



The Work Day Reconstruction Method: an adaptation of the Day Reconstruction Method to the work setting

Renaud Gaucher¹

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Abstract

The Day Reconstruction Method (DRM) is a time-diary, in which respondents record how they spent their time during the previous day and how they felt during these activities. We propose an adaptation of this interrogation technique to the work setting and call this adaptation the Work Day Reconstruction Method (W-DRM). The W-DRM is designed to focus on work activities, and to be adapted to the specific work activities of any worker. As time means money for firms, the W-DRM is designed to take less time to respond to, and can be used by firms and consulting firms to improve the workday of their workers. The W-DRM includes a U-Index at work, U stands for “unpleasant” or “undesirable”, a U-Index at work is used to measure the proportion of time a worker spends in an unpleasant state during a workday. A French insurance company sales representatives case study is used to demonstrate what information this method can yield. For example, we see that positive affects tend to decrease during the work day, while negative affects tend to increase, and the best work activity is... the meal break. Researchers can develop new forms of W-DRM and study new jobs. Researchers can also hybridize a W-DRM with a DRM, and they can adapt the DRM to new contexts, for example it would be possible to develop a School Day Reconstruction Method (S-DRM).

Keywords Day Reconstruction Method · U-index · Work organization · Experience Sampling Method · Sales representatives · Affect at work

1 Introduction

How do workers experience their daily work life? How do they live the tasks they have to accomplish and other aspects of their daily work life? How do they use their daily work time? Quantitative information about the valence, frequency and intensity of affects at work and information about work-time use may be very useful for workers, firms and more broadly organizations, researchers, policy-makers, and the society. This information may

✉ Renaud Gaucher
renaudgaucher@gmail.com

¹ Erasmus Happiness Economics Research Organization, Erasmus University Rotterdam, Burg. Oudlaan 50, Van der Goot Building, M5-43, 3062 PA Rotterdam, The Netherlands

help employers to improve workers' well-being at work and organizations' and society's economic performance.

Kahneman et al. (2004) have developed an instrument for multi-moment assessment research, the Day Reconstruction Method (DRM). The DRM 'combines a time-use study with a technique for recovering affective experiences'. Kahneman and Krueger (2006) add the U-Index to the DRM. U stands for unpleasant or undesirable, and the U-Index is the proportion of time spent in an unpleasant psychological state.

Our goals with this paper were to propose an adaptation of the DRM to the work setting, and to show in a trial case the data that can be obtained using this adaptation. We call our adaptation of the DRM to the work setting the Work Day Reconstruction Method (W-DRM), and this adaptation includes an adaptation of the U-Index to the work setting. This adaptation should allow us to study the affects of workers throughout the workday, to calculate average affects at work, to study the difference with single rating retrospective estimates for the same workday, to assess affects during particular work activities and social situations, and to evaluate the part of the workday dominated by negative affects.

We designed the W-DRM to study affects at work, however, it is possible to use the W-DRM to measure other phenomena such as work engagement, perceived productivity and occupational stress.

This paper is not the first paper in which a Work Day Reconstruction is used, see Baker and Oerlemans (2016), but to our knowledge it is the first paper that gives a name to an adaptation of the DRM to the work setting, includes a U-Index at work to follow Kahneman and Krueger's thinking (2006), and is centred on what a W-DRM could be. Writing this paper is a means to encourage researchers to develop various forms of W-DRM questionnaires, comparing them, validating them, using them to study various jobs and theories.

This paper continues as follows: in the second section, we review the available literature. In the third section, we introduce the W-DRM. In the final section, we give the results of a W-DRM case study of a small sample of sales representatives ($N=33$) all working at the same French insurance company.

2 Literature review

In this section, we present the concepts of *utility* and *objective happiness* (Kahneman 1999) and the measures that have been developed to assess these concepts, i.e. the DRM and U-Index. In Subsection 2.2 we compare the results of using DRM and Experience Sampling Method (ESM), in 2.3 we discuss the Event Reconstruction Method (ERM), a technique that is designed to take time use in a work setting into account, and in 2.4 we discuss DRM surveys and work studies.

