 1 and 3 portray the spirit of the study's results.

Two kinds of randomized trial (denoted Experiments 1 and 2) have been described. The first examines the consequences of randomly-assigned happiness in the laboratory. It has the advantage that we can directly control the happiness shock and the disadvantage that it studies a small shock of a special kind in the laboratory. The second estimates the repercussions of major life-events assigned by Nature. It has the disadvantage that we cannot directly control the happiness shock and the advantage that it studies a large shock<sup>23</sup> of a fundamental kind in real life.

Self-evidently, it is conceivable in the second experiment that there is some unobservable feature of people that makes them both less productive and more likely to report a bad life event. But such a mechanism cannot explain our results in the first experiment. By design, Experiments 1 and 2 have complementary strengths and weaknesses.

Various implications emerge. First, researchers may need to pay more attention to emotional well-being as a causal force. Second, better bridges may be required here between scholars in applied economics and other disciplines. Third, if happiness in a workplace carries with it a return in productivity, the paper's findings may have consequences for firms' promotion policies<sup>24</sup> and how they structure internal labor markets, and thus may be of interest to management and human resources specialists. Fourth, if well-being boosts human performance, that raises the possibility of self-reinforcing spirals from productivity-to-well-being-to-productivity.

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<sup>23</sup> Plainly, for ethical reasons, we cannot in a laboratory randomly assign some of our subjects large unhappiness shocks.

<sup>24</sup> Over and above neoclassical pay-effort mechanisms discussed in sources such as Lazear (1981) and Oswald (1984).



**Figure 1: Those exposed to the happiness treatment have higher productivity in Experiment 1**

*[95% confidence intervals]*

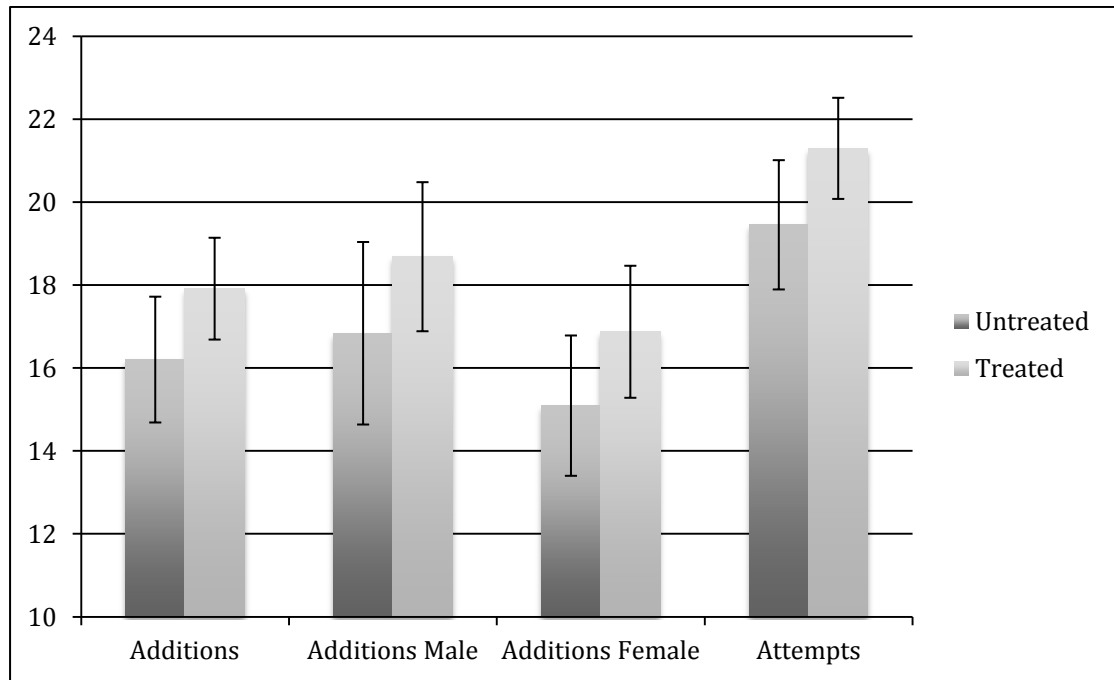
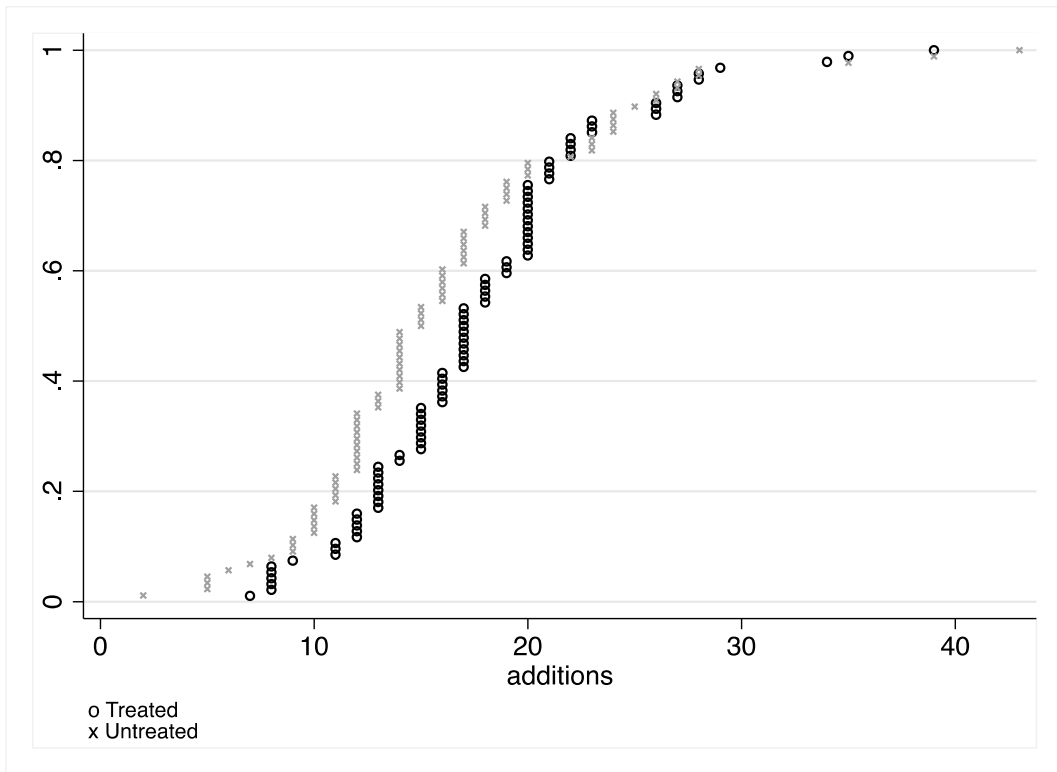


