Activity, Time, and Subjective Happiness:

An analysis Based on an Hourly Web survey [†]

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Abstract

This paper investigates how people's happiness depends on their current activities and time. For this aim, we conducted an hourly web survey, where 70 students reported their happiness every hour on a day every month from December 2006 to February 2008. This method is an extension of experience sampling method (ESM) in that it uses mobile phones and personal computers. Our newly method has the same merit of ESM that can measure real time happiness data and escape from reflection and memorial bias. Using our newly method, we can obtain diurnal happiness data of respondents and also grasp their behavior at each of their reporting time during 14 months. Analyzing the data of our survey, we found (a) happiness significantly depends on activities, hours, and months, (b) while most of the time-variation of happiness is attributed to time pattern of activities, happiness varies with hours in a day, even when activities are controlled. (c) while activities affect similarly both genders, there are gender gaps of diurnal happiness pattern, after controlling activities.

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1. Introduction

For a long time, it is a convention in happiness studies that asks "All things considered, how satisfied are you with your life as a whole these days? (The World Values Survey)" or "Taken all together, how would you say things are these days? Would you say that you are very happy, pretty happy, or not too happy? (The General Social Survey)." These questions ask the evaluation of their own life or global retrospective judgment (Kahneman and Krueger, 2006). To answer these questions, respondents reflect their life from various viewpoints. Some of them might predict their happiness considering their situation at home and workplace comparing with other people, reaching a conclusion that "considering various elements, I should be happy, even if I don't feel so." In a word, it is known that memory and reflection often differs from their feeling at real time (Kahneman, 1999).

To escape from reflection and memory bias, experience sampling method (ESM) is developed. ESM refers to a method of data collection in which participants respond to repeated assessments at moments over the course of time while functioning within their natural settings (Scollon et al., 2003). ESM typically uses beepers to alarm respondents to fill in questionnaires at random time. A merit of ESM is that it measures "point-instant utility" (Kahneman, 1999), which may be close to "instantaneous utility" in economics, and it is free from memory bias. On the other hand, "overall" happiness is more difficult to relate to the concept of utility in economics.[1] A demerit of ESM is that it is a costly method, and burdens respondents, which may cause a selection bias problem.

Two methods are developed associated with ESM. The one is ecological momentary assessment (EMA), in which measurement is concerned with not just the participant's momentary subjective experience, but also with elements of the environment related to momentary experience (Stone at al. 1999). For example, Steptoe et al. (2005) asked 228 individuals of their happiness every 20 minutes during a workday, and measured the level of cortisol, an adrenal hormone related to the risk of obesity, hypertension and autoimmune conditions, every two hours. From these data, they found that the subjects' happiness ratings were significantly inversely correlated with their cortisol levels. This line of studies is expected to establish a foundation for measuring objective happiness. However, EMA is more costly and puts a heavier burden on subjects than ESM.

The other is the daily reconstruction method (DRM) proposed by Kahneman et al. (2004), in which respondents first revive memories of the previous day by constructing a diary consisting of a sequence of episodes, then, they describe each episode by answering questions about the

[1] Kimball and Willis (2006) refute both opinions that happiness and utility has no relation and that they are the same, and formulate the relation between them. Happiness at moment may not be just the same as the instantaneous utility in economics, but they are related each other.

situation and about the feelings that they experienced, as in ESM. Comparing with the ESM, DRM has a merit of low costs to investigator and low burdens to subjects. Kahneman et al. (2004a,b) show that the diurnal cycles of affect and tiredness produced by DRM and ESM are quite similar. Atz (2014) reports a low recall bias for the DRM. Thus, DRM might be a good substitute to ESM, although more studies are necessary to confirm this (Diener and Tay 2014, Tay et al. 2014).

Essentially following ESM, this study has the following distinguished features. First, we utilize a web survey, in which subject well beings (SWBs) access to a website by personal computers or mobile phones.[2] The conventional ESM cannot confirm that subjects really fill in forms when they receive a beep, which damages the reliability of the results of ESM (Scollon et al., 2003). In our web survey, the timing of the answers by subjects is automatically recorded in the database, which allows no cheating. In addition, most of younger generations in Japan always bring mobile phone, which has a function of connecting to internet and mailing already in 2006. Thus, this method put a less burden to respondents when they report outside, while bringing beeper and forms is a burden to subjects (Scollon et al., 2003).

Second, we do not beep respondent at random time, but entrust them to report when they want to. However, we made the following regulations: Respondents should start reporting within three hours after waking up and should report more than ten times during the day, where the consecutive reports should be separated more than 50 minutes. Thus, our method is “interval-contingent sampling” in a broader definition of ESM (Scollon et al., 2003). Making a beep would have caused a problem because our subjects, as university students, attend classes. If we followed the conventional ESM with a beeper and “signaling sampling”, few students would have joined to our survey. Using mobile phones they probably report secretly during a class! On the other hand, randomness is not warranted with “signaling sampling” because subjects report only when it is possible.

Third, our survey continues to secure data for 14 months, and our subject chooses one day every month and make a report on that day. Meanwhile, ESM typically shackle respondents for a week.[3] Thus, our survey offers unique results, which has a merit in investigation of weekday effect.

Using data from 70 Japanese students for the period over a year, this paper examines how happiness depends on activities and investigate patterns of variation in happiness during a day, a

[2] Recently, papers using smartphone in ESM have been published. MacKerron and Mourato (2014) and Doherty et al. (2014) investigate how happiness relates to natural environments using smartphone with its Global Positioning Systems (GPS) and other functions. The former reports that happiness is greater in natural environments. In Atz (2013) respondents report their happiness level using smartphones.