2.1 Measuring utility

Utility is a key concept in economics: it is assumed to be the main driver of economic activity. In present-day mainstream economics, utility is typically seen to manifest in *revealed preference*, that is, what people choose to buy or sell. An assumption underlying this view is that Homo Economicus is fully rational and informed, so that his or her choices reflect the maximal happiness result possible. In this view, there is no reason to measure utility as such. Earlier classical economists thought of utility as an affective phenomenon that should be measured as such. Bentham (1789/1948) defined utility as the sum of pleasure

and pain. Measuring utility in this sense requires ideally that the experience of pleasure and pain is measured continuously at every instant. In this context Kahneman speaks of *instant utility*. Practically such a measure would be more precise as the discretization of time is finer. Kahneman (1999) explains that his approach is not a new one. A 19th-century economist, Edgeworth (1881/1967), suggested using a hedonometer to measure utility, and Kahneman has taken this idea and expanded it using recent scientific advances in measurement techniques.

Kahneman (1999) proposes measuring what he calls *experienced utility* using the ratio of pleasant and unpleasant experiences over a period of time. In this view this measure reflects *objective happiness*. Although he is well aware that what is captured is subjective experience, Kahneman uses the term *objective happiness* to distinguish these measures of momentary affect from general estimates of how one has felt in some period in the past, recollections of which will be biased in several ways by subjective factors.

Various studies have shown that retrospective evaluations of happiness can be different from means obtained using instant evaluations, see Frederickson and Kahneman (1993) and, for a review, Robinson and Clore (2002). Kahneman (1999) explains that three biases explain this phenomenon: duration neglect and the overweight given to most intense and most recent episodes. This is the peak-end theory. The difference between retrospective evaluations of happiness and means using instant evaluations has led to a distinction being made between *experienced utility* and *remembered utility* (Kahneman et al. 1997).

2.2 Day reconstruction method

Continuing Kahneman's (1999) work on objective happiness, Kahneman and several colleagues developed a new method to measure it, the Day Reconstruction Method (DRM) (Kahneman et al. 2004) and a new measure, derived from the DRM, the U-Index (Kahneman and Krueger 2006). These new measures were used and compared in France and the US (Krueger et al. 2009a) and a first review of the work done on these topics was conducted by Krueger et al. (2009b).

The DRM is a questionnaire in which respondents are asked to reconstruct a timeline of episodes of the day before, and, for each episode, to answer a series of questions about the episode's context and the affects they experienced during the episode. The DRM questionnaire is constructed deliberately to minimize the memory's cognitive biases.

The DRM was not the first tool created to enable the reconstruction of a day. Before the DRM was developed, there was the Experience Sampling Method (ESM) (Larson and Csikszentmihalyi 1983), also referred to as Ecological Momentary Assessment (EMA). The principle of the ESM is that a pager, today a smartphone, rings at random or at pre-chosen intervals and the respondent is asked to answer questions based on their situation at the precise time of the call. See Csikszentmihalyi and Larson (1987), Hektner et al. (2007) and Newman and Stone (2019) for a review of the ESM.

Kahneman et al. (2004) explain that the DRM has six advantages over the ESM. The DRM imposes less respondent burden, does not disrupt the respondent's normal activities, gives more information about uncommon or brief events, provides an assessment of contiguous episodes over a full day, gives effectively time-budget information, and is less expensive to conduct.

The argument of cost is no longer relevant due to the technological progress which has decreased costs since Kahneman et al. (2004) developed the DRM. There are several strategies that can be used when using the ESM. One of them is to use the ESM to get

information, not just for a moment, but between two prompts, which allows us to reconstruct an entire day, however, this strategy has a weakness that the DRM does not have. The more prompts a respondent has to deal with in a day, the more burden and inconvenience there are for the respondent. The fewer prompts in a day, the less precise the data that is collected, in particular there is the fact that several events may happen between two widely spaced prompts.

We would like to add another advantage of the DRM over the ESM: the ESM may change the respondent's experiences of a day. When a participant in an ESM study is interrupted to respond to prompts, these interruptions may change the way he or she continues to experience the day, for example it can break a moment of flow at work or a joyful moment with friends or family. When using a DRM, the participant has already experienced the day that is studied, the only influence that a DRM can have on the studied day is that the participant know he or she will respond a DRM questionnaire the day after.

Although, the DRM has some advantages, it also has drawbacks. Diener and Tay (2014), while recognizing the value of the DRM, point to some problems and unresolved issues: (a) there have been few studies on the psychometric properties of the DRM, for example there have been few studies on the stability and variability of scores of the DRM across days; (b) DRM may accentuate the differences found between situations or activities by directing attention to these situations; (c) participant selection of situations and enjoyment may distort the obtained data, this is the possibility that the scores are due to a person's characteristics rather than to the activities themselves; (d) administration of a DRM is more difficult and costly than originally thought; and (e) there is an issue with the equal time weighting of minutes.

