Happiness & Productivity

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What do we mean by "happiness"? Emotion, mood, state of mind...different for psychologists, but not really for us.

A good deal of existing work considers the impact of key economic variables on happiness: \( H = f(Y, educ, age, etc.) \).

Little or no work examining the opposite direction: the impact of happiness on key economic variables.

For this talk we will focus on productivity.

Our idea in a nutshell: as individuals becomes happier, this allows them to divert attention away from background worries, and put that attention into work tasks.
Productivity can be split into two components: effort and ability.

The impact of happiness on these is not clear:

1. Will a happier individual work harder or not? (effort up or down).
2. Will a happier individual be more or less focused? (ability up or down).
Isen et al (1978) and Teasdale and Fogarty (1979) show that positive affect improves memory recall.


Benabou and Tirole (2002) on the interaction between self-deception, malleability of memory, and ability and effort. ["I have done this, says my memory. I cannot have done that, says my pride, remaining inexorable. Finally—memory yields" Friedrich Nietzsche, Beyond Good and Evil].

Compte and Postlewaite (2004) provide circumstances in which biased perceptions might increase welfare.
Argyle (1989, 2001) points out that little is understood about how life satisfaction affects productivity, but that there is (mixed) evidence that job satisfaction exhibits modestly positive correlations with measures of worker productivity.

Wright and Staw (1999) examines the connections between worker affect and supervisors’ ratings of workers with mixed results.

Amabile et al (2005) uncovers evidence that happiness provokes greater creativity.
Existing Work: Productivity (continued)

- Sanna et al (1996) suggests that those individuals in a negative mood put forth a high level of effort (which we refute in our study).
- Gneezy and Rustichini (2000) find that increasing the size of monetary compensation raises performance, but no monetary compensation may actually be better motivation than offering little.
- Prior to our paper, no existing work combines happiness and worker-level productivity with incentivized payments.
Let the worker’s randomly ability be $z$, with density function $f(z)$.

Denote $p$ as a piece-rate level of pay and $h$ a happiness shock.

Let $e$ be the energy the worker devotes to solving the tasks at work.

Let $w$ be the energy the worker devotes to ‘worrying’.

$R$ denotes the worker’s psychological resources.
Utility

- Utility = utility from work + utility from worrying
- Following this "decomposition" we maximize
  \[ \int u(p, e, h, z) f(z) \, dz + v(w, h) \text{ s.t. } R \geq e + w \]
- So \( u_e - v_w = 0 \)
- Differentiating this one more time shows the sign of \( \frac{de^*}{dh} \) (the impact to "productivity" of a happiness shock) is given by the sign of \( u_{eh} + v_{wh} \).
Functional Forms

- To get some insight into the likely outcome, consider simple forms of these functions.
- Say the person maximizes $u(pe) + v(1-e) + 2h$
- So, the optimal work effort, $e^\ast$, is independent of the happiness shock, $h$. 

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Concavity Case

- Consider instead the maximand $u(pe + h) + v(1 - e + h)$.
- Now at a turning point $u'(pe + h)p - v'(1 - e + h) = 0$ and so the sign of $\frac{de^*}{dh}$ takes the sign of $u''(pe + h)p - v''(1 - e + h)$.
- After substitution, the sign of the comparative static response of work effort, $e$, w.r.t. the size of the happiness shock, $h$, is greater than or equal to zero as $\frac{u''(.)}{u(.)} - \frac{v''(.)}{v(.)} \geq 0$.
- So, if the marginal utility of worry declines quickly enough as energy is transferred from working to worrying, then a positive happiness shock raises productivity, $e^*$, the reverse is also possible.
Within utility theory, under quite general assumptions, a shock to happiness may or may not affect productivity: much depends upon parameter values and functional form.

We then need to go to the data.

But we need an exogenous shock to happiness and control over other key parameters.

