

# HAPPINESS RAISED BY RAISING AWARENESS OF HOW HAPPY ONE FEELS: Effect of Happiness Self-Monitoring Using the Happiness Indicator<sup>1</sup>

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## ABSTRACT

*The Happiness Indicator ([www.happinessindicator.com](http://www.happinessindicator.com)) is an online tool designed to make people more aware of their own happiness. The theory behind the website is that a keener awareness of one's own happiness helps users find an optimal lifestyle and consequently promotes happiness among participants.*

*Participants periodically record how happy they feel on the present day and how happy they have felt over the past month, using the Happiness Comparer. They also have the option of indicating in the Happiness Diary how happy they felt during the various activities of the previous day. Participants receive instant feedback in the form of a comparison with their earlier scores and with the average scores of similar participants.*

*The website has been online since January 2011; 5,411 participants have participated at least twice, and 64% of them used the Happiness Diary one or more times. These numbers are now high enough to permit an initial analysis of the effect of the use of the Happiness Indicator on the participants' happiness.*

*We find that the use of the Happiness Comparer does not increase happiness significantly. The effect of using the Happiness Diary turns out to be stronger. Using the Happiness Diary 10 times is followed by an average increase in happiness of 2%. In addition, we find that the gain in happiness was particularly strong for those who felt less happy when they first used the Happiness Indicator.*

*Use of the Happiness Indicator may have prevented a decline of happiness among*

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*our participants, such as observed in the control-groups of 10 studies among self-selected participants in happiness trainings. If so, the gain in happiness following use of the Happiness Indicator was about 5%, which is quite substantial and comparable to effects of real-life events, such as the birth of a first child.*

Keywords:

life satisfaction, mood, self-help, e-help, effectiveness, lifestyle, day reconstruction method  
DRM

# 1 INTRODUCTION

## 1.1 In search of greater happiness

It is in our nature to prefer feeling good over feeling bad (Grinde 2007) and this tendency extends to a universal quest for a satisfying life, called ‘happiness’ (Veenhoven 2010). Currently we pursue happiness probably more than in the past. One reason for this greater weight given to happiness is that chances of living a satisfying life have increased considerably in modern society and a related reason is that in modern multiple-choice society our happiness is more in our own hands (Veenhoven 2015).

Feeling happy is not only more pleasant than feeling unhappy; it also has positive side effects. Happiness makes people typically more productive (Oswald & Proto, 2014), as well as social, active, and engaged (Lyubomirsky, King & Diener 2005). Therefore, happy people are generally better citizens (Guyen 2009). Happiness also makes people less susceptible to disease, and as a result, happy people live considerably longer than unhappy people do (Lyubomirsky et al., 2005; Veenhoven, 2008). These positive effects fit the theory that happiness is part of our affective orientation system and that feeling good tends to accompany functioning well (Grinde 2007; Johnston 2003).

In the light of the above findings especially, there is increasing support for the ideology that we should seek greater happiness for a greater number of people (e.g. Layard, 2006; Veenhoven, 2010; Diener et al., 2012). One way to promote happiness is to create situations in which most people will enjoy their life, such as material comfort and safety. Though quite successful, this approach involves the danger of paternalism, which may backfire on happiness (Omerod & Johns 2007). Another approach is to help people find happiness by themselves. In this paper, we follow that pathway and present tools by means of which people can get a better view on their happiness and adjust their way of life accordingly.

## 1.2 Methods for becoming happier

Happiness depends in part on genetic predisposition and on circumstances that are difficult to change. However, we can control a considerable part of our happiness<sup>7</sup> Therefore, many people ask themselves: What would be the best way to do this?

This question has led to the development of a growing range of happiness-help products, such as advisory books (e.g. Lyubomirski 2008), training courses (e.g. Fordyce 1977) and life-coaching services (e.g. Spence & Grant, 2007). These products use different techniques, such as training social skills, increasing personal insight, reducing stress and promoting positive thinking, for example, encouraging people to see a glass as half full instead of half empty. Most of these techniques originate from psychology; in recent years, they have drawn mainly from the field of positive psychology. Other

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<sup>7</sup> Some researchers estimated that about 40% of our happiness depends on how we arrange our lives (e.g. Sheldon & Lyubomirski 2007) This statistic has been criticized as an overestimation, since it covers also unexplained variance and measurement error. Still there is no doubt that life-choices make a difference, such as in the case of marriage (e.g. Stutzer & Frey 2006) and migration (e.g. Hendriks 2018).

methods that aim to increase happiness draw on esoteric inspiration, such as Buddhist meditation.

Effect studies have been done on several of these interventions. Reviews of this effect research have been published by e.g. Sin & Lyubomirsky (2009 and Bolier et al (2013) and show modest positive effects. The focus of these ‘happiness trainings’ is typically on ‘eudaimonic happiness’, which is a trendy name for ‘positive mental health’. Positive mental health is a syndrome of mental traits deemed beneficial (healthy), such as self-esteem and a sense of meaning, first described in 1958 by Marie Jahoda and currently at the core of positive psychology movement since 2000. Though related, ‘positive mental health’ is not the same as ‘happiness’ in the sense of the subjective enjoyment of life, commonly called ‘life-satisfaction’ and in contrast to ‘eudaimonic happiness’ referred to as ‘hedonic happiness’. This focus on mental health manifests in the outcome measures used in the above-mentioned effect studies, which are typically the positive things trained, such as self-esteem or reduction of negative mental states, such as depression. Hedonic happiness is often not measured.

Still a substantial number of interventions presented as a ‘happiness training’ aims at fostering subjective enjoyment of life and this focus appears in the inclusion of measures of hedonic happiness in studies on the effectiveness of these interventions. An overview of these particular effect studies is available in the World Database of Happiness, the Bibliography of which listed some 150 publications in its subject section ‘Happiness Trainings’ by February 2019. This literature provides an overview of the techniques used in these training and the observed effects on hedonic happiness.

#### *Approaches in happiness trainings*

The ‘happiness trainings’ described in this literature are meant for mentally healthy people and consist of psycho-education and exercises, presented in books (e.g. ), websites or personal instruction, either individually or in classes. The following approaches have been used for raising hedonic happiness in participants:

- Enjoyment training; e.g. mindfulness, savoring
- Goals setting,
- Humor therapy, e.g. laughter yoga
- Life-review
- Positive thinking; e.g. gratitude, hope
- Relaxation; e.g. meditation
- Self-awareness, e.g. of character strengths
- Self-development, e.g. self-affirmation
- Self-management, e.g. time-management
- Sociability: e.g. acts of kindness exercise

For a recent review, see Diener & Biswas-Diener (2018)

### *Effectiveness of these trainings*

Of the 125 effect studies listed in the above-mentioned Bibliography of Happiness only 38 had used a of happiness that fits the validity demands of the World Database of Happiness<sup>8</sup>. The results of these studies are described in a standard format and language in the section ‘Effects of happiness trainings’<sup>9</sup>A look at these findings reveals a mixed picture, 22 show a positive effect, 11 no effect and 2 a negative effect. The effects are typically small and tend to be most positive among initially least happy users

### **1.3 Plan of this paper**

We presents a self-help website, which contains several tools for increasing one’s happiness. In section 2, we describe this Happiness Indicator, in section 2.1 the tools it contains, in section 2.3 the reasons why we expect that the use of these will add to one’s happiness and in section 2.3 some differences with common approaches in positive psychology. Next, we assess whether happiness actually rises after repeated use of the Happiness Indicator. In section 3 we present descriptive statistics and our method of analysis In section 4 we report the results. We find that happiness increased following repeated use of the happiness indicator and that this gain was largest among the initially least happy. We discuss these results in section 5, evidence for a causal effect. In section 6 we conclude.

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<sup>8</sup> [https://worlddatabaseofhappiness.eur.nl/hap\\_cor/desc\\_sub.php?sid=5137](https://worlddatabaseofhappiness.eur.nl/hap_cor/desc_sub.php?sid=5137). Several much used happiness scales fail this test, e.g. Diener’s (19??) Satisfaction With Life Scale (SWLS) and Lyubomirsky’s Subjective Happiness Scale (SHS) because they include items on essentially different things. In the case of Diener;s SWLS this is the item ‘If I could live my life over again I would change nothing’, which is rejected because one can enjoy life, but still be open for something else and is particularly inapt for people seeking a more satisfying way of life at hand here

<sup>9</sup> [https://worlddatabaseofhappiness.eur.nl/hap\\_cor/desc\\_sub.php?sid=5137](https://worlddatabaseofhappiness.eur.nl/hap_cor/desc_sub.php?sid=5137)

## 2 THE HAPPINESS INDICATOR

In collaboration with the health insurance company VGZ, a new online method has been developed at the Erasmus University Rotterdam<sup>10</sup>, that aims to provide people with greater insight into their own happiness. Participants monitor how well they feel in general and during specific daily activities and are informed of how similar people feel. The method is based on the expectation that a better awareness of one's own happiness helps individuals find a personally optimal lifestyle, which subsequently leads to increased happiness.

### 2.1 Tools in the Happiness Indicator

The website is presented as 'A tool for working on your happiness' and is available free of charge on [www.happinessindicator.com](http://www.happinessindicator.com)<sup>11</sup>. Upon visiting the website for the first time, the participants create an account and complete a profile questionnaire. They receive an e-mail every month with a link to the website, where they complete the 'Happiness Comparer' and, if desired, also the 'Happiness Diary'. At the end of each calendar year, they also specify what has changed in their lives.

#### 2.1.1 *Happiness Comparer*

The participants' first task is to answer two questions: first, how happy they feel that day, and next, how happy they have felt over the past month. The answers are rated using a visual faces scale, ranging from zero (very unhappy) to 10 (very happy); see Figure 1. In asking the participants first how they feel that day, we focus the participants' attention on the affective component of happiness and minimize the influence of their current mood on their answer to the second question on their happiness over the past month. After answering the two questions, the participants receive instant feedback in the following two ways:

##### *Comparison with others*

The program compares the answer to the two questions with the average score of all participants and with the average score of participants with the same profile; e.g. those in same age category, with same gender and with a similar level of education. A screenshot of this feedback is shown in Figure 2. This feedback is meant to provide the participants with insight about the likelihood of becoming happier than they are at present.