Figure 2: CDF of subjects' performances in Experiment 1



**Figure 3: Individuals with a recent Bad Life Event (BLE) have lower productivity in Experiment 2**

*[95% confidence intervals]*

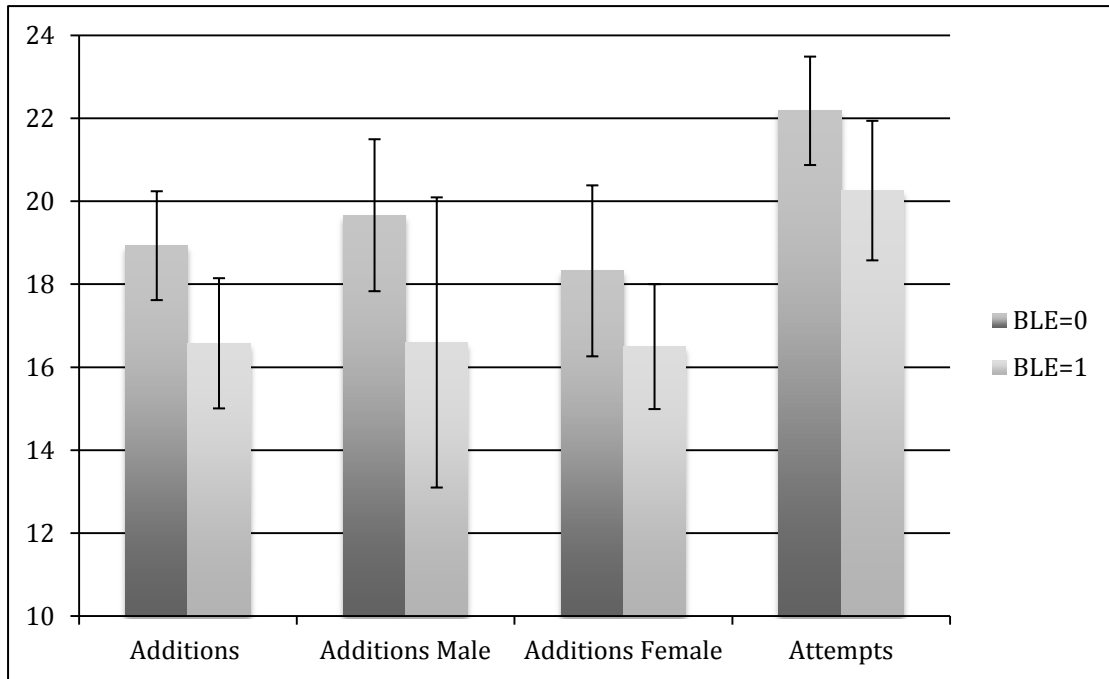
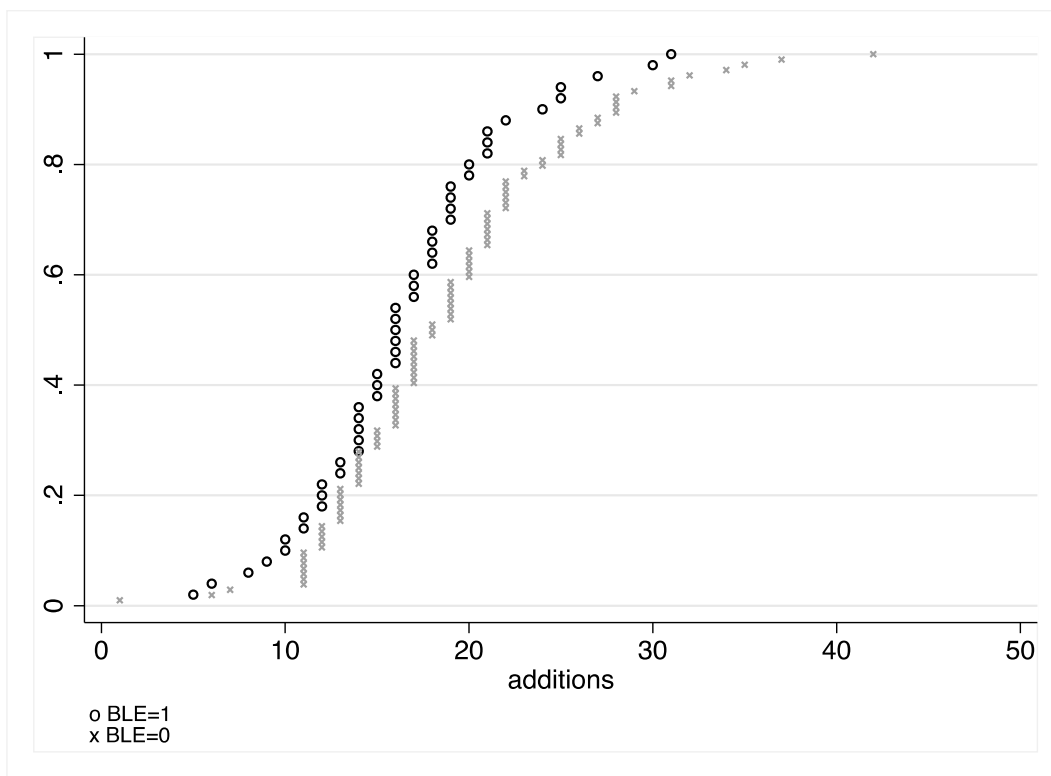


Figure 4: CDF of subjects' performances in Experiment 2



**Table 1: Subject numbers for each session and day (Experiment 1)**

Main Sessions	Day	Session with Treatment	Session without treatment
	1	24	24
	2	23	20
	3	23	24
	4	24	25
Extra Sessions	5	25	25
	6	23	21

**Table 2: Data description: treated individuals (Experiment 1)**

Variable	#Observations	Mean	SD	Min	Max
#Correct Additions	94	17.91	5.99	7	39
Happiness Before	94	4.46	0.82	3	7
Happiness After	94	5.45	0.74	3	7
GMAT MATH	94	3.48	1.39	0	5
High School Grades	93	0.50	0.27	0	1
Enjoyment-of-Clip	94	5.93	0.68	5	7

**Table 3: Data description: non-treated individuals (Experiment 1)**

Variable	#Observations	Mean	SD	Min	Max
#Correct Additions	88	16.20	7.16	2	43
Happiness Before	88	4.64	1.20	1	7
GMAT MATH	88	3.36	1.37	1	5
High School Grades	85	0.48	0.24	0	1

**Table 4: Data description: individuals treated with placebo clip<sup>25</sup> in Exp. 1**

Variable	#Observations	Mean	SD	Min	Max
#Correct Additions	25	14.84	6.43	5	34
Happiness Before	24	4.37	1.05	2	6
Happiness After	24	4.29	0.99	2	7
GMAT MATH	25	3.08	1.63	0	5
High School Grades	24	0.47	0.23	0.06	0.93
Enjoyment-of-Clip	24	3.67	1.27	1	6

**Table 5: Data description: treated individuals (precise-payment case) in Exp. 1**

Variable	#Observations	Mean	SD	Min	Max
#Correct Additions	48	19.41	8.88	0	42
Happiness Before	48	4.35	1.02	1	6
Happiness After	48	5.39	0.94	3	7
GMAT MATH	48	3.54	1.30	0	5
High School Grades	47	0.48	0.24	0.06	1
Enjoyment-of-Clip	48	5.81	1.04	2	7

**Table 6: Data description: non-treated individuals (precise-payment) in Exp. 1**

Variable	#Observations	Mean	SD	Min	Max
#Correct Additions	21	18.52	7.08	7	34
Happiness Before	21	4.47	1.29	0	5
GMAT MATH	21	3.38	1.60	0	5
High School Grades	20	0.58	0.25	0.14	1

<sup>25</sup> The measure called "High School Grades" asks students to consider all of their qualifications and gives a percentage of those qualifications that are at the highest possible grade. It therefore measures their past performance against the highest possible performance. More precisely, on the questionnaire we asked two questions: "How many school level qualifications have you taken (including GCSEs, A-levels and equivalent)?" (forming the denominator) and "How many of these qualifications were at the best grade possible? (e.g. A\* in GCSE, A is A-level, etc.)" (forming the numerator).