So we opt to generate our own data using a laboratory experiment.
Inducing Happiness

- The key difficulty is how to ‘assign’ emotions to people to produce a randomized trial.
- So we used a comedy clip (Bill Bailey) for our key treatment (treatment 1).
- Restricted our laboratory pool to subjects of an English background who had likely been exposed to similar humour before
- Questionnaires seemed to indicate that it did indeed raise happiness.
Measuring Productivity

- Main productivity task previously used in Niederle and Vesterlund (2007), which entails asking subjects to add sequences of five 2-digit numbers under timed conditions. Example:

  31  56  14  44  87

- Comparatively simple but is taxing under pressure.
- It might be thought of as representing in a highly stylized way an iconic white-collar job: both intellectual ability and effort are rewarded.
Controlling for Ability

- Notice that the number of attempts might proxy for effort, while the accuracy of answers might proxy for ability.

- We also require our subjects to undertake GMAT math-style questions:

- For example:

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
Controlling for Ability

- GMAT math-style questions also used in Gneezy and Rustichini (2000).
- We supplement this with information in a final questionnaire (eg school grades).
- The aim was to allow us to control for heterogeneous ability levels, while remaining open for happiness to affect ability too.
Control Treatment: Mood

- The main control treatment identical but for the lack of a clip (treatment 0)
- Second control treatment in which we used a “placebo” clip designed to be neutral with regard to mood, but to take up the same amount of time as the comedy clip.
Control Treatment: Payment

- Standard treatment stressed that a better performance in experiment produced a better payment.
- This was left open in the form of a "performance-related bonus".
- We also ran a control treatment in which we specified the payment reward exactly (£0.25 per correct addition, £0.50 per correct GMAT).
Sessions

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).
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 enter and are given basic instructions on experimental etiquette.

Subjects in clip treatment are exposed to a comedy clip for 10 minutes, otherwise not.

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

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

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

After the questionnaire has been completed, subjects receive payment as calculated by the central computer.
A group of 276 subjects drawn from the University of Warwick participated in the experiment. Of these, 182 took part in the main experiment, while the others participated in the control sessions of day 5 and 6. Each took part in only one session. The subject pool here was made up of 58% males and 42% females.
## Numbers

<table>
<thead>
<tr>
<th>Main Sessions</th>
<th>Day</th>
<th>Treated</th>
<th>Untreated</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>24</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td></td>
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<td>3</td>
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<td>24</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>25</td>
<td></td>
</tr>
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<td>6</td>
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</tbody>
</table>
Reported Happiness

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Happiness & Productivity
Reported Happiness

- Clip successful in increasing the happiness levels of subjects: average reported rise of almost one point (0.98) on the scale of 1 to 7.

- Comparing the ex-post happiness of the treated subjects with that of the non-treated subjects, the average of the former is higher by 0.85 points - using a two-sided t-test, this difference is statistically significant (at the 1% level).

- Note that the 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 (even at the 20% level).
Number of Correct Additions

![Bar Chart]

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Number of Correct Additions

- The treated group’s mean performance is higher by 1.71 additions than the average performance of the untreated group.
- This productivity difference is approximately ten percent.
- It is statistically significantly different from zero (at the 5% level).

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Gender

![Bar chart showing comparison of treated and untreated groups by gender.]

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Distribution

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Description of Variables

- The number of correct additions is in the allotted ten minutes.
- ‘Happiness before’ is the self-reported level of happiness (for the treated group before the clip) on a seven point scale. The variable ‘happiness after’ is the level of happiness after the clip for the treated group. Change in Happiness is the difference between the two.
- GMAT MATH is the number of correct problems solved.
- High-school-grades is an index calculated from the questionnaire based on the ratio of top grades.
- Enjoyment-of-clip is a measure in a range between 1 and 7 of how much subjects said they liked the movie clip.
What Determines Productivity?