##### *Comparison over time*

If the participant has previously used the Happiness Comparer, the program generates a trend line (see Figure 3). This trend line shows participants whether they have made

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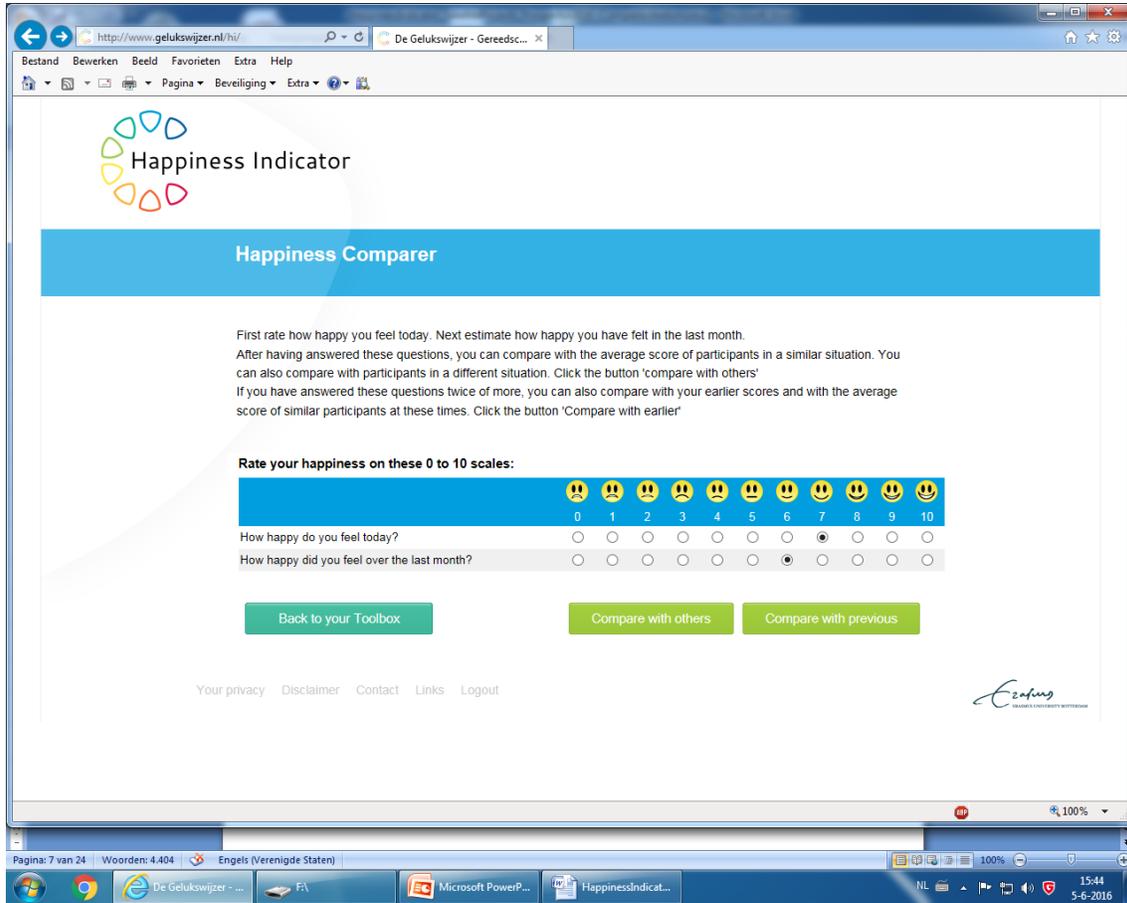
<sup>10</sup>The first version of the Happiness Indicator was developed for a study of elderly people by xx in collaboration with xx. xx also involved in the development of the current version.

<sup>11</sup> The version in Dutch: [www.gelukswijzer.nl](http://www.gelukswijzer.nl)

progress in their happiness and whether they have fared better or worse than similar participants have.

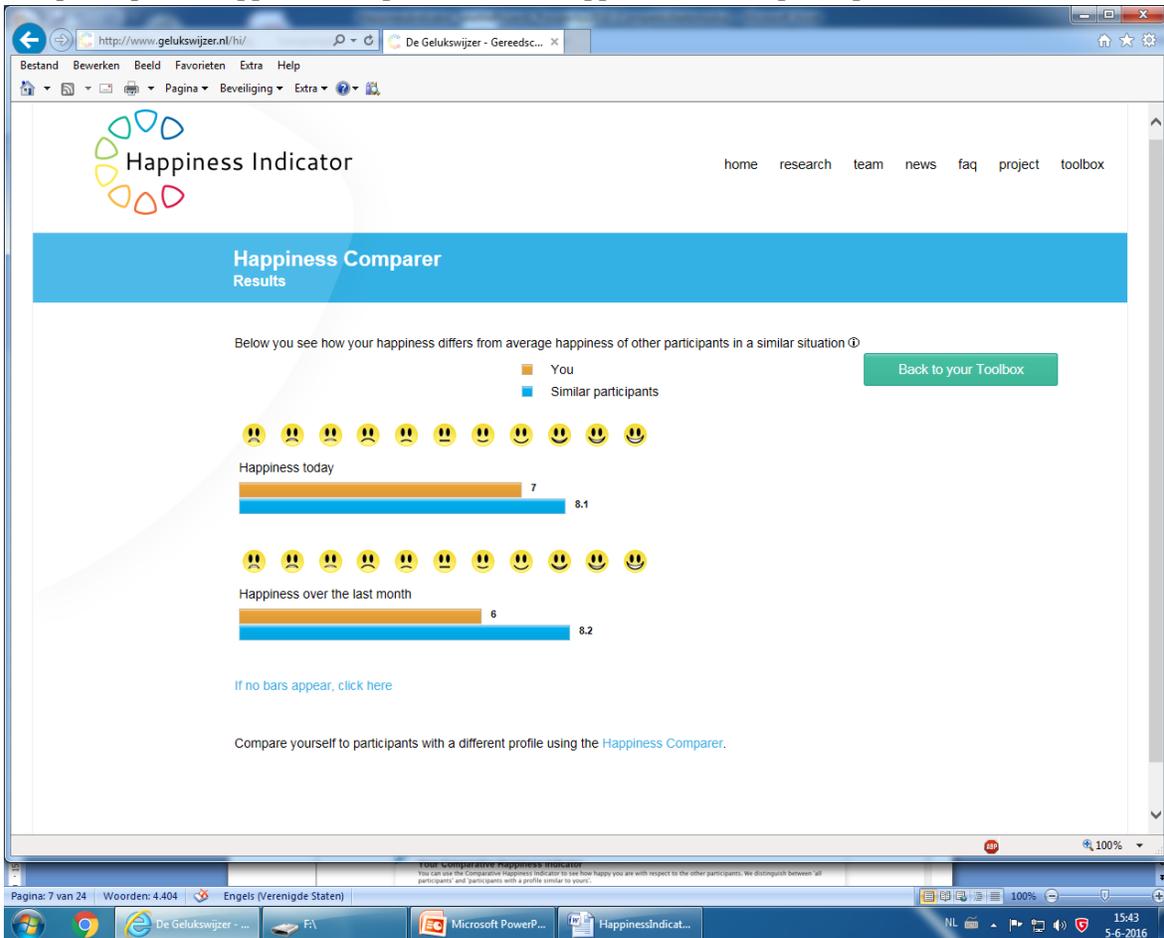
**Figure 1**

Questions about how happy the participant feels

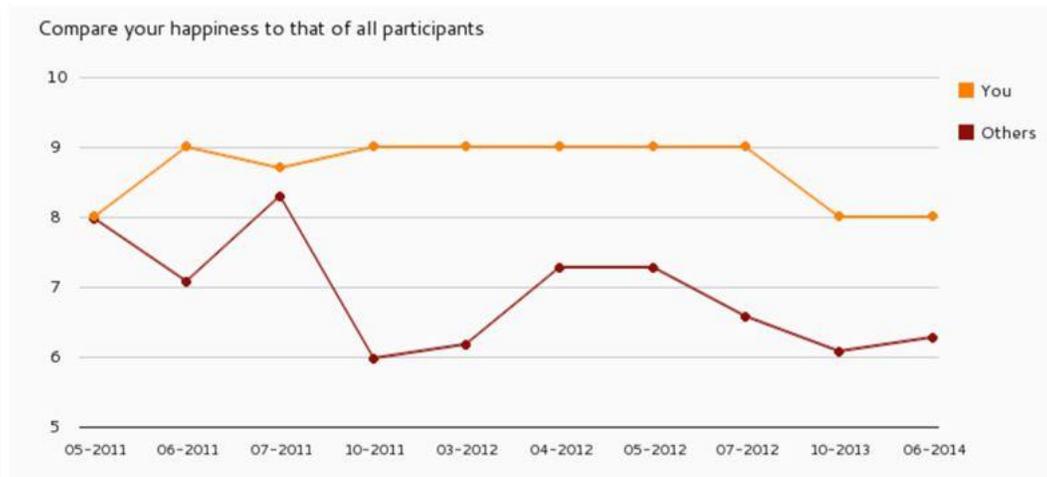


**Figure 2**

The participant's happiness compared with the happiness of other participants



**Figure 3**  
Example of a comparison over time



### 2.12.2 *Happiness Diary*

The Happiness Diary (Figure 4) comprises an internet application of the Day Reconstruction Method (DRM) developed by Kahneman, Krueger, Schkade, Schwarz & Stone (2004).<sup>12</sup> Participants are first asked to record everything they did the day before, such as eating, completing household tasks, working and resting. They also state how much time they spent on each activity, where the activity was carried out (e.g., at home or at work) and with whom (e.g., alone, with a partner, with family, or with colleagues). Happiness during the activities is indicated on a scale ranging from 0 (very unhappy) to 10 (very happy), identical to that shown in Figure 1. As Figure 5 shows, participants can use this scale to indicate how happy they felt during each activity.