**Table 7: The determinants of subjects' performance in Experiment 1 after the happiness treatment** <sup>26</sup>

	(1)	(2)	(3)
	Log(Additions)	Log(Additions)	Log(Additions)
			<i>Treated only</i>
Treatment	0.118** (0.0548)		
Change-in-Happiness		0.101** (0.0405)	0.0847* (0.0495)
GMAT MATH score	0.104*** (0.0226)	0.100*** (0.0226)	0.0739*** (0.0273)
High School Grades	0.471*** (0.114)	0.477*** (0.114)	0.428*** (0.124)
Male	-0.0257 (0.0609)	-0.0267 (0.0606)	0.00675 (0.0774)
Day 2	-0.0169 (0.0790)	0.000901 (0.0787)	-0.0170 (0.0905)
Day 3	0.0975 (0.0779)	0.106 (0.0776)	0.131 (0.0885)
Day 4	0.0118 (0.0762)	0.00724 (0.0758)	-0.00752 (0.0895)
Constant	2.106*** (0.105)	2.120*** (0.102)	2.244*** (0.126)
Observations	178	178	93
R-squared	0.273	0.280	0.307

Std errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>26</sup> Within the table, the notation \*\*\* indicates p<0.01, \*\* p<0.05, \* p<0.1, and standard errors are given in parentheses.

**Table 8: The determinants of subjects' performance non-logged in Experiment 1**

	(1) Additions	(2) Additions (no outliers)	(3) Additions	(4) Additions (no outliers)
Treatment	1.336 (0.889)	1.572** (0.825)		
Change-in-Happiness			1.316** (0.657)	1.407** (0.608)
GMAT MATH score	1.286*** (0.367)	1.291*** (0.343)	1.243*** (0.366)	1.244*** (0.342)
High School Grades	8.284*** (1.854)	8.349*** (1.710)	8.355*** (1.844)	8.429*** (1.701)
Male	0.824 (0.988)	0.606 (0.919)	0.828 (0.982)	0.607 (0.914)
Day 2	0.472 (1.281)	-0.325 (1.193)	0.693 (1.276)	-0.0707 (1.187)
Day 3	2.105* (1.264)	2.330** (1.173)	2.212* (1.258)	2.455** (1.167)
Day 4	0.868 (1.236)	0.809 (1.140)	0.814 (1.230)	0.749 (1.134)
Constant	6.603*** (1.697)	6.602*** (1.575)	6.680*** (1.657)	6.763*** (1.535)
Observations	178	176	178	176
R-squared	0.245	0.283	0.253	0.290

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Std errors in parentheses



**Table 9: The determinants of subjects' attempts in Experiment 1**

	(1)	(2)
	Log(Attempts)	Log(Attempts)
Treatment	0.0911** (0.0417)	
Change-in-Happiness		0.0812*** (0.0308)
GMAT MATH score	0.0758*** (0.0172)	0.0733*** (0.0171)
High School Grades	0.372*** (0.0869)	0.377*** (0.0863)
Male	-0.0165 (0.0463)	-0.0170 (0.0460)
Day 2	0.0198 (0.0600)	0.0340 (0.0597)
Day 3	0.133** (0.0592)	0.140** (0.0589)
Day 4	0.0767 (0.0579)	0.0732 (0.0576)
Constant	2.432*** (0.0795)	2.441*** (0.0776)
Observations	178	178
R-squared	0.279	0.288

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Std errors in parentheses

**Table 10: The determinants of subjects' precision (i.e. the ratio of their correct answers to attempts) in Experiment 1**

	(1) Correct/ Attempts	(2) Correct/ Attempts
Treatment	0.0128 (0.0185)	
Change-in-Happiness		0.0102 (0.0138)
GMAT MATH score	0.0165** (0.00765)	0.0162** (0.00767)
High School Grades	0.0656* (0.0386)	0.0663* (0.0386)
Male	0.00152 (0.0206)	0.00134 (0.0206)
Day 2	-0.0268 (0.0267)	-0.0249 (0.0267)
Day 3	-0.0201 (0.0263)	-0.0192 (0.0263)
Day 4	-0.0507* (0.0258)	-0.0512** (0.0257)
Constant	0.753*** (0.0354)	0.755*** (0.0347)
Observations	178	178
R-squared	0.095	0.096

Std. errors in parentheses \*\*\* p<0.01,

**Table 11: Checking the robustness of the results to a placebo film and explicit payment in Experiment 1**

VARIABLES	(1) Log Additions	(2) Log Additions	(3) Log Attempts	(4) Log Attempts	(5) Correct/ Attempts
Treatment	0.123** (0.0569)	0.112** (0.0496)	0.0935** (0.0458)	0.0986** (0.0399)	-0.000874 (0.0170)
Explicit Payment	0.105 (0.0952)	0.0747 (0.0557)	0.0119 (0.0767)	0.0262 (0.0446)	0.0237 (0.0191)
Treatment*ExPa	-0.0461 (0.117)		0.0216 (0.0939)		
Placebo film	-0.0553 (0.0879)	-0.0612 (0.0865)	-0.0761 (0.0707)	-0.0733 (0.0696)	0.000595 (0.0297)
GMAT Math	0.0897*** (0.0186)	0.0894*** (0.0185)	0.0751*** (0.0148)	0.0752*** (0.0148)	0.0142** (0.00632)
High School	0.455*** (0.0977)	0.458*** (0.0971)	0.377*** (0.0786)	0.375*** (0.0780)	0.0664** (0.0333)
Male	0.0308 (0.0501)	0.0299 (0.0500)	0.0206 (0.0404)	0.0210 (0.0402)	0.0129 (0.0172)
Constant	2.147*** (0.0782)	2.153*** (0.0769)	2.464*** (0.0624)	2.462*** (0.0614)	0.736*** (0.0262)
Observations	268	268	269	269	269
R-squared	0.247	0.247	0.259	0.259	0.062

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors in parentheses

**Table 12: Subject numbers for each session and day: Experiment 2**

Day	1	2
Session 1	19	19
2	25	19
3	25	26
4	23	24

**Table 13: Data description in Experiment 2 (where Bad Life Event is family illness or bereavement)**

Variable	#Observations	Mean	Std Error	Min	Max
#Correct Additions	179	18.40	6.71	1	47
Happiness	179	4.82	0.95	2	7
GMAT MATH	179	3.63	1.46	0	5
High School Grades	164	0.57	0.25	0	1
No Bad Life Event	179	0.7	0.46	0	1
Bad Life Event less than 1 year ago	154	0.06	0.23	0	1
Bad Life Event 1 year ago	154	0.19	0.23	0	1
Bad Life Event 2 year ago	154	0.06	0.23	0	1
Bad Life Event 3 year ago	154	0.05	0.22	0	1
Bad Life Event 4 year ago	154	0.08	0.26	0	1
Bad Life Event 5 year ago	179	0.08	0.25	0	1
Years From Bad Life Event	93	2.30	1.70	0	5
Male	170	0.5	0.5	0	1
Age	169	19.49	1.48	18	30

**Table 14: Happiness equations in Experiment 2 with a variable for a Bad Life Event (BLE) defined as family illness or bereavement**

	(1) Happiness	(2) Happiness	(3) Happiness	(4) Happiness
BLE less than 1 year ago	-0.88** (0.35)			
BLE 1 year ago	-0.30 (0.21)			
BLE 2 year ago	-0.86** (0.34)			
BLE 3 year ago	0.18 (0.36)			
BLE 4 year ago	-0.40 (0.31)			
BLE 5 year ago	-0.45 (0.35)			
YBLE <sup>27</sup>		0.13** (0.049)		
BLE in the last 2 years			-0.43** (0.18)	
BLE1 <sup>28</sup>				-0.39** (0.17)
Male	0.11 (0.17)	0.069 (0.17)	0.081 (0.17)	0.20 (0.16)
Age	-0.094 (0.069)	-0.088 (0.069)	-0.092 (0.069)	-0.064 (0.052)
High School Gr.	-0.23 (0.31)	-0.17 (0.31)	-0.16 (0.31)	-0.14 (0.30)
Session 1.2	-0.19 (0.31)	-0.15 (0.31)	-0.13 (0.31)	-0.15 (0.29)
Session 1.3	0.089 (0.31)	0.11 (0.31)	0.080 (0.31)	-0.058 (0.29)
Session 1.4	0.38 (0.33)	0.37 (0.32)	0.36 (0.33)	0.41 (0.30)
Session 2.1	0.15 (0.40)	-0.0019 (0.39)	-0.045 (0.39)	0.11 (0.36)
Session 2.2	0.45 (0.35)	0.48 (0.34)	0.48 (0.35)	0.29 (0.31)
Session 2.3	0.0013 (0.33)	0.077 (0.32)	0.11 (0.33)	-0.0081 (0.30)
Session 1.2	-0.059 (0.32)	0.028 (0.33)	-0.088 (0.32)	-0.090 (0.31)
Constant	6.85*** (1.42)	6.33*** (1.43)	6.71*** (1.42)	6.11*** (1.12)
Observations	142	142	142	164
R-squared	0.163	0.113	0.107	0.099