[3] There are some exceptions. Clark and Watson (1988) collected the data for 90 days.

week and a year. Though previous studies including Kahneman et al. (2004a) reported that happiness changes with time during a day, they did not adjust the effect of the activity taken at that time. Thus, their results might merely indicate a time pattern of activity taken in a day, which in turn affects the happiness. It is interesting to know whether or not happiness changes along with time, even if they take the same activity, which is done in this paper.[4]

2. Outline of Survey

We solicited 70 undergraduate and graduate students of Osaka University and requested them to choose one day every month and report their happiness and what they were doing just before reporting every hour during that day. This paper is based on the data from December 1, 2006 to February 18 2006. Respondents are requested to start reporting within three hours after waking up and report more than ten times, where the consecutive reports should be separated more than 50 minutes.[5] Those reports, which do not satisfy these conditions are not regarded valid ones and are not included in the samples. Students could answer through a mobile phone as well as through a personal computer.[6] The hourly survey consists of two questions: Q1. How happy do you feel now? Please rate it in the scale from 0 (very unhappy) to 10 (very happy). Q2. What were you doing just before? Choose one from the following options: 1. Study (alone), 2. Attending to a class, a seminar, or a group study, 3. Commuting to the university, 4. Side-job, 5. Clubs or circles, 6. Exercise, 7. Date (including by phone), 8. Enjoying time with friends (including by phone), 9. Enjoying time with family members (including by phone), 10. Watching TV or playing game, 11. Doing internet or email, 12. Preparation for or cleanup after meals, 13. Household chores, 14. Meals, 15. Drinking, 16. Smoking, 17. Shopping, 18. Driving, 19. Playing pachinko (Japanese pinball), 20. Going out for things to do, 21. Taking rest, 22. Sleeping, 23. Others.

3. Time and happiness

Calendar has cycles such as morning, afternoon, evening, and night during a day, weekdays and weekends during a week, and seasons (month) during a year. Subjective happiness may fluctuate depending on the cycles: e.g. they say that people living in northern part of Europe are depressed during long winter and enjoy themselves during summer. People look like relaxed in holidays than weekdays. In this section, we investigate time patterns of happiness. Diurnal variation in happiness, among others, is interesting in this paper, because this cannot be investigated without

[4] In addition, panel data has a merit to estimate the relation of happiness with activity and time adjusting the individual effect.

[5] This is the method called “interval-contingent sampling” in the broader definition of ESM (Scollon et al., 2003).

[6] In Japan, most of mobile phones have high quality and users can connect to internet before the appearance of smart phone.

an hourly survey.

In the web survey, the time of sending answers is automatically recorded. The average happiness falls during night reaching the lowest value at 7:00 in the morning. Then, it rises until 10:00. After staying at a constant level until 16:00, it goes up until 23:00. This pattern is similar to what Kahneman et al. (2004a) found, although the change in happiness is not significant for most cases. In sum, happiness is the lowest in the morning and the highest in the evening, and this pattern is more salient in weekdays. These suggest that the pattern of happiness may reflect, at least partially, stress of preparation for study before 9:00and release from the stress after 17:00.

We examined how subjective happiness depends on daily hour in a day. However, we did not identify the effect of hour from the effect of time pattern of activity. It might be the case that happiness merely appears to depend on time during a day because people have, by and large, a certain time pattern of activities in a day, which happiness depends on. If this is really the case, happiness will not depend on time, once we control activities. To examine this prediction, we run a following regression (1) considering the effect of activities and time at the same time;

$$Happiness_{i,t} = \sum_l \beta_1{}^l Dhour^l{}_{i,t} + \sum_l \beta_2{}^l Dactivity^l{}_{i,t} + \beta_3 Dweekday_{i,t} + \sum_l \beta_4{}^l Dmonth^l + c_i + \varepsilon_{it} \quad (1)$$

where *i* stands for individual and *t* is the time when responses are made. Here, we added weekday dummy and month dummies as control variables. *Dweekday* is a dummy variable, which takes on unity if the response is made on a weekday and 0 otherwise. $Dactivity^l$ is a dummy variable that takes on unity if the activity is the *l*-th activity shown in Table 1 and 0 otherwise. $Dhour^l$ is a dummy variable that takes on unity if the response is made at *l*-th o'clock and 0 otherwise. C_i stands for the individual effect and $\varepsilon_{i,t}$ stands for the error term.

4. Conclusions

In this paper, we investigated whether or not people's diurnal variation of happiness are existed or can be explained by the respondents' gender gap and current activities. To reveal this point, we conducted an hourly web survey, where 70 students reported their happiness every hour on the day that they choose every month from December 1, 2006 to February 18, 2008. Our hourly-survey methodology is a development of ESM in that it uses web survey and subjects could respond by a mobile phone as well as a personal computer. Analyzing the data of the survey, we found the followings: (a) the level of happiness significantly depends on activities that they are doing, (b) the subjects are relatively unhappy around 7:00 and happy around 21:00 to 23:00, (c) the diurnal variation in happiness is still observed, even when activities are controlled, (d) how happiness depends on activity does not differ between male and female. While happiness of

female depends on time, that of male does not depend on time strongly.

Investigation of the reason why happiness depends on time even after controlling activities is also an interesting task. There are at least three possibilities. The one is that stress of study and release from it make students unhappy and happy during a day. The second is that the diurnal pattern of happiness is biologically determined. The last is that our result merely means a lack of enough control of activity variables.

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