This diary provides participants with instant feedback in the following ways:

#### *Feelings during each activity*

The program generates an at-a-glance overview that shows the activities during which the participant felt the least and most comfortable (see Figure 6). This overview can help participants allocate their time optimally.

#### *Comparison with other participants*

This part of the program also provides instant comparison with other participants with similar life situations (see Figure 6). This comparison can help when the participant is making choices, for example, when deciding whether to look for a new job. The fact that a person does not feel great at work is not a reason to change jobs, because most people

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<sup>12</sup> For a recent review of this method, see Diener & Tay (2014). Other studies that have applied DRM to the study of happiness include Kahneman et al. (2006), Oishi et al. (2009), Knabe et al. (2010), and Hendriks et al. (2014).

feel one point less happy at work than at home. However, if your difference between work-happiness and home-happiness is greater than that of similar participants, it is most likely worthwhile to try to improve your work conditions or look for a better job.

*Feelings throughout the total activity pattern.*

The average happiness level of the day is calculated based on the time spent on each activity. This helps participants to assess more accurately their own happiness level; if the daily averages obtained with the Happiness Diary differ substantially from the global estimates made on the Happiness Comparer, the latter estimates may be biased.

**Figure 4:**  
Example of a diary

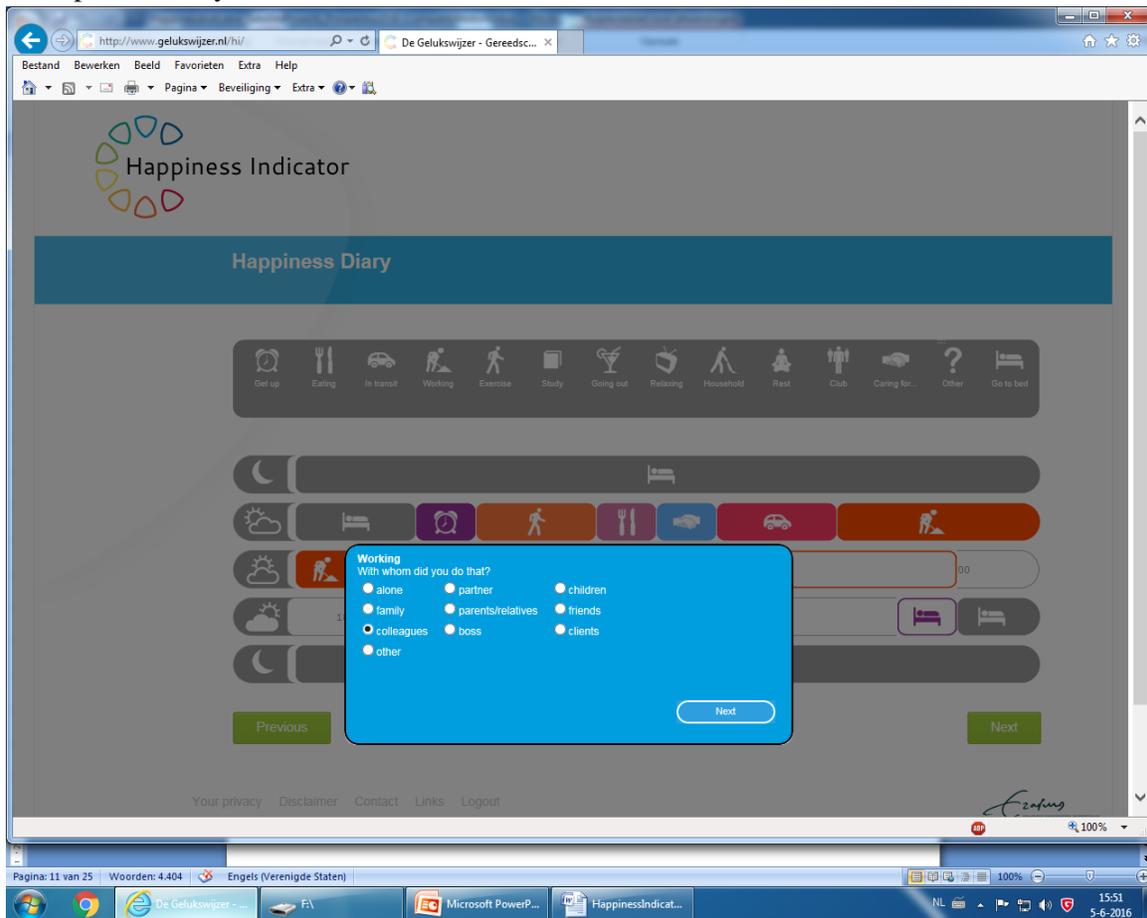


Figure 5  
**Rating of how happy the participant felt during each activity**

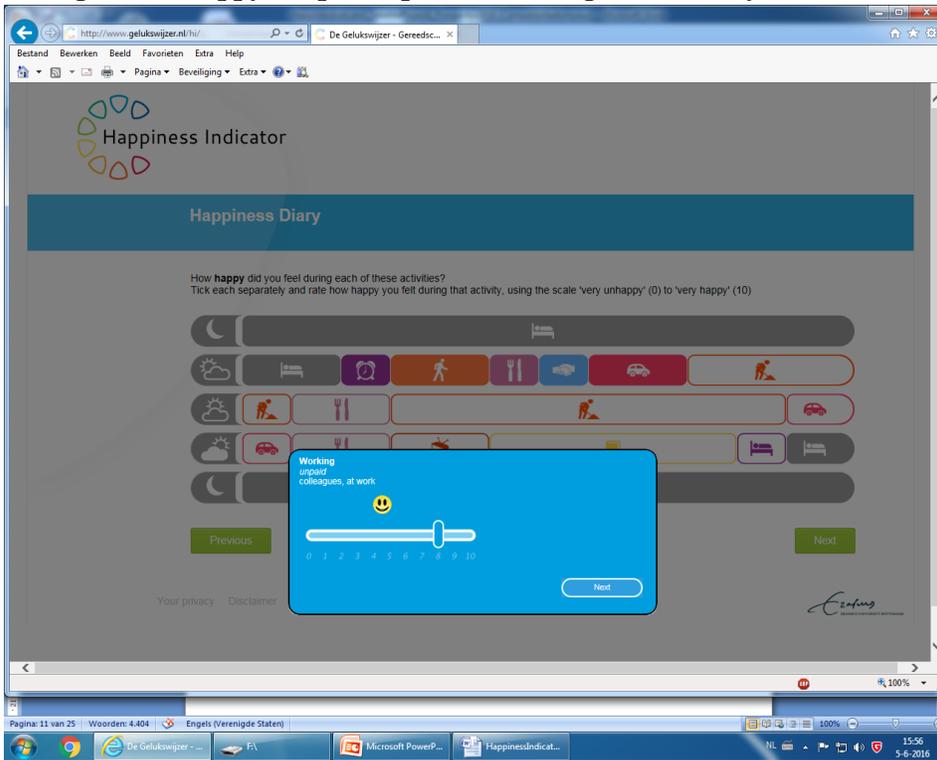
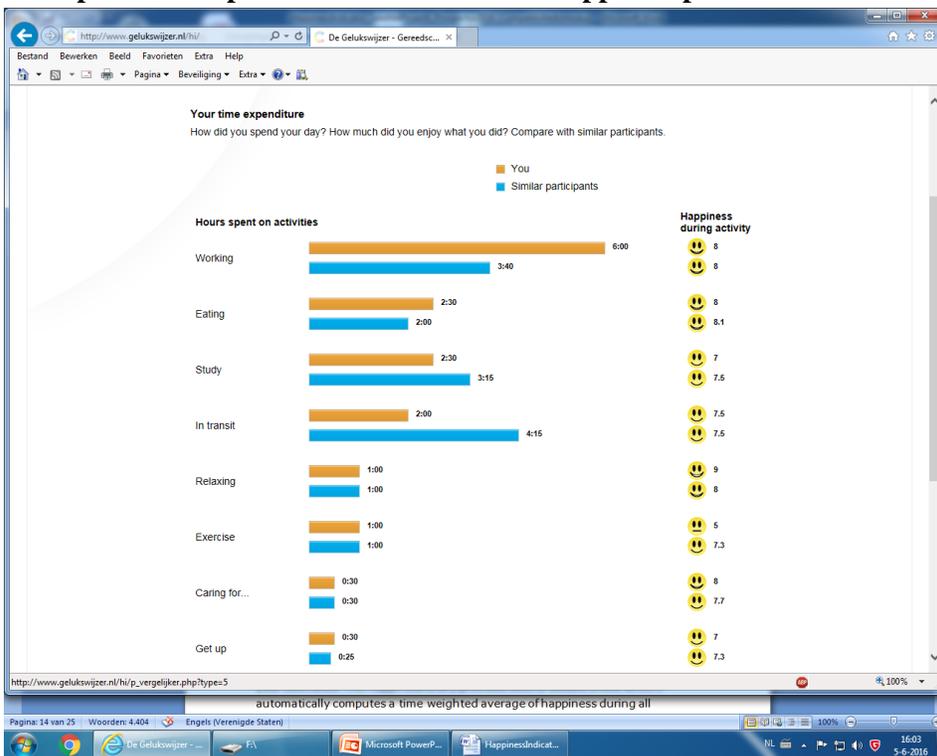


Figure 6  
**Example of a comparison of an individual's happiness profile with that of similar people**



### **2.13 Other tools to work on happiness**

The Happiness Indicator contains two more tools that are designed to provide participants with more insight into their situation, a personality test and a diagnostic questionnaire addressing how they experience their job. Both these tools allow a comparison with the average population in the Netherlands, but not (yet) with people with a similar profile. About ??% of the participants has used one of these additional tools at least once. More of such tools will be added in the future and automatic referral to tools that seem suitable for participants is planned.