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Standard errors in parentheses

<sup>27</sup> The variable YBLE is equal to Log(year of the Bad Life Event+0.01) if the bad life event occurred, and Log(N+0.01) otherwise, where we set N=10. Very similar results are obtained by setting N=6.

<sup>28</sup> BLE1 is set equal to 1 when a bad life event happened in the last two years and it is set equal to 0 when no bad life event happened or the year is missing.

**Table 15: Determinants of subjects' performance in Experiment 2 where Bad Life Event (BLE) is defined as family illness or bereavement**

VARIABLES	(1) Additions	(2) Additions	(3) Additions (log)	(4) Attempt	(5) Correct/ Attempts	(6) Additions
BLE in the last 2 years	-2.31** (1.12)		-0.12* (0.067)	-1.92* (1.13)	-0.030 (0.022)	
BLE1 <sup>29</sup>						-2.05* (1.04)
YBLE <sup>30</sup>		0.65** (0.31)				
Male	-0.77 (1.15)	-0.83 (1.15)	-0.048 (0.068)	-0.88 (1.16)	0.0040 (0.023)	-0.84 (1.03)
Age	0.30 (0.44)	0.32 (0.44)	-0.0023 (0.026)	0.41 (0.44)	-0.0027 (0.0087)	-0.14 (0.33)
High School Gr.	3.75* (2.04)	3.68* (2.04)	0.24* (0.12)	5.42*** (2.06)	-0.018 (0.041)	3.21* (1.92)
GMAT MATH	1.22*** (0.38)	1.23*** (0.38)		1.23*** (0.38)	0.0079 (0.0076)	0.98*** (0.35)
Session 1.2	-1.44 (1.96)	-1.54 (1.95)	-0.098 (0.12)	-0.41 (1.97)	-0.054 (0.039)	-1.31 (1.83)
Session 1.3	1.44 (2.00)	1.57 (2.00)	-0.030 (0.12)	2.17 (2.01)	-0.046 (0.040)	1.22 (1.86)
Session 1.4	-0.39 (2.05)	-0.42 (2.05)	-0.018 (0.12)	0.45 (2.07)	-0.030 (0.041)	-0.032 (1.89)
Session 2.1	2.89 (2.49)	3.12 (2.49)	0.14 (0.15)	4.45* (2.51)	-0.042 (0.050)	2.87 (2.28)
Session 2.2	2.85 (2.19)	2.80 (2.19)	0.14 (0.13)	2.82 (2.21)	0.014 (0.044)	2.11 (1.97)
Session 2.3	1.45 (2.07)	1.25 (2.05)	0.044 (0.12)	2.23 (2.08)	-0.029 (0.041)	3.01 (1.86)
Session 2.4	4.08** (2.02)	4.62** (2.08)	0.19 (0.12)	4.38** (2.04)	0.020 (0.040)	4.30** (1.93)
Constant	5.79 (9.04)	3.85 (9.10)	2.60*** (0.54)	5.35 (9.12)	0.90*** (0.18)	15.2** (7.11)
Observations	142	142	142	142	142	164
R-squared	0.218	0.218	0.188	0.228	0.078	0.184

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Standard errors in parentheses

<sup>29</sup> BLE1 is set equal to 1 when a bad life event happened in the last two years and it is set equal to 0 when no bad life event happened or the year is missing.

<sup>30</sup>The variable YBLE is equal to Log(year of the Bad Life Event+0.01) if the bad life event occurred, and Log(N+0.01) otherwise, where we set N=10. Very similar results are obtained by setting N=6.

**Table 16: Performance equations with instrumented happiness in Experiment 2**

	(1) Additions OLS	(2) Additions IV (BLE)	(3) Additions IV (YBLE)
Happiness	0.47 (0.51)	5.27* (3.11)	4.98* (2.86)
Male	-0.90 (1.05)	-1.61 (1.51)	-1.56 (1.46)
Age	-0.12 (0.33)	0.79 (0.62)	0.76 (0.60)
High School	3.14 (1.94)	4.10 (2.51)	4.07* (2.45)
GMAT MATH	1.09*** (0.36)	1.62*** (0.51)	1.60*** (0.49)
Session 1.2	-1.49 (1.85)	-0.77 (2.45)	-0.82 (2.39)
Session 1.3	1.16 (1.87)	1.23 (2.44)	1.23 (2.39)
Session 1.4	-0.86 (1.87)	-2.22 (2.51)	-2.17 (2.44)
Session 2.1	2.91 (2.30)	3.21 (3.05)	3.19 (2.98)
Session 2.2	1.81 (1.99)	0.37 (3.02)	0.50 (2.91)
Session 2.3	2.56 (1.86)	0.97 (2.51)	0.97 (2.45)
Session 2.4	3.71* (1.92)	4.52* (2.53)	4.45* (2.47)
Constant	11.9 (7.88)	-30.7 (24.4)	-28.7 (22.7)
Observations	164	142	142
R-squared	0.168	.	.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Standard errors in parentheses

## References

- Amabile, T.M., Barsade, S.G., Mueller, J.S., Staw, B.M. 2005. Affect and creativity at work. *Administrative Science Quarterly* 50, 367-403.
- Argyle, M. 1989. Do happy workers work harder? The effect of job satisfaction on job performance. In: Ruut Veenhoven (ed), *How harmful is happiness? Consequences of enjoying life or not*, Universitaire Pers Rotterdam, The Netherlands.
- Ashby, F.G., Isen, A.M.,Turken, A.U. 1999. A neuropsychological theory of positive affect and its influence on cognition. *Psychological Review* 106, 529-550.
- Baker, S.C., Frith, C.D., Dolan, R.J. 1997. The interaction between mood and cognitive function studied with PET. *Psychological Medicine* 27, 565-578.
- Banerjee, A., Mullainathan, S. 2008. Limited attention and income distribution. Working paper. MIT.
- Becker, G. S., Rayo, L. 2008. Comment on ‘Economic growth and subjective wellbeing: Reassessing the Easterlin Paradox’ by Betsey Stevenson and Justin Wolfers. *Brookings Papers on Economic Activity*, Spring, 88-95.
- Benabou, R., Tirole, J. 2002. Self-confidence and personal motivation. *Quarterly Journal of Economics* 117, 871-915.
- Benabou, R., Tirole, J. 2003. Intrinsic and extrinsic motivation. *Review of Economic Studies* 70, 489-520.
- Benjamin D., Heffetz, O., Kimball, M.S., Rees-Jones, A. 2010. What do you think would make you happier? What do you think you would choose? Working paper, Cornell University. *American Economic Review*, forthcoming.
- Bennedsen, M., Perez-Gonzalez, F., Wolfenzon, D. 2010. Do CEOs matter? Working paper, Stanford GSB.
- Blanchflower, D.G., Oswald, A.J. 2004. Well-being over time in Britain and the USA. *Journal of Public Economics* 88, 1359-1386.
- Caves, R.E. 1974. Multinational firms, competition, and productivity in host-country markets. *Economica* 1974, 176-193.
- Clark, A. E., Diener, E., Georgellis, Y., Lucas, R. E. 2008. Lags and leads in life satisfaction: A test of the baseline hypothesis. *Economic Journal* 118, F222-F243.
- Compte, O., Postlewaite, A. 2004. Confidence-enhanced performance. *American Economic Review* 94, 1536-1557.
- Dickinson, D.L. 1999. An experimental examination of labor supply and work intensities. *Journal of Labor Economics* 17, 638-670.
- Diener, E., Suh, E.M., Lucas, R.E., Smith, H.L. 1999. Subjective well-being: Three decades of progress. *Psychological Bulletin* 125(2), 276-302.
- Di Tella, R., MacCulloch, R.J., Oswald, A.J. 2001. Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review* 91, 335-341.
- Di Tella, R., MacCulloch, R.J., Oswald, A.J. 2001. The macroeconomics of happiness. *Review of Economics and Statistics* 85, 809-827.
- Easterlin, R.A. 2003. Explaining happiness. *Proceedings of the National Academy of Sciences* 100, 11176-11183.
- Frederickson, B. L., Joiner, T. 2002. Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science* 13, 172–175.
- Freeman, R.B. 1978. Job satisfaction as an economic variable. *American Economic Review*, 68, 135-141.