<table>
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<tr>
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<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Additions)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>0.118**</td>
<td>0.101**</td>
<td>0.0847*</td>
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<tr>
<td></td>
<td>(0.0548)</td>
<td>(0.0405)</td>
<td>(0.0495)</td>
</tr>
<tr>
<td>Change-in-Happiness</td>
<td></td>
<td>0.100***</td>
<td>0.0739***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0266)</td>
<td>(0.0273)</td>
</tr>
<tr>
<td>GMAT MATH score</td>
<td>0.104***</td>
<td>0.100***</td>
<td>0.0739***</td>
</tr>
<tr>
<td></td>
<td>(0.0226)</td>
<td>(0.0262)</td>
<td>(0.0273)</td>
</tr>
<tr>
<td>High School Grades</td>
<td>0.471***</td>
<td>0.477***</td>
<td>0.428***</td>
</tr>
<tr>
<td></td>
<td>(0.114)</td>
<td>(0.114)</td>
<td>(0.124)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.0257</td>
<td>-0.0267</td>
<td>0.00675</td>
</tr>
<tr>
<td></td>
<td>(0.0609)</td>
<td>(0.0606)</td>
<td>(0.0774)</td>
</tr>
<tr>
<td>Day 2</td>
<td>-0.0169</td>
<td>0.000901</td>
<td>-0.0170</td>
</tr>
<tr>
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<td>(0.0790)</td>
<td>(0.0787)</td>
<td>(0.0905)</td>
</tr>
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<td>Day 3</td>
<td>0.0975</td>
<td>0.106</td>
<td>0.131</td>
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<tr>
<td></td>
<td>(0.0779)</td>
<td>(0.0776)</td>
<td>(0.0885)</td>
</tr>
<tr>
<td>Day 4</td>
<td>0.0118</td>
<td>0.00724</td>
<td>-0.00752</td>
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<tr>
<td></td>
<td>(0.0762)</td>
<td>(0.0758)</td>
<td>(0.0895)</td>
</tr>
<tr>
<td>Constant</td>
<td>2.106***</td>
<td>2.120***</td>
<td>2.244***</td>
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<tr>
<td></td>
<td>(0.105)</td>
<td>(0.102)</td>
<td>(0.126)</td>
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<td>Observations</td>
<td>178</td>
<td>178</td>
<td>93</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.273</td>
<td>0.280</td>
<td>0.307</td>
</tr>
</tbody>
</table>

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

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### Table 5: Determinants of attempts

<table>
<thead>
<tr>
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<th>(1)</th>
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<tbody>
<tr>
<td>Log(Attempt)</td>
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<td></td>
</tr>
<tr>
<td>Log(Attempts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>0.0911**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0417)</td>
<td></td>
</tr>
<tr>
<td>Change-in-Happiness</td>
<td>0.0758***</td>
<td>0.0733***</td>
</tr>
<tr>
<td></td>
<td>(0.0172)</td>
<td>(0.0171)</td>
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<tr>
<td>GMAT MATH score</td>
<td>0.372***</td>
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</tr>
<tr>
<td></td>
<td>(0.0869)</td>
<td>(0.0863)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.0165</td>
<td>-0.0170</td>
</tr>
<tr>
<td></td>
<td>(0.0463)</td>
<td>(0.0460)</td>
</tr>
<tr>
<td>Day 2</td>
<td>0.0198</td>
<td>0.0340</td>
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<tr>
<td></td>
<td>(0.0600)</td>
<td>(0.0597)</td>
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<tr>
<td>Day 3</td>
<td>0.133**</td>
<td>0.140**</td>
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<tr>
<td></td>
<td>(0.0592)</td>
<td>(0.0589)</td>
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<tr>
<td>Day 4</td>
<td>0.0767</td>
<td>0.0732</td>
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<td></td>
<td>(0.0579)</td>
<td>(0.0576)</td>
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<tr>
<td>Constant</td>
<td>2.432***</td>
<td>2.441***</td>
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<td>(0.0795)</td>
<td>(0.0776)</td>
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<tr>
<td>Observations</td>
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<td>178</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.279</td>
<td>0.288</td>
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</table>

*** p<0.01, ** p<0.05, * p<0.1 Std errors in parentheses
## Precision (ie ratio of correct answers)

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

Std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Further Results

- The payment rule was not significant (even at 10% level), indicating that piece rate or bonus regime are similarly affected by happiness shocks.
- The placebo was not significant (even at 10% level).
An "instrument" for Happiness

- We used "nature" to ‘assign’ emotions to a new group of subjects.
- We measured the level of Happiness at the Beginning and at the end we asked about BLE.
- BLE = bereavement in the close family, in the extended family, serious illness in the close family.
- YBLE = Years-Since-Bad-Life-Event variable \[\text{Log}(\text{Year of the Bad Life Event}+0.01)\] or \[\text{Log}(\text{N}+0.01)\] otherwise, with N=10
Measuring Productivity and Ability

- Again asking subjects to add sequences of five 2-digit numbers under timed conditions.
- GMAT math-style questions:
- High School marks.
- Payment reward specified exactly (£0.25 per correct addition, £0.50 per correct GMAT).
- Time line like before, with the only exception that Happiness is asked at the beginning and BLE question added at the end.
A group of 179 subjects drawn from the University of Warwick participated in Experiment 2.