## **2.2 Why the use of these tools is expected to raise one's happiness**

The expectation that a better awareness of one's happiness will be helpful, is based on several psychological insights.

### *Information function of affective experience*

Our feelings have a signaling function (e.g. Schwartz 2012) and feeling happy basically indicates that our way of life matches our nature (Grinde 2007). In this perspective, it is functional to be aware of how happy you feel, at least when there is opportunity to improve your situation. Locked in hell, it is probably better to reduce awareness of one's feelings as far as possible, since one cannot change the situation while the signal hurts. Awareness of happiness is also not functional in cases of affective disorder.

### *Inaccurate view on how happy one typically feels*

Memories of how happy we felt in the past are often distorted and may feed us with false information. Several sources of bias in affective recall have been identified. One is that salient memories of ups and downs limit our perception of the average experience (Wilson, Gilbert & Meyers 2003). Another source of memory bias is in 'cognitive framing'; the longer ago the affective experience, the more its afterglow is adapted to existing views on the world and the more we are blinded to divergent information (Kahneman & Krueger 2006).

A related insight is that we are bad at predicting how our choices will affect our future happiness (Gilbert 2005). We tend to project our biased memories of past affective experience on the future, typically neglecting uncertainties and differences in conditions and being susceptible to suggestion (e.g. Wilson et. al 2000). For this reason, we frequently make misinformed choices, such as accepting a better paying job at a longer distance, which in the end makes us less happy because better pay does not compensate the happiness lost in commuting (Frey & Stutzer, 2004).

In this respect, it is plausible that the view on our affective experience will be less biased if we monitor it systematically and can retrieve in writing how well we have felt in the past and how well we typically feel during specific activities. It is also plausible that this will subsequently result in better informed choices when it comes to decisions in

which happiness is at stake and that a better view on one's happiness will therefore tend to result in a higher level of happiness in the long term.

*Limited view on how happy one could be, given one's situation*

Next to a better view on how happy one feels personally, we could profit from more accurate information on how our own happiness compares to the happiness of other people, similar people in particular. If these other people are typically unhappy, there is apparently little chance of a satisfying life and you better not sink energy in the pursuit of happiness; at least not in a real-world context. However, pursuing happiness makes more sense if a satisfying life appears to be possible in your situation.

It is not easy to assess how much happiness is realistically possible for you. There is a lot of misleading information in fiction and advertisement. Media coverage of happiness research concerns mostly the general population, while what you need to know is how happy people like you typically are. Good talks with intimates may provide you with information on this, but there are limits to openness and size of one's circle of intimates. Anonymous reports of a greater number of similar people are therefore helpful.

A further, more common sense, insight underlying the Happiness Indicator is that we can learn from each other and typically do. If you appear to be less happy than otherwise comparable people are and want to improve, it is worth knowing what these other people do differently. One of the most palpable things in that context is how these people usually spend their time, such as how much of the day they spend with others or alone, how long they commute and how many hours they sleep. It is also of interest to know how otherwise comparable people feel during activities. If they feel less miserable when the alarm clock goes off or enjoy dinner more than you do, that is another clue in your search for a more satisfying way of life.

*Limited view on effects of behavioral change*

Bias in affective recall also makes it difficult to grasp the effect of behavioral changes on one's happiness. For instance, when you went to a gym, you are probably aware of how you feel right after leaving the gym but may have little awareness of how daily exercise has affected your average mood in the last month. Systematic mood monitoring will make such small and delayed effects more visible.

The idea behind the Happiness Indicator is that accurate and tailored information will be helpful in the pursuit of happiness. As such, it fits a wider plea for 'informed pursuit of happiness' (Veenhoven 2015). The emphasis is more on *fact finding* than on *soul searching*. Contrary to mainstream happiness advice, the Happiness Indicator does not involve generic recipes, such as 'count your blessings', but aims to help you find what works for you. This approach will not fit everybody, since it requires an ability to digest complex information and to behave accordingly.

### 2.3 Related self-monitoring techniques

Self-tracking techniques are also used in health care, for example for controlling weight and drinking and are part of the ‘Quantified Self’ movement<sup>13</sup> (e.g. Neff & Natus 2016) also called ‘life-logging’. The aim is mostly to help people achieve behavioral changes, whereas the Happiness Indicator rather helps people to find out what to change. The use of these techniques has increased considerably since self-tracking tools became available on mobile phones and other wearable electronic devices. Though mostly welcomed, these practices are also criticized (e.g. Lipton 2016).

### 2.4 Difference with other approaches in Positive Psychology

As noted above in section 1.3.2, the focus of the Happiness Indicator is on how happy one feels. In Positive Psychology, this is called ‘hedonic happiness’ and distinguished from ‘eudaimonic happiness’, which denotes a wider set of desirable mental and moral features and is also referred to as ‘positive mental health’ (Jahoda 1960)

#### *Focus on feeling*

The Happiness Indicator addresses how happy one feels, in other words, how pleasant or unpleasant one’s mood is most of the time. In the academic literature on subjective well-being, this is referred to as the ‘affective component’ of happiness and is distinguished from the ‘cognitive component’, the more rational assessment of the extent to which life brings what one wants it to bring (Veenhoven 1984: Section 2.2). Research has shown that the affective component dominates in the overall evaluation of life (Kainulainen, Saari, & Veenhoven 2017) and that the effect of happiness on health mainly takes place via the affective component (Veenhoven 2009).

#### *Focus on facts*

Next to this difference in object, there is also a difference in method. The Happiness Indicator aims specifically at providing a better view on the facts of one’s happiness, assuming that this will enable more informed life-choices. Positive Psychology interventions cover a much broader range of mental changes, such taking another view on one’s self and practicing new behaviors

### 2.5 Long-term objectives of the Happiness Indicator

In the long-term, the Happiness Indicator is also expected to generate information that will be used in happiness education.

One such kind of information is how changes in daily behavior have worked out

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<sup>13</sup> [https://en.wikipedia.org/wiki/Quantified\\_Self](https://en.wikipedia.org/wiki/Quantified_Self)

on the happiness of participants, for instance, whether doing more exercise has added to the happiness of the average participants and to what extent that effect differed across kinds of participants. Information of this kind will be published on the website. Next to on their own experience, individuals can therefore also orient on the experience of other participants and of similar participants in particular.

Likewise, the Happiness Indicator will generate information about long-term effects on happiness of major life choices, such as having children or early retirement. Often, individuals do not know how these life choices will turn out; consequently, it is helpful to know how similar people who have made a similar choice have fared. Gathering this information requires that a large number of people continue to use the Happiness Indicator at least once a year. Of course, the willingness of participants to do so depends on the effect of participation in the short run.

Information about effects on happiness of life-style and of life-style change will be fed back to the participants, using e-mail messages and short reports on the website. The information will also be presented to public media, the life-style press in particular. Part of the information is expected to find its way into health education.

Still another application of the Happiness Indicator is to use it to assess the effects on happiness of interventions, such as medical or psychological treatment and organizational change. Follow-up is easy and control groups can be selected from the large pool of participants. There is still the problem that using the Happiness Indicator may have an effect on happiness by itself, and this effect must be subtracted from the effect of the intervention evaluated. It is for this reason also worth knowing whether participants have become happier, and if so, by how much.

## 3 METHOD

### 3.1 Participants

Participants were, and continue to be, recruited using various channels, including different types of customer communications from the health insurer XX, social media (Facebook, LinkedIn, Twitter) and Dutch popular magazines (including ‘Libelle’ and ‘Psychologie Magazine’). Since its start in January 2011, the Happiness Indicator has attracted 40,495 participants all of whom completed a profile and the Happiness Comparer at least one time. Of these 40,495 participants, 9,091 (22%) subsequently filled out the Happiness Diary at least once.

The average happiness of these visitors at the first time of participation was a 6.32 on scale 0-10, which is well below average life satisfaction scores reported in Dutch surveys<sup>14</sup>; 9 out of 20 people gave his or her monthly happiness a 6 or lower. This indicates that the Happiness Indicator particularly attracts individuals who are less happy than the average citizen is and probably for that reason would like to work on their happiness.

Most of these individuals (86%) only participated once; therefore, we could not ascertain whether those users became happier because of using the Happiness Indicator. Consequently, we limited this study to examining the change in happiness for people who used the happiness indicator twice or more. A total of 5,411 participants met this criterion. Those individuals used the Happiness Indicator for an average of 233 days, measured as the difference between the first day and last day of use, where there were on average 3 months between participations.

When comparing the one-time and returning participants, it appears that the returning participants were slightly less happy on their first visit (6.24 vs. 6.34) and more likely to be female (78.0% vs. 73.7%) and older (e.g. of the returning participants 51.4% was between 40 and 60 years old vs. 43.4% for the one-time users). In addition, returning participants were more likely to have a chronic disease (32.8% in vs. 26.4%), richer (e.g. of the returning participants 38.4% had an income of more than 5000 euros per month compared to 30.7% of the one-time users), and higher-educated (e.g. of the returning participants 54.2% had a higher-vocational or university degree compared to 38.4% of the one-time users).

#### *Frequency of participation*

The participants in our sample completed the Happiness Comparer 2 to 35 times.<sup>15</sup> Each time, they had to indicate how happy they had felt over the past month (see Section 1.4.1). In addition, over 64% of the participants completed the Happiness Diary (see Section 1.4.2) at least once. It is possible that the participants also used other tools on the

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<sup>14</sup> Average response to the question “How happy would you say you are?” was 7,9 in the Dutch sample of the European Social Survey in 2014.

<sup>15</sup> Individuals falling within the top 1% for the number of times of participation (35 or more) were considered outliers and were excluded from our analysis.

website, such as the personality test or the questionnaire about how they experienced their jobs; however, the use of these tools was not taken into account in this analysis given the very limited number of participants that filled out these tests.