- Frey, B. S., Stutzer, A. 2002. *Happiness and Economics*. Princeton, USA.
- Frey, B.S., Stutzer, A. 2006. Does marriage make people happy, or do happy people get married? *Journal of Socio-economics* 35, 326-347.
- Gneezy, U., Rustichini, A. 2000. Pay enough or don't pay at all, *Quarterly Journal of Economics* 115, 791-810.
- Hermalin, B.E., Isen, A.M. 2008. A model of the effect of affect on economic decision-making. *Quantitative Marketing and Economics* 6, 17-40.
- Ichniowski, C., Shaw, K. 1999. The effects of human resource management systems on economic performance: An international comparison of US and Japanese plants. *Management Science* 45, 704-721.
- Ifcher, J., Zarghamee, H. 2009. Happiness and time preference: The effect of positive affect in a random-assignment experiment. Working paper, Leavey School of Business, St Clara University, California. Forthcoming: *American Economic Review*,
- Isen, A. M. 2000. Positive affect and decision making. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions*. 2nd ed. New York: The Guilford Press.
- Isen, A. M., Reeve, J. 2005. The influence of positive affect on intrinsic and extrinsic motivation: Facilitating enjoyment of play, responsible work behavior, and self-control. *Motivation and Emotion* 29, 297-325.
- Killingsworth, M.A., Gilbert, D.T. 2010. A wandering mind is an unhappy mind. *Science* 330, 932-932.
- Kimball, M. S., Willis, R.J. 2006. Happiness and utility. Working paper, University of Michigan.
- Kirchsteiger, G. Rigotti, L., Rustichini, A. 2006. Your morals might be your moods. *Journal of Economic Behavior and Organization* 59, 155-172.
- Lazear, E. 1981. Agency, earnings profiles, productivity, and hours restrictions. *American Economic Review* 71, 606-620.
- Luttmer, E.F.P. 2005. Neighbors as negatives: Relative earnings and well-being. *Quarterly Journal of Economics* 120, 963-1002.
- Layard, R. 2006. *Happiness: Lessons from a New Science*. Penguin Books, London.
- Lyubomirsky, S., King, L., Diener, E. 2005. The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin* 131, 803-855.
- Niederle, M., Vesterlund, L. 2007. Do women shy away from competition? Do men compete too much? *Quarterly Journal of Economics* 122, 1067-1101.
- Oswald, A.J. 1984. Wage and employment structure in an economy with internal labor markets. *Quarterly Journal of Economics* 99, 693-716.
- Oswald, A.J., Wu, S. 2010. Objective confirmation of subjective measures of human well-being: Evidence from the USA. *Science* 327, 576-579.
- Powdthavee, N. 2010. *The Happiness Equation: The Surprising Economics of Our Most Valuable Asset*. Icon Books, London.
- Patterson, M., Warr, P., West, M. 2004. Organizational climate and company productivity: The role of employee affect and employee level. *Journal of Occupational and Organizational Psychology* 77, 193-216.
- Pischke, J-S. 2010. Money and happiness: Evidence from the industry wage structure. Working paper. London School of Economics.
- Pugno, M., Depedri, S. 2009. Job performance and job satisfaction: An integrated survey. Working paper, Università di Trento.
- Sanna, L.J., Turley, K.J., Mark, M.M. 1996. Expected evaluation, goals, and performance: Mood as input. *Personality and Social Psychology Bulletin* 22, 323-325.

- Segal, C. 2012. Working when no-one is watching: Motivation, test scores, and economic success. *Management Science*, forthcoming.
- Senik, C. 2004. When information dominates comparison: Learning from Russian subjective data. *Journal of Public Economics* 88, 2099-2123.
- Siebert, S.W., Zubanov, Z. 2010. Management economics in a large retail company. *Management Science* 56, 1398-1414.
- Steele, C.M., Aronson, J. 1995. Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology* 69, 797-811.
- Tsai, W-C., Chen, C-C., Liu, H-L. 2007. Test of a model linking employee positive moods and task performance. *Journal of Applied Psychology* 92, 1570-1583.
- Van Praag, B., Ferrer-I-Carbonell, A. 2004. *Happiness Quantified: A Satisfaction Calculus Approach*, Oxford University Press, Oxford.
- Westermann, R., Spies, K., Stahl, G., Hesses, F. W. 1996. Relative effectiveness and validity of mood induction procedures: a meta-analysis. *European Journal of Social Psychology* 26, 557-580.
- Winkelmann, L., Winkelmann, R. 1998. Why are the unemployed so unhappy? Evidence from panel data. *Economica* 65, 1-15.
- Wright, T.A., Staw, B.A. 1998. Affect and favorable work outcomes: two longitudinal tests of the happy-productive worker thesis. *Journal of Organizational Behavior* 20, 1-23.

## APPENDIX: PART 1

### Replication of the findings on subsamples

**Table A1: Treatment Dates**

Experiment 1 was at first carried out on four separate days, as follows:

Session	Treatment	Date	Time
1	Treatment 0	21 May 2008	2.30-3.30pm
1	Treatment 1	21 May 2008	4.00-5.00pm
2	Treatment 0	18 June 2008	2.30-3.30pm
2	Treatment 1	18 June 2008	4.00-5.00pm
3	Treatment 1	10 October 2008	2.30-3.30pm
3	Treatment 0	10 October 2008	4.00-5.00pm
4	Treatment 1	15 October 2008	2.30-3.30pm
4	Treatment 0	15 October 2008	4.00-5.00pm

Treatment 0 is the control treatment without a video clip and treatment 1 includes a video clip. Sessions 1 and 2 were undertaken in term 3 of the University of Warwick academic year 2007-8, while sessions 3 and 4 were undertaken in term 1 of the 2008-9 academic year. Since they are separated by a gap of approximately 4 months, we might wish to check for significant changes across the time between sessions 1-2 and sessions 3-4. The aggregate variables results broken down by session are as follows:

**Table A2: Summary Statistics by Treatment**

Session	Additions	Log Additions	Additions Male	Additions Female	Happy before	Happy after	Enjoy clip
1 Treatment 0	15.38**	1.17	14.88**	16.83	4.54	na	na
1 Treatment 1	18.21**	1.23	18.26**	18.00	4.54	5.63	5.96
2 Treatment 0	16.85	1.18	19.41	13.00*	4.45	na	na
2 Treatment 1	16.48	1.19	16.36	16.58*	4.43	5.22	5.74
3 Treatment 0	16.26*	1.16	15.75*	17.14	4.79	na	na
3 Treatment 1	19.52*	1.27	20.42*	18.11	4.48	5.39	5.83
4 Treatment 0	16.04	1.15	18.07	14.36	4.92	na	na
4 Treatment 1	17.72	1.22	19.6	15.92	4.36	5.44	6.21

The key column is perhaps *log additions* (the log of the number of correct additions) which somewhat smoothes outliers in the number of correctly answered numerical additions. The data for sessions 1-2 are very similar to those from sessions 3-4. Importantly, the pattern of results seems strongly consistent across sessions. The only exception comes in session 2 where the raw number of additions does not rise moving from control treatment 0 to happiness treatment 1. As explained, this is down to one outlier. Using logs brings the results into line with those from the other sessions.