New studies have been published since Diener and Tay's review (2014). Some of the disadvantages highlighted by Diener and Tay are still relevant, however, others have been mitigated. For example, Anusic et al. (2017) conducted a study using a nationally representative sample of 2303 people from the German Socio-Economic Panel Innovation Sample (SOEP-IS; Richter and Schupp 2015). Anusic et al. (2017) demonstrate that variability in emotional ratings of episodes replicates what has been found in prior studies, that correlations with personality traits are for the most part negligible, and that correlations with global ratings of domain satisfaction are higher for domain-relevant situations.

2.3 Comparison of the results of DRM and ESM

Kahneman et al. (2004) state that ESM is the gold standard to which DRM results *must* be compared. Using a visual comparison of studies with different samples, they show that the diurnal patterns for DRM and ESM studies are remarkably similar, however, the degree of overlap was not compared statistically.

After Kahneman et al. (2004) work, some researchers went beyond visual comparison of studies using different samples and studied the relationship between DRM and ESM results using same samples and calculation.

Dockray et al. (2010) compare DRM results and ESM results in a sample of 94 working women monitored over work and leisure days. They show that the between-person correlations between DRM and ESM results range from 0.58 for stress in a working day to 0.90 for happiness in a leisure day. They conclude that the DRM provides reasonably reliable estimates of the intensity of affect and variations in affect over the day, and that the DRM is a valuable instrument for the measurement of everyday experience.

Bylsma et al. (2011) compare the results of DRM and ESM among 35 individuals experiencing a major depressive episode, 26 in a minor depressive episode, and 38 never-depressed healthy controls. They conclude that nearly all significant findings involving the groups replicated across the two methods.

Kim et al. (2013) compare the results of a DRM and an ESM study for 25 healthy adults. Participants recorded momentary fatigue and mood states using ESM, and then, reconstructed them with DRM. Kim et al. (2013) find no significant differences between the mean or the variability of ESM and DRM estimated over the monitoring period, however, the correlations between DRM and ESM were low, albeit statistically significant.

Lucas et al. (2021) obtained a different result from those of the previous studies. They explain that ‘for aggregate assessments of total time spent in situations and average affect in situations, agreement was high; for between-person differences in time use and experienced affect, agreement varied across situations; and for within-person differences in both situations and affect, agreement was quite low’.

In sum, although there are some disagreements, most studies tend to demonstrate that DRM is a valid instrument to collect and use the data obtained by this method, however, it is possible that in certain case DRM taps something different from ESM.

2.4 U-index

Kahneman and Krueger (2006) suggest a measure that can be very easily calculated based on the results of a DRM: the U-Index, the U stands for unpleasant or undesirable. A U-Index is the proportion of time spent in an unpleasant psychological state. We need two steps to compute a U-Index. In step 1, we have to determine whether an episode is pleasant or unpleasant. An episode is unpleasant if the most intense feeling reported for that episode is a negative one, that is, if the highest rating on any of the negative affect dimensions is strictly greater than the maximum of rating of the positive affect dimensions. In step 2, once we have categorized episodes as unpleasant or pleasant, we have to calculate the fraction of time spent in an unpleasant state. The U-Index can be calculated for one respondent, or for a group of respondents, and by activity. When a U-Index is high, it allows us to make a distinction between two strategies for reducing the experienced displeasure: a strategy based on people, when a small number of people are affected, and a strategy based on time use when it is time use that caused a problem.

Kahneman and Krueger (2006) explain that one of the difficulties of using data on subjective well-being is that individuals may interpret and use the response categories differently. We have no guarantee that two respondents use the same scale comparably. For example, two people who respond 6 on a 1–7 scale on happiness may not be as equally happy. The U-Index overcomes this issue, because a U-Index does not provide a cardinal measure, but an ordinal measure.

Another reason for using a U-Index is that it allows us to take negative emotions into consideration with respect to time use. Although negative emotions are generally experienced less frequently than positive emotions, they are stronger. Frederickson and Losada (2005) have shown that a human being needs a minimum ratio of 2.9 positive emotions to 1 negative emotion to thrive.

2.5 Event reconstruction method

The relationship between time use and affects at work has recently become a subject of interest. Bakker and Daniels present this emerging field in a book called “A Day in the Life of a Happy Worker” (2012), however, the research in this field is scant compared to that which can be found when looking at the traditional approaches used to measure well-being at work.