### *Personal characteristics*

The average age of the participants was 45 years ( $SD = 14$ ), and 78% of the participants were women. Regarding employment, 68% of the participants had a job, and the participants worked an average of 4 days ( $SD = 1.26$ ) or 29 hours a week ( $SD = 11.86$ ). Over a quarter of the participants (28.9%) worked in health care institutions and welfare institutions, 13.8% worked in the business or financial sector, 13.4% worked in education, 9.5% worked for the government, 6.1% worked in retail, 4.9% worked in the cultural sector, 4.1% worked in the catering industry, 2.2% worked in the transportation sector, and 17.1% worked in other sectors. The participants' level of education varied: 34.1% of the participants had a higher vocational education (HBO), 23.0% had a university degree, 6.1% had a pre-university education (VWO), 19% had a senior secondary vocational education (MBO), 11.7% had a preparatory secondary vocational education (VMBO), 7.5% had senior general secondary education (HAVO), and 2.7% had only attended a basic school. In terms of household income, 27.1% of the participants had a relatively low family income (€ 0-2499 per month), 34.5% had an average family income (€ 2500-4499 per month), and 38.4% had a relatively high family income on average (>€ 5000 per month). The participants' living situations also varied: 43.2% were single or divorced with no children living in the household, 27.9% of the participants cohabited with their partner and no children, 10.4% cohabited with their partner and had children, 2.7% were single parents with children, and 15.8% had some other living situation (e.g., a communal group, living with parents or student group housing).

It should be noted, that data collected online has some well-known limitations, one of which is representativeness of the sampling. However, given the goal of the Happiness Indicator, representativeness is not really a problem. The Happiness Indicator gathers information *on* particular people *for* particular people, in this case mainly *on* and *for* well-educated women, interested in getting happier than they are. Representativeness for the general population is therefore not necessary. This point is discussed in more detail in section 4.5.

## **3.2 Descriptive Statistics**

The means, standard deviations and inter-correlations of the variables used in this study are presented on Table 1. These descriptive statistics are based on 13.320 data-points provided by 5.411 participants.

Inspection of the means shows that average happiness 'today' (6.89) is somewhat higher than retrospective happiness over the last month (6.61). This may mean that participants are more inclined to use the Happiness Indicator on good days and/or that they underestimated their happiness over the last month. A possible reason for such under-estimation is that memories of affective experience fade, making way to more evaluative cues.

Table 1

**Descriptive statistics and correlation matrix of most important variables in the analysis**

	Mean	SD	1	2	3	4	5	6	7
1. Happiness Last Month	6.61	1.68	1.00						
2. Happiness Today	6.89	1.64	0.64	1.00					
3. Times Comparer Used	4.29	5.44	0.10	0.07	1.00				
4. Times Diary Used	2.91	5.60	0.11	0.07	0.68	1.00			
5. Number of Days Participating	93.31	198.3	0.04	0.04	0.24	0.01	1.00		
6. Days since Last Participation	90.24	177.4	-0.01	0.01	-0.15	-0.14	0.68	1.00	
7. Change Happiness Last Month	0.09	1.48	0.41	0.20	-0.03	-0.02	-0.03	-0.01	1.00

**3.3 Analysis**

In this study, we focused on the feeling of happiness in the past month, as measured using the second question shown in Figure 1. The research question was whether happiness in the past month increases with the repeated use of the Happiness Comparer and the Happiness Diary. As a first test, we assessed whether a participant's happiness had changed between their first and their last use of the Happiness Indicator, and, if so, by how many points to the positive or negative. As a next step, we performed a more sophisticated analysis taken from econometrics, which allowed a better estimate of the size and significance of the changes. A standard reduced-form happiness model was estimated (see also Di Tella, MacCulloch & Oswald 2003; Arampatzi, Burger & Veenhoven 2015):

$$H_{it} = \alpha_0 + \alpha_1 H_{i(t-1)} + \alpha_2 P_{i(t-1)} + \alpha_3 X_{i(t)} + \mu_i + \varphi_t + \varepsilon_{it},$$

where  $H$  is the self-reported happiness over the past month, at participation time  $t$ ;  $P$  is a set of variables capturing the number of times the participant has used the Happiness Comparer and the Happiness Diary<sup>16</sup>;  $X$  is a set of control variables capturing happiness that day, the number of days the participant has already used the Happiness Indicator, and the number of days since the last use;  $\mu_i$  is a vector of participant fixed effects to control for time-invariant participant characteristics, such as gender, marital status, income, and level of education; and  $\varphi_t$  is a vector of month and year dummies to capture time-related circumstances, such as the weather and economic situation. The lagged dependent variable  $H_{i(t-1)}$  is included to allow for adjustment dynamics and to tackle serial correlation and avoid potential omitted variable bias. Please note that we use a *within-person* design, where we look at variation of happiness within persons and not between persons.

<sup>16</sup> Please note that our Happiness Diary variable is Winsorized at the 1% level.

We acknowledged that there is interdependence between the Happiness Comparer use and Happiness Diary use variables. To measure how large these influences might be, three versions of the model were estimated: version (i) only included the use of the Happiness Comparer variable; version (ii) only included the use of the Happiness Diary variable; and version (iii) included both variables. We prefer the third specification because it allowed us to capture the “direct” impacts of the Happiness Diary and Happiness Diary use variables on happiness.

## 4 RESULTS

An overview of the observed changes in last-month happiness following use of the Happiness Diary is presented in Figure 7.

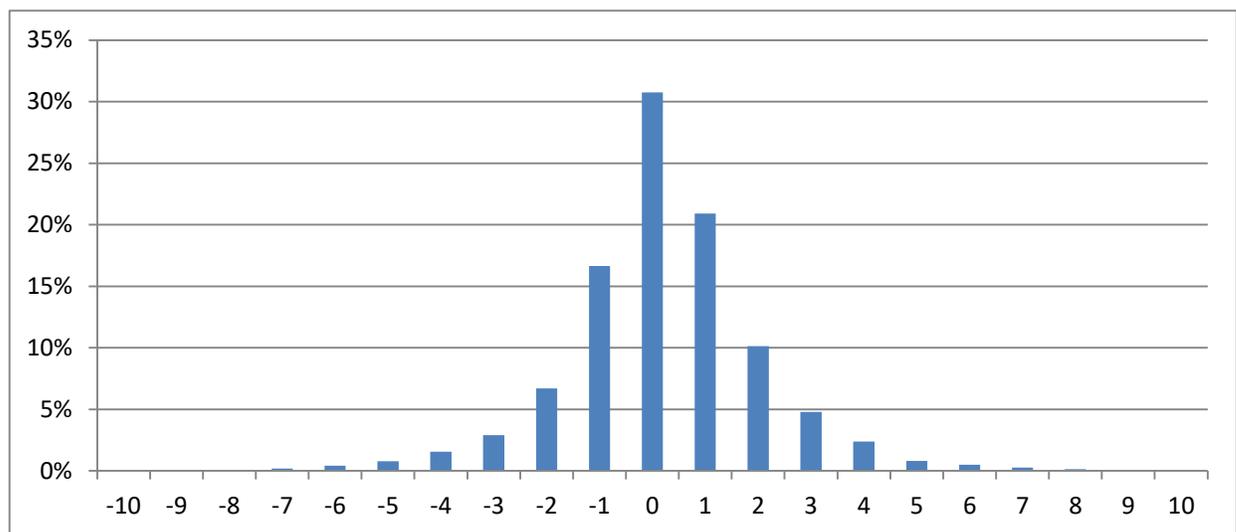
### 4.1 Happiness is changeable

First, we examined whether individual happiness fluctuates over time. This was found to be true. From Figure 7, it can be seen that among the users of the Happiness Diary, only some 30% remained evenly happy and some 20% experience changes of 2 points or more. The average monthly change was 0.09 point on scale 0-10, that is, about 1% of the possible range.

At first sight, this small change supports the ‘set point’ theory, which holds that happiness is a stable ‘trait’ (e.g. Cummins 2010). Yet cumulated over time such minor monthly changes can result in substantial alterations of happiness, such as these demonstrated in long-term follow-up studies, see for example Headey (2008).

Figure 7

**Change in Happiness Last Month between First and Last Use of the Happiness Diary**



### 4.2 Happiness increases following repeated use of the Happiness Indicator

We considered whether individuals experienced an increase in monthly happiness following the use of the Happiness Indicator. As we can see from Figure 7, there was more change to the positive than to the negative. This is confirmed using the econometric analysis reported in Table 2. In that analysis, all models were estimated using fixed-effects estimators and cluster robust standard errors. Of the control variables included in the model (Table 1, Column 1), only happiness that day was statistically significant ( $b = 0.314$ ,  $SE = 0.016$ ,  $p < 0.01$ ). Surprisingly, we did not find an effect of happiness of last

month in the previous period (t-1) on happiness of last month in the current time period. However, it should be noted that this effect might be confounded by individual fixed effects and the Nickell bias induced by fixed-effects estimation. This is further explored below.

#### 4.2.1 *No significant gain after use of the Happiness Comparer*

We examined whether there was an increase in monthly happiness over time because of repeated use of the Happiness Comparer. We observed a positive change that did not reach statistical significance ( $b = 0.008$ ,  $SE = 0.005$ ,  $p = 0.113$ ; Table 2, Column 2).

#### 4.2.2 *Significant gain following use of the Happiness Diary*

We found a significant positive change in happiness after use of the Happiness Diary ( $b = 0.013$ ,  $SE = 0.005$ ,  $p < 0.01$ ; Table 1, Column 3), even when controlling for use of the Happiness Comparer ( $b = 0.014$ ,  $SE = 0.007$ ,  $p < 0.05$ ; Table 2, Column 4).

How sizable is this gain? Using the Happiness Diary ten times increased monthly happiness by approximately 0.14 points on a 0 to 10 scale when all other factors were held constant. However, less than 4% of the respondents completed the diary 10 times or more, and the average use was only 2.4 times.