We put an asterisk when the difference between treated and untreated groups is statistically significant. In particular, we have that for session 1 (21 May 2008) and session 3

(10 October 2008) the difference for the entire pool is already statistically significant at  $p$ -values 0.047 and 0.052 respectively. When we split the group into males and females, we note that, even in these small subsamples of raw data, there is a statistically significant finding individually in 3 out of 8 sub-cases.

Alternatively, we also regressed the key variables for all four sessions individually:

**Table A3: Session Regressions (Log Additions)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log	Log	Log	Log	Log	Log	Log	Log
	Add.	Add.	Add.	Add.	Add.	Add.	Add.	Add.
Treatment	0.129 (0.0889)		0.0931 (0.124)		0.184 (0.127)		0.0979 (0.118)	
GMAT score	0.0799* (0.0472)	0.0859* (0.0453)	0.115** (0.0507)	0.110** (0.0510)	0.139*** (0.0434)	0.135*** (0.0448)	0.0739 (0.0473)	0.0722 (0.0469)
High Sc. Gr.	0.482** (0.198)	0.486** (0.192)	0.398 (0.261)	0.386 (0.266)	0.277 (0.262)	0.332 (0.262)	0.657*** (0.239)	0.652*** (0.236)
Male	-0.0729 (0.111)	-0.0373 (0.110)	0.113 (0.127)	0.0985 (0.126)	-0.153 (0.134)	-0.150 (0.136)	-0.0258 (0.136)	-0.0350 (0.133)
Ch.-in-happ.		0.126** (0.0585)		0.0256 (0.112)		0.0993 (0.102)		0.0980 (0.0792)
Constant	2.220*** (0.187)	2.165*** (0.185)	2.022*** (0.218)	2.093*** (0.198)	2.219*** (0.184)	2.256*** (0.184)	2.122*** (0.170)	2.128*** (0.163)
Observations	48	48	40	40	41	41	49	49
R-squared	0.286	0.323	0.288	0.278	0.336	0.315	0.264	0.278

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors in parentheses

Regression (1) considers *log additions* from session 1 regressed on treatment, with (2) instead using change-in-happiness. This is in general a better measure of the hedonic impact since it allows for those subjects who did not gain in happiness from watching the clip. Columns (3) and (4) are the respective regressions for session 2, (5) and (6) for session 3, and (7) and (8) for session 4. We might also consider merging sessions 1 and 2, and merging sessions 3 and 4:

**Table A4: Grouped Session Regressions (Log Additions)**

VARIABLES	(1)	(2)	(3)	(4)
	Log	Log	Log	Log
	Additions	Additions	Additions	Additions
Treatment	0.0989 (0.0712)		0.139 (0.0848)	
GMAT MATH score	0.100*** (0.0333)	0.0987*** (0.0330)	0.111*** (0.0316)	0.108*** (0.0318)
High School Grades	0.458*** (0.157)	0.462*** (0.155)	0.468*** (0.169)	0.479*** (0.169)
Male	0.0299 (0.0797)	0.0309 (0.0789)	-0.0658 (0.0918)	-0.0720 (0.0916)
Change-in-happiness		0.0990* (0.0535)		0.0982 (0.0617)
Constant	2.091*** (0.135)	2.096*** (0.130)	2.147*** (0.122)	2.174*** (0.118)
Observations	88	88	90	90
R-squared	0.268	0.281	0.274	0.273

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors in parentheses

In Table A4, regressions (1) and (2) group together sessions 1 and 2. Similarly, regressions (3) and (4) group together sessions 3 and 4. As in Table A3, the first regression in each pair considers *Treatment*.

In Table A5, given below, we report the findings for a complete pooled set of the data from the two experiments.

**Table A5: Determinants of subjects' performance using the two experiments pooled together**

	(1)	(2)	(3)	(4)
VARIABLES	Log	Log	Log	Log
	Additions	Additions	Attempts	Attempts
Treatment	0.12**	0.10**	0.094**	0.10***
	(0.058)	(0.050)	(0.044)	(0.038)
Treat.*Exp.Payment	-0.082		-0.028	
	(0.086)		(0.065)	
Explicit Payment	0.095*		0.068*	
	(0.052)		(0.039)	
Placebo Clip	-0.079	-0.097	-0.093	-0.096
	(0.090)	(0.088)	(0.068)	(0.066)
High School Grades	0.47***	0.48***	0.39***	0.39***
	(0.075)	(0.074)	(0.056)	(0.056)
Male	0.082**	0.077**	0.055*	0.052*
	(0.038)	(0.037)	(0.028)	(0.028)
Experiment 2		0.076		0.072*
		(0.049)		(0.037)
Constant	2.49***	2.50***	2.75***	2.75***
	(0.060)	(0.057)	(0.045)	(0.043)
Observations	433	433	433	433
R-squared	0.121	0.119	0.143	0.143

## APPENDIX: PART 2

### Checking the effects of a placebo film and of exact numerical payment

This describes Day 5 (3/12/08): session 1 (placebo, 25 subjects), session 2 (explicit payment and treatment, 25 subjects) and Day 6 (14/01/09), session 1 (explicit payment and no treatment), session 2 (explicit payment and treatment). Table A6 provides the results in terms of average correct additions.

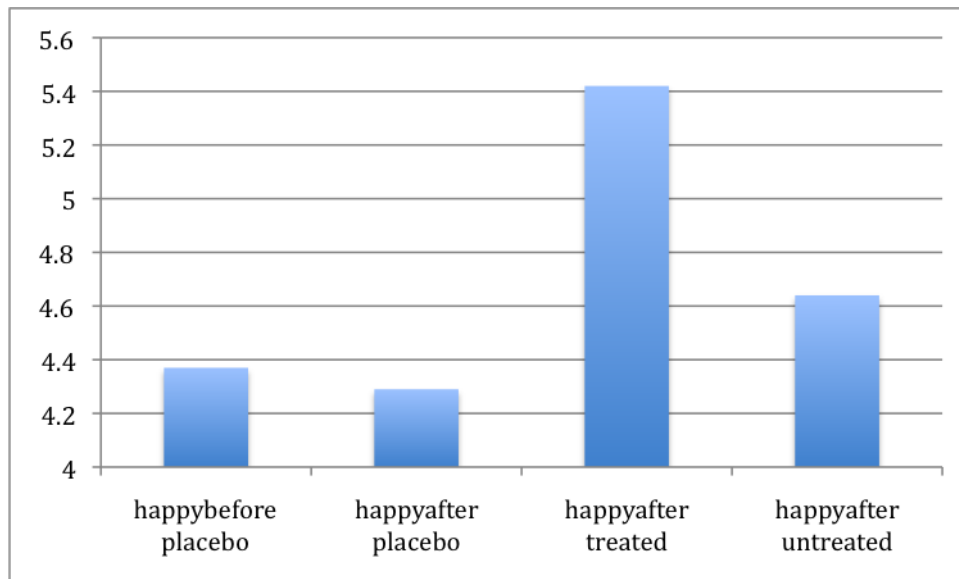
**Table A6: Summary Statistics by Treatment for Explicit Payment and Placebo**

Description	Day /Session	Additions	Log Additions
Explicit payment Treatment 0	6 / 1	18.52	2.84
Explicit payment Treatment 1	5/2 and 6/2	19.41	2.89
Treatment Placebo	5/1	14.84	2.61

### Placebo film

In the figure below we present the level of reported happiness after and before the placebo. The placebo film had the effect of very slightly reducing subjects' happiness but the two levels are not statistically different ( $p=0.39$ ). The level of reported happiness after the placebo is slightly lower than the one of the non treated group ( $p=0.093$ ), and statistically lower than the one in the treated group ( $p<0.001$ ). All in all, the placebo film does not have a statistically significant impact on the level of self-reported happiness when compared against the non treated group.