Grube et al. (2008) developed a new measure, the Event Reconstruction Method (ERM), which is inspired by the work of Kahneman et al. (2004) on the DRM and focused on the world of work.

The principle of the ERM is as follows: researchers select five work events considered typical for the workers studied. More precisely, these five events are chosen in the following manner: non-directive interviews with the managers of the company in which the study is carried out and with a panel of experts who decide on the definitive list of events. In the population studied for the validation of the measure, the five events chosen were: working on a computer, communicating with a superior, talking to a client on the telephone, talking about something important on the telephone, and talking to colleagues.

The respondents were then questioned about the most recent occurrence of each chosen event, which made it possible to reduce biases. In order to encourage the recall of each event, the questions first dealt with the context of an event, as it is done in the DRM, this is a question of activating memory and limiting biases. Next, the respondents were questioned about the positive and negative affects that they felt during a specific event, then about their degree of satisfaction. Finally, they were asked how representative the event was of their workdays. Once the questions about an event were finished, the respondents were asked to continue to a next event. It should be noted that in this study some questions covered elements other than those covered by a standard DRM: pro-social behaviour at work and whether or not the respondents intended to leave the company.

An ERM has some of the advantages of the DRM. Like the DRM, it is less invasive than the ESM; it does not require the respondents to stop what they are doing to answer. It also includes the DRM's procedures for limiting the cognitive biases of the memory. The ERM also has its own advantages. It takes less time than the DRM; this is a significant advantage in Grube et al.'s (2008) case, because the company in which the study was carried out set a time limit. The ERM also allows researchers to study infrequent events. Despite these advantages, the ERM has some limitations compared to the DRM. Although the study of infrequent but significant events have value, this is not a priority in a time use approach. There is a loss of chronology of episodes, which prevents researchers from reconstructing a workday, and using a U-Index.

In order to introduce time-use into the world of work, we designed a different approach to that of the ERM, an approach that is much closer to the DRM, which we named the Work Day Reconstruction Method (W-DRM). We kept the advantages of the DRM and added some of the advantages of the ERM: the focus on work events and the reduction in time spent responding to a W-DRM questionnaire.

2.6 DRM surveys and work studies

In the first DRM (Kahneman et al. 2004), working was one of the sixteen activities proposed by the research team. Twelve affects, 4 positive and 8 negative, were studied for each

episode and the activity working was among the worst activities with the highest degree of negative affects, 0.97, and almost the lowest degree of positive affects, 3.62.

Kopperud and Vittersø (2008) used a DRM in which the only difference to Kahneman et al. original DRM was that the respondents were asked to define activities themselves, then two independent researchers classified the episodes designed by the respondents into five categories. The advantage of this methodology is more freedom for the respondents to define exact answers. The five categories were: commuting, maintenance work, core work, breaks, and leisure. Kopperud and Vittersø (2008) divided work time into two categories, maintenance work and core work, and took into account two activities related to work, commuting and breaks.

Bakker and Oerlemans (2016) used a DRM focused on the workday time frame. Respondents could choose in a pre-selected list of activities of six main categories: “core” activity, administration, client interactions, meeting, interactions with colleagues and break. In addition, participants could select “other” and define their own work activity, for each activity, they had to indicate how happy they felt on a scale from 0 (extremely unhappy) to 10 (extremely happy) and the extent to which the activity satisfied their need for autonomy, competence, and relatedness.

The DRM has been used to study work in other studies (e.g. Powers 2014; Oerlemans and Bakker 2018).

3 The work day reconstruction method (W-DRM)

The W-DRM is an adaptation of the DRM of Kahneman et al. (2004) for the work context. In this section, we explain the methodology that we developed to adapt the DRM to the world of work.

Our goal was to retain all the advantages of the DRM. The W-DRM should enable us to determine, among other data, the evolution of a respondent’s affects throughout a workday, average affects experienced during the workday studied, a U-Index for the workday, and levels of affects depending on the tasks, the places, and the people around the respondent.

Note: the questionnaire is given in the online appendix.

3.1 Adaptations

In adapting the DRM to the world of work, we had two aims in mind. One, that the time spent on answering the W-DRM be greatly reduced, to encourage the use of this technique in the world of work, especially within companies. We thought it was important that the time spent on answering a W-DRM be considerably less than that spent on a DRM, and two, that the events recorded in the W-DRM were adapted to the world of work.