The Happiness Comparer and Happiness Diary cannot be considered as substitutes in terms of their contribution to well-being. The participants who only used the Happiness Comparer and not the Happiness Diary did not profit more from the Happiness Comparer than the participants who used both tools (Table 2, Column 5).

We found decreasing marginal benefits of using the Happiness Comparer and Happiness Diary. In other words, the gain in happiness following use of the happiness indicator decreases slightly with increasing uses. These interaction effects are shown in Table 3. When participants first begin to use the Happiness Indicator, one additional use of the Happiness Comparer increased happiness in the last month by 0.025; however, after using the Happiness Comparer 20 times, the marginal benefits of use become negligible (Table 3, Column 1)<sup>17</sup>. Given that most of the participants only used the Happiness Comparer a few times, it can be tentatively concluded that happiness increases for participants who repeatedly use the Happiness Comparer, but typically by less than 1%. A similar observation can be made regarding the Happiness Diary (Table 3, Column 2), although the squared term becomes insignificant when the squared terms of both the Happiness Comparer and Happiness Diary variables are entered into our model (Table 3, Column 3).

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<sup>17</sup> Our results do not change when we exclude the variable 'Happiness Today', which reflect current mood. These results are available upon request.

Table 2

**Determinants of Happiness Last Month – Fixed Effects Estimation**

	(1) Only Control Variables	(2) + Happiness Comparer	(3) + Happiness Diary	(4) Full Model	(5) + No diary use Effect
Times Happiness Comparer Used $t_{-1}$		0.008 (0.005)		-0.001 (0.007)	0.001 (0.008)
Times Happiness Comparer Used $t_{-1}$ x No Diary Used					-0.010 (0.012)
Times Happiness Diary Used $t_{-1}$			0.013*** (0.005)	0.014** (0.007)	0.012* (0.007)
Happiness Last Month $t_{-1}$	0.024 (0.020)	0.023 (0.020)	0.022 (0.019)	0.022 (0.020)	0.022 (0.020)
Days Using Happiness Indicator (x100)	0.156 (0.146)	0.126 (0.149)	0.119 (0.148)	0.121 (0.150)	0.123 (0.149)
Days Since Last Use (x100)	-0.020 (0.014)	-0.012 (0.015)	-0.012 (0.015)	-0.013 (0.015)	-0.014 (0.015)
Happiness Today	0.314*** (0.016)	0.314*** (0.016)	0.314*** (0.016)	0.314*** (0.016)	0.314*** (0.016)
Respondent FE	Yes	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes	Yes
Observations	13320	13320	13320	13320	13320
Number of Respondents	5411	5411	5411	5411	5411
Within R-Square	0.15	0.15	0.15	0.15	0.15
Between R-Square	0.26	0.29	0.30	0.29	0.29
Overall R-Square	0.27	0.29	0.30	0.29	0.29

Cluster-robust standard errors in parentheses \*\*\*p<0.01, \*\* p<0.05, \* p<0.10.

Table 3

**Determinants of Happiness Last Month – Fixed Effects Estimation – Squared Terms**

	(1) Squared Term Happiness Comparer	(2) Squared Term Happiness Diary	(3) Full Specification
Times Happiness Comparer Used $t_{-1}$	0.026** (0.012)	0.000 (0.007)	0.021* (0.013)
Times Happiness Comparer Used $t_{-1}$ Squared	-0.001*** (0.000)		-0.001*** (0.000)
Times Happiness Diary Used $t_{-1}$	0.011* (0.006)	0.033*** (0.011)	0.020 (0.013)
Times Happiness Diary Used $t_{-1}$ Squared		-0.001** (0.000)	-0.000 (0.000)
Happiness Last Month $t_{-1}$	0.019 (0.019)	0.020 (0.019)	0.019 (0.019)
Days Using Happiness Indicator (x100)	0.101 (0.149)	0.108 (0.149)	0.100 (0.149)
Days Since Last Use (x100)	-0.009 (0.015)	-0.010 (0.015)	-0.008 (0.015)
Happiness Today	0.313*** (0.016)	0.314*** (0.016)	0.313*** (0.016)
Respondent FE	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes
Observations	13320	13320	13320
Number of Respondents	5411	5411	5411
Within R-Square	0.15	0.15	0.15
Between R-Square	0.31	0.30	0.31
Overall R-Square	0.30	0.30	0.30

Cluster-robust standard errors in parentheses \*\*\*p<0.01, \*\* p<0.05, \* p<0.10.

#### 4.2.3 Nickell bias, reverse causality and selection bias

One potential problem with the fixed-effects estimation presented above is that the presence of a lagged<sup>18</sup> endogenous variable in the model induces autocorrelation. Nickell (1981) has indicated that in this context, fixed-effects estimates tend to be downward biased, and the use of this technique typically results in an underestimation of the coefficient of the lagged dependent variable. If the other independent variables in the model are correlated with the lagged dependent variable, their coefficients may also be biased. The Nickell bias is particularly pertinent when the time dimension of the panel is short and the number of individuals is large. Given that our sample is generally characterized by a large  $N$  (many individuals), a small  $T$  (limited number of time points), and a very small coefficient for our lagged dependent variable, the results described in

<sup>18</sup> Here, the lagged value of a variable is the value of a variable at the previous measurement point.

the previous section might be biased. The system ‘Generalized Method of Moments’ (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998) addresses the issue by instrumenting the variables in the regressions with their lagged levels and lagged first differences.<sup>19</sup>

System GMM estimation has two additional advantages. First, using the lagged levels and lagged first differences of the variables as internally generated instruments, system GMM addresses the issue of reverse causality, in which individuals who have the idea that the Happiness Indicator tool works for them are more likely to use the Happiness Indicator. In other words, differences in the change in average monthly happiness, measured as the change in happiness between first and last use of the Happiness Indicator, between frequent and infrequent users can be contingent on characteristics that affected whether or not an individual used the Happiness Indicator frequently. In this regard, Jiménez-Martín et al. (2014), however, showed that results obtained from System GMM estimators are robust to this form of sample selection bias and often no bias correction is necessary.

Second, the time-invariant individual characteristics in the fixed-effects estimation can be correlated with the other independent variables; GMM models address this problem by using a first-difference estimation.

The results of our GMM estimation<sup>20</sup> are shown in Table 4 for the baseline specifications in Table 2 and 3. System GMM use did not lead to different conclusions regarding the effect of repeated Happiness Comparer and Happiness Diary use on happiness.<sup>21</sup> Two differences regarding our fixed-effects estimations stand out. One, our fixed-effects estimation was subject to Nickell bias in that the coefficient of the lagged endogenous variable became positive and significant. Two, the size of the main effect for Happiness Comparer use became much smaller, and we did not find evidence of decreasing marginal returns for the use of the Happiness Comparer. Hence, we concluded that only use of the Happiness Diary adds substantially to happiness.

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<sup>19</sup> Another solution would be to estimate the model using the first-differenced generalized method of moments (difference GMM), a technique developed by Arellano and Bond (1991). However, Bond et al. (2001) note that in many empirical applications, the performance of difference GMM is disappointing, and the estimates of difference GMM are often implausible because the lagged levels are often poor instruments for first differences. Hence, this technique was not used in this study.

<sup>20</sup> In this estimation, we also allowed the independent variables to be endogenous.

<sup>21</sup> Please note that system GMM assumes that the internally generated instruments are exogenous (tested with the Sargan test) and that the error term was not serially correlated (tested with the AR2 test). In addition, there should be no correlation between the unobserved individual fixed effects and the instruments, a factor that can be tested with the difference-in-Sargan test. The test statistics, provided in Table 3, show that there were no problems.

Table 4

**Determinants of Happiness Last Month – System GMM Estimation**

	(1) Baseline Specification	(2) Squared Term Happiness Comparer	(3) Squared Term Happiness Diary	(4) Full Specification
Times Happiness Comparer Used $t_{-1}$	0.002 (0.006)	0.001 (0.006)	0.004 (0.005)	0.003 (0.005)
Times Happiness Comparer Used $t_{-1}$ Squared		-0.000 (0.000)		-0.000 (0.000)
Times Happiness Diary Used $t_{-1}$	0.015** (0.007)	0.015** (0.007)	0.017*** (0.006)	0.015** (0.006)
Times Happiness Diary Used $t_{-1}$ Squared			-0.001* (0.000)	-0.000 (0.000)
Happiness Last Month $t_{-1}$	0.140*** (0.024)	0.138*** (0.024)	0.142*** (0.024)	0.142*** (0.024)
Days Using Happiness Indicator (x100)	0.029 (0.022)	0.024 (0.023)	0.005 (0.023)	0.009 (0.023)
Days Since Last Use (x100)	-0.023 (0.020)	-0.017 (0.021)	-0.019 (0.020)	-0.016 (0.021)
Happiness Today	0.454*** (0.048)	0.444*** (0.048)	0.440*** (0.046)	0.437*** (0.047)
Respondent FE	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes
Observations	13320	13320	13320	13320
Number of Respondents	5411	5411	5411	5411
AR (2) test (p-value)	0.07	0.07	0.06	0.06
Sargan test (p-value)	0.54	0.52	0.88	0.87
Difference-in-Sargan test (p-value)	1.00	1.00	1.00	1.00

Cluster-robust standard errors in parentheses \*\*\*p<0.01, \*\* p<0.05, \* p<0.10.

**4.3 Larger gain among those who initially were the least happy**

Further analysis of the use of the Happiness Diary indicated that the increase in happiness gain was larger for the participants who were less happy at the first use of the Happiness Indicator. This analysis is shown in Table 5. The participants who were initially the happiest profited less from participation compared with the participants who were initially the least happy. Using the Happiness Comparer or the Happiness Diary 10 times resulted in a 0.3-point increase the happiness of the people who scored 4 on their first use, whereas on average, no advance was found for people who were relatively happy (7 or higher) at the start. The coefficient of the interaction effect between the number of times the Happiness Diary was used and happiness at first use became insignificant when both interaction effects were entered into our model. Here, it should be noted that the zero-order correlations between happiness at the start and the number of times that the

Happiness Comparer and Happiness Diary were used were very low (0.02). These results were confirmed when the models were re-estimated using system GMM.