The placebo film has, if anything, a negative impact on performances, although this difference is statistically non-significant ( $p=0.19$ ). This finding is shown in Tables A5 and A6, where we can see that placebo treatment has no effect on additions, attempts or precision.



### Explicit payment

Here we announced that each subject would be rewarded with £0.25 for each correct addition. In Table A6 we introduce the dummy Explicit Payment, this is equal to 1 where the payment is specified, 0 otherwise. We interact this term with the variable Treatment to check whether this could threaten our previous finding. If the interacted term is negative and significant, this would imply that happiness has less or no impact when the payment is specified. From the first regression on Table A6, we note that the interacted term Treatment\*ExPayment is not statistically different from 0 ( $p=0.60$ ), while the payment when introduced alone (2nd regression in Table A6) is positive, although not significant at the 10 percent level. Similar results are obtained when we consider (log) attempts as a dependent variable (3rd and 4th regressions). Finally we also note that explicit payment has a positive but insignificant effect on precision (5th regression).

## APPENDIX: PART 3

### Description of Procedures

This part of the appendix includes a full set of subject instructions, a copy of the GMAT MATH-style test, and the questionnaire.

#### Instructions

[**bold** = only for the comedy clip/placebo treatment; *italics* = explicit payment variant; X directly addresses; Y, Z, etc. are assistants. Parts in square brackets are descriptive.]

[X invites subjects to enter room **while Y sets up the video clip**]

Welcome to the session. My name is X, and working with me today are Y, Z, etc. Many thanks for attending today. You will be asked to perform a small number of very minor tasks and will be paid both a show-up fee and an amount based on how you perform, **but first we would like to ask you to watch a video clip**. Please do not talk to each other at any stage in the session. If you have any questions please raise your hands, but avoid distracting the others in the room.

**Z will now guide you to the seats at the front of the room directly in front of the projector, while Y prepares the video clip. Please make yourselves comfortable: the clip will last about 10 minutes and I will have more instructions for you afterwards.**

[10 minutes: video clip]

**Thanks for watching.** Z will now distribute ID cards to you and you are asked to sit at the computer corresponding to the ID number. Everything is done anonymously – your performance will simply be recorded based on the ID card, and not your names. You will find some paper and a pen next to your computer – use them if you wish, and raise your hand if you wish to request additional paper. Please do not use calculators or attempt to do anything other than answer the questions through mental arithmetic. If we observe any form of cheating it will invalidate your answers and you will be disqualified, and therefore receive only the show-up fee.

For the first task you will have 10 minutes to add a sequence of numbers together and enter your answers in the column labelled “answer”. To remind you, you will be paid based on the number of correct answers that you produce. *at the rate of £0.25 per correct answer* When the ten minutes are over I will ask you to stop what you are doing and your results will be saved.



Next look at your screens: you will find that a file called “Numberadditions.xls” is open but minimized on your screen. Please now maximize the file by clicking on the tab. You have ten minutes starting now.

[10 minutes: number additions]

Please stop what you are doing, your answers will now be saved. Y and Z will now visit your computers and place a sheet faced down next to your keyboards. Please do not turn over the sheet until I ask.

[Y and Z move to terminals, placing question sheets faced down]

For the second task we would like you answer a small number of questions. You can maximize the file on your computer labelled “GMAT MATH.xls” and you will once again see a column labelled answers. In this column you will have to enter a letter from (a) to (e), corresponding to a multiple-choice answer to the sheet which is faced-down in front of you. Once again, I remind you that you will be paid based on the number of correct answers *at the rate of £0.50 per correct answer*. You have 5 minutes to attempt these questions, please turn over the sheets and begin.

[5 minutes: GMAT MATH-style test ]

Please stop what you are doing, your answers will now be saved. You should next open the final document: a questionnaire that you are asked to complete. You will be given 10 minutes to complete this, though if you need additional time we can extend this deadline indefinitely. Please answer as truthfully as you can and feel free to raise your hands if anything is unclear. To stress, where you are asked to input a number from 1 to 7, “7” is the high number and “1” is the low one.

[10 minutes: questionnaire]

Hopefully you have all had a chance to complete the questionnaire. If you need more time, then please raise your hand. Otherwise we will save your questionnaire replies.

The central computer has calculated your payments. Please remain at your computer for the time being. I will ask you to approach the front in order of your ID numbers and you will need to sign a receipt for your payments and to hand in both your ID cards and the test document before receiving payment. Many thanks for taking part in today’s session.

[Test documents destroyed, ID cards collected, receipts signed and payments handed out]

FOR REFEREES ONLY  
NOT FOR PUBLICATION

**GMAT MATH-style Test**

**Questions**

Please answer these by inserting the multiple choice answer a, b, c, d or e into the GMAT MATH spreadsheet on your computer.

1. Harriet wants to put up fencing around three sides of her rectangular yard and leave a side of 20 feet unfenced. If the yard has an area of 680 square feet, how many feet of fencing does she need?

- a) 34
- b) 40
- c) 68
- d) 88
- e) 102

2. If  $x + 5y = 16$  and  $x = -3y$ , then  $y =$

- a) -24
- b) -8
- c) -2
- d) 2
- e) 8

3. If “basis points” are defined so that 1 percent is equal to 100 basis points, then 82.5 percent is how many basis points greater than 62.5 percent?

- a) .02
- b) .2
- c) 20
- d) 200
- e) 2,000

4. Which of the following best completes the passage below?

In a survey of job applicants, two-fifths admitted to being at least a little dishonest. However, the survey may underestimate the proportion of job applicants who are dishonest, because—.

a) some dishonest people taking the survey might have claimed on the survey to be honest.

b) some generally honest people taking the survey might have claimed on the survey to be dishonest.

c) some people who claimed on the survey to be at least a little dishonest may be very dishonest.

d) some people who claimed on the survey to be dishonest may have been answering honestly.

e) some people who are not job applicants are probably at least a little dishonest.

5. People buy prestige when they buy a premium product. They want to be associated with something special. Mass-marketing techniques and price-reduction strategies should not be used because —.

a) affluent purchasers currently represent a shrinking portion of the population of all purchasers.

b) continued sales depend directly on the maintenance of an aura of exclusivity.

c) purchasers of premium products are concerned with the quality as well as with the price of the products.

d) expansion of the market niche to include a broader spectrum of consumers will increase profits.

e) manufacturing a premium brand is not necessarily more costly than manufacturing a standard brand of the same product.