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

<table>
<thead>
<tr>
<th>Session</th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
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<td>26</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>24</td>
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## Numbers

### Happiness

<table>
<thead>
<tr>
<th></th>
<th>(1) Happiness</th>
<th>(2) Happiness</th>
<th>(3) Happiness</th>
<th>(4) Happiness</th>
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</thead>
<tbody>
<tr>
<td>BLE less than 1 year ago</td>
<td>-0.88**</td>
<td>(0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLE 1 year ago</td>
<td>-0.30</td>
<td>(0.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLE 2 year ago</td>
<td>-0.86**</td>
<td>(0.34)</td>
<td></td>
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<tr>
<td>BLE 3 year ago</td>
<td>0.18</td>
<td>(0.36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLE 4 year ago</td>
<td>-0.40</td>
<td>(0.31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLE 5 year ago</td>
<td>-0.45</td>
<td>(0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YBLE</td>
<td>0.13**</td>
<td>(0.049)</td>
<td>-0.43**</td>
<td>(0.18)</td>
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<table>
<thead>
<tr>
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<th>(5) Happiness</th>
<th>(6) Happiness</th>
<th>(7) Happiness</th>
<th>(8) Happiness</th>
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<tbody>
<tr>
<td>Male</td>
<td>0.11</td>
<td>0.069</td>
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<td>Age</td>
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<td>(0.17)</td>
<td>-0.092</td>
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<tr>
<td>High School Grad.</td>
<td>(0.069)</td>
<td>(0.31)</td>
<td>(0.069)</td>
<td>(0.052)</td>
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<tr>
<td>Session 1.2</td>
<td>-0.19</td>
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<td>(0.31)</td>
<td>(0.31)</td>
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<td>0.45</td>
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<td>0.48</td>
<td>0.29</td>
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<td>Session 2.3</td>
<td>0.0013</td>
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<td>-0.0081</td>
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<td>Session 1.2</td>
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<td>0.32</td>
<td>0.32</td>
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<td>6.33***</td>
<td>6.71***</td>
<td>6.11***</td>
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<td>Observations</td>
<td>142</td>
<td>142</td>
<td>142</td>
<td>164</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.163</td>
<td>0.113</td>
<td>0.107</td>
<td>0.099</td>
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* *p < 0.01, **p < 0.05, *p < 0.1 Standard errors in parentheses
## Productivity and BLE

<table>
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<tr>
<th>VARIABLES</th>
<th>(1) Additions</th>
<th>(2) Additions</th>
<th>(3) Additions (log)</th>
<th>(4) Attempt</th>
<th>(5) Correct/Attempts</th>
<th>(6) Additions</th>
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</thead>
<tbody>
<tr>
<td>BLE in the last 2 years</td>
<td>-2.31**</td>
<td>-0.12*</td>
<td>-1.92*</td>
<td>-0.030</td>
<td>-2.05*</td>
<td></td>
</tr>
<tr>
<td>BLE</td>
<td>(1.12)</td>
<td>(0.067)</td>
<td>(1.13)</td>
<td>(0.012)</td>
<td>(1.04)</td>
<td></td>
</tr>
<tr>
<td>YBLE</td>
<td>0.65**</td>
<td>-0.048</td>
<td>-0.88</td>
<td>0.0040</td>
<td>-0.84</td>
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<tr>
<td>(0.31)</td>
<td>(0.068)</td>
<td>(1.16)</td>
<td>(0.023)</td>
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*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses
### Productivity IV and OLS

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Observations: 164 142 142
R-squared: 0.168

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

Oswald, Proto & Sgroi | Happiness & Productivity
The key contribution of this paper is to suggest that human happiness has powerful causal effects on labor productivity and that the effect operates though a change in output rather than the quality of the laboratory subjects’ work, furthermore:

- this effect is marked;
- it appears in each session;
- it can be replicated even with small numbers of subjects;
- the effect is found equally in male and female subsamples.

This is supported in three ways: through induced happiness and reported happiness inside the lab and "bad life events" which occur outside the lab.