#### 4.4 No differences in gain across participant types

We examined whether the increase in monthly happiness with repeated participation differed according to participant's background (with respect to differences in age, gender, income level, and education level). We found no evidence of heterogeneity across groups in the change in happiness following use of the Happiness Comparer or Happiness Diary.

Table 5

**Determinants of Happiness Last Month – Fixed Effects and System GMM Estimation - Effect for Unhappy vs. Happy People at Start. Fixed**

	Fixed Effects			System GMM		
	(1) Interaction Term Happiness Comparer	(2) Interaction Term Happiness Diary	(3) Full Specification	(1) Interaction Term Happiness Comparer	(2) Interaction Term Happiness Diary	(3) Full Specification
Times Happiness Comparer Used $t-1$	0.099*** (0.022)	0.000 (0.007)	0.090*** (0.031)	0.068*** (0.010)	0.004 (0.004)	0.081*** (0.020)
Times Happiness Comparer Used $t-1$ * Happiness Last Month at Start	-0.016*** (0.003)		-0.014*** (0.005)	-0.010*** (0.001)		-0.013*** (0.002)
Times Happiness Diary Used $t-1$	0.016** (0.007)	0.096*** (0.019)	0.028 (0.028)	0.013** (0.005)	0.063*** (0.011)	0.001 (0.028)
Times Happiness Diary Used $t-1$ * Happiness Last Month at Start		-0.013*** (0.003)	-0.002 (0.004)		-0.009*** (0.002)	-0.002 (0.003)
Happiness Last Month $t-1$	0.001 (0.019)	0.008 (0.019)	0.001 (0.019)	0.180*** (0.022)	0.209*** (0.022)	0.190 (0.022)
Days Using Happiness Ind.(x100)	0.141 (0.150)	0.135 (0.151)	0.142 (0.150)	0.003 (0.021)	0.007 (0.020)	0.004 (0.020)
Days Since Last Use (x100)	-0.013 (0.014)	-0.014 (0.014)	-0.013 (0.014)	-0.009 (0.020)	-0.006 (0.020)	-0.012 (0.020)
Happiness Today	0.310*** (0.016)	0.311*** (0.016)	0.310*** (0.016)	0.712*** (0.048)	0.692*** (0.044)	0.675*** (0.046)
Respondent FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13320	13320	13320	13320	13320	13320
Number of Respondents	5411	5411	5411	5411	5411	5411
Within R-Square	0.16	0.15	0.16			
Between R-Square	0.19	0.23	0.19			
Overall R-Square	0.18	0.22	0.18			
AR (2) test (p-value)				0.12	0.06	0.08
Sargan test (p-value)				0.24	0.05	0.09

Difference Sargan test (p-value)	1.00	1.00	1.00
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Cluster-robust standard errors in parentheses \*\*\*p<0.01, \*\* p<0.05, \* p<0.10.

## 5 DISCUSSION

This first exploration of the changes in happiness following use of the Happiness Indicator confirmed our expectation that increased awareness of one's own happiness contributes to the likelihood of one finding a more satisfying way of life. Still the findings give rise to the following questions.

### 5.1 Causal effect?

Possibly, the observed gain in happiness following use of the Happiness Indicator is due to other causes than the greater awareness of one's happiness postulated in section 1.3.1 of this paper. The following alternative causes could be involved:

#### 5.1.1 *Spontaneous recovery from a temporary dip?*

Happiness Indicator participants are probably occupied with their own happiness to an above-average degree. Would these people have become happier without using the Happiness Indicator? We are familiar with the 'waiting room effect' described in psychotherapy<sup>22</sup>. A part of that effect is seen in spontaneous healing and another part in sharper problem awareness, i.e. there is something wrong with me, and consequent coping. In our case, the problem lies not in sharper awareness, because that is what the Happiness Indicator aims to promote, but in spontaneous recovery, in this case, overcoming a dip in happiness, one that one would have over-mounted anyway.

*Difference with observed gains in control groups in effect studies of happiness trainings*  
In effect studies, this possibility of spontaneous improvement is commonly handled using 'control groups', typically randomly assigning part of the applicants to a waiting list or a placebo treatment. The Happiness Indicator does not have such a control group, but we can learn from other studies.

We looked for earlier studies among self-selected participants in wellbeing trainings that involved a control group in which change in happiness was assessed and we subjected these findings to a mini meta-analysis. We used the Bibliography of Happiness<sup>23</sup>, which lists some 90 studies on the effects on happiness of individual level interventions on wellbeing, of which 10 were among self-selected participants and had a control group<sup>24</sup>. The observed changes in happiness among these controls are reported in table 6.

The changes are typically small and mostly negative, the average decline of happiness in these control groups is 3,8% of the possible scale ranges. So, denying treatment to people who seek treatment lowers these people's happiness. If spontaneous recovery exists at all, it is apparently an exception rather than the rule.

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<sup>22</sup> Waiting for treatment often appears to be conducive to spontaneous healing.

<sup>23</sup> Bibliography of Happiness, section Rf02.08 '[Psychological training/therapy](#)'

<sup>24</sup> We did not consider studies that rewarded participants with money or course credits

This means that the observed rise in happiness following use of the Happiness Indicator is unlikely to have happened without use of this tool. It can also mean that the observed rise in happiness since start is an underestimation of the total advance in happiness. Below in section 4.5, we will see that frequent use of the Happiness Diary raises happiness 1,4% of the scale range. If using this tool has also prevented a 3,8% decline, the net gain is about 5%.

Table 6

**Observed changes in happiness in the control group of studies among self-selected participants in trainings for greater wellbeing**

<i>Intervention</i>	<i>Control condition</i>	<i>Measure of happiness</i>	<i>Change happiness in % possible range</i>	<i>Time</i>	<i>Study</i>
Acts of kindness	no intervention	SWLS	-1,2%	10 days	Buchanan & Bardi 2010:236
Positive event recall	Randomly assigned to neutral	SHS	-14,3%	10 weeks	Chancellor et al. 2015:881
Well-being training	Waiting list	Single questions: 'How happy are you right now?' 'How satisfied are you right now?'	-13,5%  -7,6%	11 weeks	Feicht et al. 2013: 7
Meditation training	Waiting list	mDES	-3,7%	6 weeks	Fredrickson et al. 2008: 27
Strenghts training	Placebo excercise	AHI	+3,2%	6 months	Gander et al. 2013: table 2
Irrational beliefs discussion	Waiting list	Affectometer 1	0,0%	6 weeks	Lichter et al. 1980: 60
Well-being website	Placebo treatment	PWI-A SWLS PANAS OTH-Pleasure	- 1,8% +1,6% -0,0% -2,0%	3 months	Mitchell et al. 2009: 752
Employee wellbeing	No intervention	SWB	-13,2%	6 weeks	Page & Vella-Brodrick 2013: 1017
Strengths training	Waiting list	SWLS	0,0%	10-14 weeks	Proyer et al. 2013: 283
Mindfulness training	Waiting list	SWLS	-0,3%	8 weeks	Shapiro et al. 2005: 171
<b>Average</b>			<b>-3,8%</b>		

### *Difference in gains between participants who used and did not use Happiness Diary*

Another way to assess whether the observed gain in happiness was caused by greater awareness of one's happiness, is to compare the gains made by participants who used only the Happiness Comparer with the gains in happiness made by participants who also used the Happiness Diary. The latter spend more time monitoring their happiness and are thus likely to become more aware of how well they feel. Indeed, we found use of the Happiness Diary affected happiness more, than use of the Happiness Comparer did (cf. section 3.2) and we also found a stronger increase in happiness, the more often the Happiness Diary was used (cf. table 3).

#### *5.1.2 Response shift?*

It is conceivable that repeated use of the Happiness Indicator has led the participants to score themselves higher on the happiness scale, even though their happiness remained unchanged. In the literature, this is known as a 'response shift'. Yet, previous follow-up research into happiness showed a reverse pattern; happiness was estimated to be lower at the second measurement, apparently because respondents had formed a clearer picture of what happiness is for them (e.g. VanLandighem 2012). Therefore, if response shift is involved at all, it is more likely to repress the happiness rating and thus under-estimate the effect rather than over-estimate it.

#### *5.1.3 Placebo effect?*

Still another possibility is that use of the Happiness Indicator has boosted happiness by the mere belief in its effectiveness and possibly also by the idea of taking control of one's life. If so, this should apply both to the use of the Happiness Comparer and the Happiness Diary and could at best explain the small non-significant gain in happiness using the Happiness Comparer, but not the greater significant gain following use of the Happiness Diary.

## **5.2 Causal paths**

As noted in Section 1.3, we assume that a clearer view of their own happiness helps individuals find a more suitable lifestyle, which subsequently results in increased happiness. In this analysis, we cannot show that the observed effect followed the path of daily lifestyle adjustment. Further analysis of shifts in time allocation (see e.g. Knabe et al., 2013; Hendriks et al., 2014 for similar approaches) will provide more insight into this effect.

It is possible that other causal mechanisms are involved, such as greater acceptance of their current way of life by participants who see that they are better off than people in similar situations are.

## **5.3 Negative effects?**

Schooler et al. (2003) claim that the pursuit and monitoring of happiness can be self-defeating and the use of the Happiness Indicator for this purpose can therefore result in a

loss of happiness. If so, such losses will have lowered the average positive change in happiness.

The question is whether this happened among our participants. Inspection of the data does show cases of declining happiness. For our complete sample, we saw that for 29% of the participants there was a decline in happiness between the first and last use of the Happiness Indicator. At the same time, we observed no change in happiness for 31% of the participants and an increase in happiness for 40% (see Figure 7). Negative effects did occur in this selection of repeated users, but those affected negatively are outnumbered by the respondents who gained happiness in the period of using the Happiness Indicator. Possibly some one-time users became less happy after use and discontinued use for that reason.