# Questionnaire in Experiment 1: The Randomized-Happiness Laboratory Experiment

## Questionnaire for Treatment 1.

<b>Questionnaire</b>	
<b>Please insert your answers into the shaded boxes to the right</b>	
<b>Details</b>	
What is your age?	<input type="text"/>
Are you a 1st year, 2nd year, 3rd year, graduate student, or other? (1/2/3/G/O)	<input type="text"/>
What is your gender? (M/F)	<input type="text"/>
<b>The Clip</b>	
How much did you enjoy the clip shown at the beginning? (1-7)	<input type="text"/>
Note: 1 is completely disliked, 2 very disliked, 3 is fairly disliked, 4 is neither enjoyed nor disliked, 5 is fairly enjoyed, 6 is very enjoyed, 7 is completely enjoyed	
<b>Happiness</b>	
How would you rate your happiness before seeing the clip? (1-7)	<input type="text"/>
Note: 1 is completely sad, 2 is very sad, 3 is fairly sad, 4 is neither happy nor sad, 5 is fairly happy, 6 is very happy, 7 is completely happy	
Did the clip shown at the beginning make you feel happier? (yes/no)	<input type="text"/>
IF SO:	
How would you rate your happiness after seeing the clip (1-7)?	<input type="text"/>
Note: 1 is completely sad, 2 is very sad, 3 is fairly sad, 4 is neither happy nor sad, 5 is fairly happy, 6 is very happy, 7 is completely happy	
<b>School Record</b>	
Have you taken GCSE or equivalent in maths? (yes/no)	<input type="text"/>
IF SO:	
What was the highest grade possible for this course? (A/A*/etc.)	<input type="text"/>
What was your grade?	<input type="text"/>
Give a percentage if you know it	<input type="text"/>
Have you taken A-level or equivalent in maths? (yes/no)	<input type="text"/>
IF SO:	
What was the highest grade possible for this course?	<input type="text"/>
What was your grade?	<input type="text"/>
Give a percentage if you know it	<input type="text"/>
How many school level qualifications have you taken (including GCSEs, A-levels and equivalent)?	<input type="text"/>
How many of these qualifications were at the best grade possible? (e.g. A* in GCSE, A is A-level, etc.)	<input type="text"/>
<b>University Record</b>	
Are you currently or have you ever been a student (yes/no)	<input type="text"/>
If yes, which degree course(s)?	<input type="text"/>
If you are a second or third year student what class best describes your overall performance to date? (1/2.1/2.2/3/Fail)	<input type="text"/>

Note: For days 5-6 we also added the following questions to the end of the questionnaire for the treated group (including the placebo treatment): (1) Did you try your best when asked to add numbers? (2) If so, why? If not, why not? (3) Did you feel that first observing the video clip made you better or worse at adding up numbers? (4) Can you say why you believe that?

Questionnaire for Treatment 0 (untreated group).

<b>Questionnaire</b>	
<b>Please insert your answers into the shaded boxes to the right</b>	
<b>Details</b>	
What is your age?	<input type="text"/>
Are you a 1st year, 2nd year, 3rd year, graduate student, or other? (1/2/3/G/O)	<input type="text"/>
What is your gender? (M/F)	<input type="text"/>
<b>Happiness</b>	
How would you rate your happiness at the moment? (1-7)	<input type="text"/>
Note: 1 is completely sad, 2 is very sad, 3 is fairly sad, 4 is neither happy nor sad, 5 is fairly happy, 6 is very happy, 7 is completely happy	
<b>School Record</b>	
Have you taken GCSE or equivalent in maths? (yes/no)	<input type="text"/>
IF SO:	
What was the highest grade possible for this course? (A/A*/etc.)	<input type="text"/>
What was your grade?	<input type="text"/>
Give a percentage if you know it	<input type="text"/>
Have you taken A-level or equivalent in maths? (yes/no)	<input type="text"/>
IF SO:	
What was the highest grade possible for this course?	<input type="text"/>
What was your grade?	<input type="text"/>
Give a percentage if you know it	<input type="text"/>
How many school level qualifications have you taken (including GCSEs, A-levels and equivalent)?	<input type="text"/>
How many of these qualifications were at the best grade possible? (e.g. A* in GCSE, A is A-level, etc.)	<input type="text"/>
<b>University Record</b>	
Are you currently or have you ever been a student (yes/no)	<input type="text"/>
If yes, which degree course(s)?	<input type="text"/>
If you are a second or third year student what class best describes your overall performance to date? (1/2.1/2.2/3/Fail)	<input type="text"/>

## Questionnaire in Experiment 2: The Real-life Happiness Shock Experiment

Asked at the start of the session:

<b>Happiness</b>	
How would you rate your happiness at the moment? (1-7)	<input style="width: 90%;" type="text"/>
<small>Note: 1 is completely sad, 2 is very sad, 3 is fairly sad, 4 is neither happy nor sad, 5 is fairly happy, 6 is very happy, 7 is completely happy</small>	

Asked at the end of the session:

<b>Questionnaire</b>			
<b>Please insert your answers into the shaded boxes to the right</b>			
<b>Details</b>			
What is your age?	<input style="width: 90%;" type="text"/>		
Are you a 1st year, 2nd year, 3rd year, graduate student, or other? (1/2/3/G/O)	<input style="width: 90%;" type="text"/>		
What is your gender? (M/F)	<input style="width: 90%;" type="text"/>		
<b>School Record</b>			
Have you taken GCSE or equivalent in maths? (yes/no)	<input style="width: 90%;" type="text"/>		
IF SO:			
What was the highest grade possible for this course? (A/A*/etc.)	<input style="width: 90%;" type="text"/>		
What was your grade?	<input style="width: 90%;" type="text"/>		
Give a percentage if you know it	<input style="width: 90%;" type="text"/>		
Have you taken A-level or equivalent in maths? (yes/no)	<input style="width: 90%;" type="text"/>		
IF SO:			
What was the highest grade possible for this course?	<input style="width: 90%;" type="text"/>		
What was your grade?	<input style="width: 90%;" type="text"/>		
Give a percentage if you know it	<input style="width: 90%;" type="text"/>		
How many school level qualifications have you taken (including GCSEs, A-levels and equivalent)?	<input style="width: 90%;" type="text"/>		
How many of these qualifications were at the best grade possible? (e.g. A* in GCSE, A is A-level, etc.)	<input style="width: 90%;" type="text"/>		
<b>University Record</b>			
Are you currently or have you ever been a student (yes/no)	<input style="width: 90%;" type="text"/>		
If yes, which degree course(s)?	<input style="width: 90%;" type="text"/>		
If you are a second or third year student what class best describes your overall performance to date? (1/2.1/2.2/3/Fail)	<input style="width: 90%;" type="text"/>		
<b>General Questions</b>			
<i>Life has its ups and downs. During the last 5 years, have you experienced any of the following events (yes/no).</i>			
<i>If yes, please could you indicate how many years ago in the second column to the right. For example, if this happened this year enter 0, for a year ago enter 1, etc. up to 5 years ago.</i>			
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">yes/no</td> <td style="width: 50%; text-align: center;">number of years ago</td> </tr> </table>	yes/no	number of years ago
yes/no	number of years ago		
A bereavement in your close family? (e.g. parent/guardian, sibling)	<input style="width: 90%;" type="text"/>		
A bereavement in your extended family? (e.g. close grandparent, close aunt/uncle, close cousin, close friend)	<input style="width: 90%;" type="text"/>		
A parental divorce?	<input style="width: 90%;" type="text"/>		
A serious (potentially life-changing or life-threatening) illness in your close family?	<input style="width: 90%;" type="text"/>		
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">yes/just averagely good/no</td> <td style="width: 50%; text-align: center;">number of years ago</td> </tr> </table>	yes/just averagely good/no	number of years ago
yes/just averagely good/no	number of years ago		
Has anyone close to you had anything really good happen to them within the last 5 years? (yes/just averagely good/no)	<input style="width: 90%;" type="text"/>		