The existence of negative effects on happiness is not surprising, it will be unpleasant to realize than one does not enjoy most activities very much, if shown that comparable people take more pleasure in their lives. Though the Happiness Indicator may be a bitter pill to swallow in the beginning, its use is likely to make one feel better later. This long-term effect is another point to consider.

#### **5.4 Sleeper effect?**

In this study, the average difference between the first and the last use of the Happiness Indicator was 233 days, which means that we have observed the short-term effects of using this self-help tool. The long-term effects on happiness could be greater, if one gains a greater awareness of one's happiness, which leads to major life-chances, such as taking another job or divorcing. Such decisions come with considerable delay, and so do the effects on happiness, which often are negative in the beginning.

The Happiness Indicator is an ongoing project, and we hope to learn more about this topic in future analyses.

#### **5.5 Variation in effect**

In section 3.3, we reported that the gain in happiness following use of the happiness Indicator does not differ greatly according to socio-demographic background. However, this does not mean that the effect is the same for everyone.

It is possible that the effect differs according to psychological characteristics, such as personality. For example, previous diary research shows that (a) extraverted participants become (even) happier on a daily basis when they spend time on social and rewarding activities (Oerlemans & Bakker, 2014); (b) participants who score high on burnout become happier daily as a result of social activities and relaxation (Oerlemans, Bakker & Demerouti 2014), and (c) participants who score high on work addiction become more vital and recover better when they exercise (Bakker, Demerouti, Oerlemans & Sonnentag 2014).

As noted in section 3.3, relatively unhappy participants, i.e. participants with an average score below 7, benefit more from repeated participation in the Happiness Indicator compared with participants with a relatively high initial score for monthly

happiness, i.e. participants that a 7 or higher. An evident explanation is that unhappy people are more motivated to change their way of life. However, this difference in happiness may also veil variations in personality and health. Hence, this finding requires further research.

## 5.6 Effect size

The observed increase in happiness that resulted from using the Happiness Diary ranged between 0.1 and 0.3 points on a scale of 0-10, i.e., approximately 1,5%. Is this a lot or a little?

One way to answer this question is to calculate how much additional income is required to achieve the same happiness benefit. The use of a new method developed by Fujiwara, Kundra & Dolan (2014) indicates that a 1% increase in happiness equals an increase in annual income of € 297<sup>25</sup>, so the 1,5% gain in happiness due to repeated use of the Happiness Diary is equivalent to an annual income increase of about € 450.

Another way of estimating the effects size is to compare with changes in happiness following real-life changes. To that end, we scanned the research literature for observed changes in happiness following major life events over periods of about a year. The best comparable findings are presented in Figure 8. The gain in happiness following use of the Happiness Diary appears to be stronger than the, surprisingly small, effect of winning a lottery and about a third of having one's first child. The size of the positive change after using the Happiness Diary appears to be like the size of the negative effect of getting injured in a traffic accident. In this comparative view, the advantage of using the happiness Diary is substantial.

As noted above in section 4.1.1, use of the Happiness Indicator may also have prevented a bigger decline of happiness in this group of people seeking to improve their happiness. Together the prevented loss and the achieved gain amount to some 5% of the scale range, which is substantial and equals the effect of getting married.

Although the effect of using the Happiness Indicator can still be considered modest, it is a relatively easy road to take in the pursuit of happiness.

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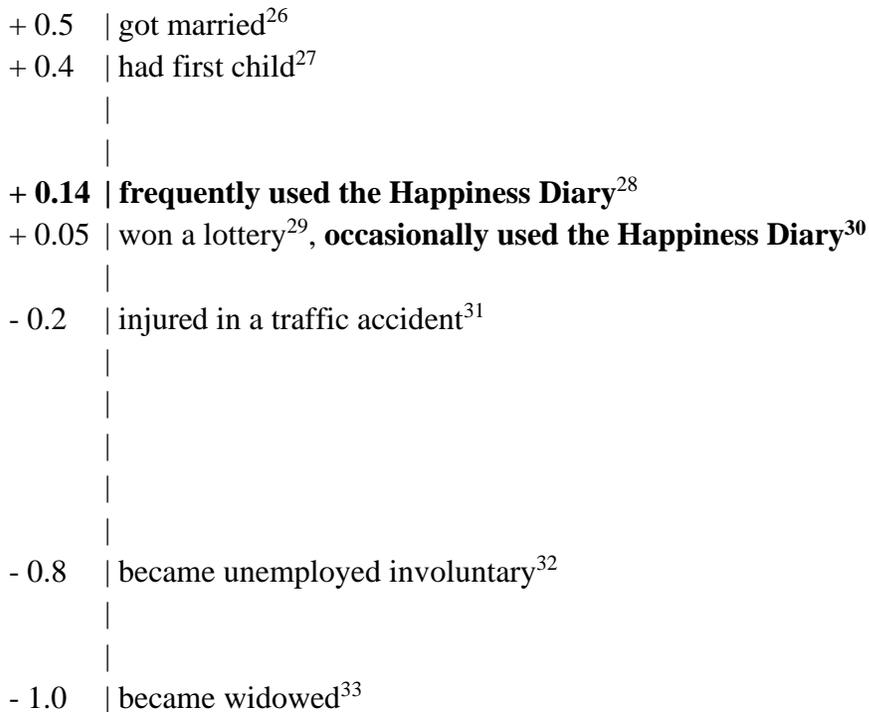
<sup>25</sup>The effect of extra income on happiness was assessed on the basis of a study of lottery winners in the UK, where a comparison was made between the increase in happiness of winners of small and medium-sized prizes. This calculation assumed the average income in the Netherlands.

Figure 8

**Changes in happiness following use of the Happiness Indicator and specific life events**

Happiness, measured using a 0-10 scale

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<sup>26</sup> One year before vs. one year after. Stutzer & Frey (2006)

<sup>27</sup> One year before vs. one year after. Stutzer & Frey (2006)

<sup>28</sup> This study.

<sup>29</sup> Winning vs. non-winning players. Kuhn, Kooreman & Soetevent (2011)

<sup>30</sup> This study

<sup>31</sup> Victim in last 2 years vs. the average population. Brorsson, Hays & Ifver. (1993)

<sup>32</sup> Lost job in the last year, due to plant closure or dismissal. Hetschko (2014)

<sup>33</sup> Lost spouse in the last year (women), Williams (2003)

## 5.7 Is self-selection a problem?

This study was done among returning visitors to the Happiness Indicator website, not among a representative sample of the general population in The Netherlands. So, we deal with change in happiness among self-selected users of this self-help website. Above in section 4.1.1, we discussed the possibility that these people would have become happier anyway because of spontaneous recovery, which appeared not to be the case. Below we consider two related issues.

### *Effective for self-help seekers*

First, self-selection bias may be an issue here, in that people who are more predisposed to consider the use of self-help websites (because they are less happy or of their attitude towards these kinds of interventions) are more willing than others to participate and to participate frequently. The observed positive change in happiness can therefore not be generalized to all citizens of the Netherlands.

We do not see this form of self-selection as a major problem. We did not and do not aim to develop a tool that will make everybody happy. We aim to serve a public, that is, people interested in raising their happiness and intellectually able to handle this tool. As noted in section 2.1, users of the Happiness Indicator were predominantly higher educated women, among which the least happy profited most. These people have much in common with members of a consumer association, who read a product test before buying that product. Like any medicine, the Happiness Indicator should not be prescribed for everybody. Possibly, there are more groups for which the Happiness Indicator will work, and it is a task for future research to identify these kinds of people.

### *No evidence for selective drop-out*

Another aspect of self-selection that is, that participants can freely select into further participation, where participants who expect that the Happiness Indicator treatment will be ineffective in the longer run are more likely to quit earlier. Following this line of argumentation, we might expect a positivity bias. In our paper, we deal with this issue by estimating a System GMM estimator which accounts for reverse causality and try to isolate the relationship that runs from participation to happiness. As Jiménez-Martín et al. (2014) have shown that estimates obtained from this method are relatively robust to this form of sample selection bias, we do not see this a major problem for our study.

An alternative study design to examine the effect of the Happiness Indicator is to first collect a first round of happiness data and then randomly assign half the sample to treatment (i.e. to use the Happiness Indicator), while keeping the other half as control. This can be done in future research.

## 5.8 Implications for further application of the Happiness Indicator

The Happiness Indicator encompasses two main tools: The Happiness Comparer and the Happiness Diary (cf. Section 1.4). Our analysis has shown that the use of the Happiness Comparer was not followed by a significant increase of on happiness, but the use of the

Happiness Diary was followed by a significant gain. Should we therefore omit the Happiness Comparer? It is possible that doing so would not harm the short-term aim of the project, namely, increasing the participants' happiness. However, eliminating the Happiness Comparer would interfere with the project's long-term aim of monitoring the effects of major life choices on happiness. Although it may not substantially contribute to the participants' happiness, the Happiness Comparer is still a useful tool for follow-up. It may also function as a stepping-stone to the use of the Happiness Diary.

### **5.9 Use of the Happiness Indicator by colleagues**

We welcome use of the Happiness Indicator technique by colleague researchers and practitioners. Now that the system has been developed, large-scale applications are possible at low cost. 'Satellite-projects' will run on the same server at YY University. Variants tailored to specific interest can be made, if a common core of variables is maintained. Data will be added to a common pool, which all projects can use, among other things for comparison. For further information, please go to <http://www.happinessindicator.com> and click 'project' in the header.

## **6 CONCLUSIONS**

This first study into the effect of using the Happiness Indicator confirms the expectation that happiness can be raised by raising awareness of how happy one feels. The effect of this intervention is between 1 and 5%, which may seem small but is considerable when compared to other determinants of happiness.

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