3.1.1 Reduction in time spent

The time spent on answering the W-DRM with respect to a DRM was reduced three ways: one by restricting the questioning to a respondent’s work day only, two, by reducing the number of types of affects sampled, and three by slightly modifying the remembering process.

The reduction in time required to answer is made possible by the nature of the W-DRM, only the workday is studied, which can reduce by half the time needed to respond to a W-DRM.

We added a reduction in the number of affects taken into account to this automatic reduction in time spent. In the DRM, 12 affects are considered: four positive affects and eight negative affects. We decided to reduce the number of affects to four: two positive and two negative. The fact that there are two positive affects or two negative affects enabled us to study of how two related affects, either the two positive affects or the two negative affects, evolved. This also opens up the possibility of considering four different sub-questionnaires and studying the convergent and divergent validities of these sub-questionnaires. In this regard, four is the smallest possible number of affects that can be required. Finally, it should be noted that the W-DRM does not give priority to negative affects as done in the DRM.

The four affects that seemed the most fitting for studying the workday are in our opinion happiness, feeling of competence, stress/nervousness and impatience for a task to end. We chose these four affects for the following reasons. Happiness falls within the hedonic perspective in that the adjective 'happy', here, refer to a positive emotion (Veenhoven 1984), while feeling of competency falls within the eudaimonic perspective and is linked with the ability to do the job. Stress/nervousness is the main affect measured by French consulting firms in psychosocial risks, and impatience for a task to end is linked with boredom and the idea that it is more interesting to do something else than work and that it would be nicer to be enjoying the week end, to be on vacation or to be retired. Despite our choice, it could be useful in the future to determine if these affects are the most useful affects to measure in a work context.

It is possible to reduce the number of affects studied to one. The Happiness Indicator, developed by the Erasmus Happiness Economics Research Organization (EHERO) and based on the DRM, uses a single measure of pleasant/unpleasant affect, using the question 'How happy did you feel during this activity?' This solution enables a maximum reduction in time spent answering a questionnaire.

We also reduced the time spent on responding to the W-DRM by slightly modifying the remembering process. In a DRM, the respondents are asked to reconstruct the day, and they are given the option of writing notes for themselves about their feeling during each episode. In the W-DRM, we removed this second option so that the respondents were only asked to focus their attention on reconstructing the chronology of the previous workday.

3.1.2 Focus on work activities

The DRM of Kahneman et al. (2004) offers the respondent a choice among 17 different types of episodes, including the episode option "other". Of these 17 types of episodes, a single one deals specifically with work, yet on a day that includes one or several episodes of work, the time spent at work can fill more than half of the respondents' day.

Our goal for the W-DRM was to be able to use it to understand the workday as the DRM enables us to understand a day. To achieve this, it must be possible for a W-DRM to discretize the workday as the DRM does for the entire day. Therefore, episodes that enable fragmentation of the workday need to be used. Our goal created an issue that is unknown to the DRM: defining episodes that are common to all workers even though their work can be very different. Between the workdays of a university professor, a manufacturing technician, a farmer, and a beauty technician, there are great differences in the types of episodes

that happen, although we can find common elements such as alternating periods between work time and break time and the fact of working alone or in a group. We do not see how it is possible to report on the diversity of the tasks in a common manner, no matter what the work involves, and because of this we believe the episodes of a W-DRM study must be adapted to each workplace. In other words, if we want to suggest a W-DRM for university professors, for nurses, for manufacturing technicians, for farmers, and for beauty technicians, then we must adapt the episode categories to fit the job situation. The episodes cannot be the same, at least not exactly, for the university professors, the nurses, the manufacturing technicians, the farmers, and the beauty technicians.

In order to achieve such an adaptation, relevantly denoted episodes that match a worker's type of employment should be methodically organized. We suggest the following process. First, talk to people who hold the job you want to study. Next, spend one or more days observing the people at work to compare what you have been told with what you actually see in the field. Finally, have more discussions with appropriate people to validate the episode categories. This is what we did for the case study example we use in the fourth section.

3.2 The two forms of the W-DRM

The W-DRM as we have conceived it leads to people holding different jobs answering questionnaires that have different categories, while everything else stays identical. The fact that the episode categories are different might give the idea that it is not possible to compare the results of a W-DRM for one type of worker to another. Imagine that we have two categories of workers, for example teachers and medical doctors. Teachers have to prepare courses, teach lessons, and correct their students' work, while doctors have to meet their patients and do some administrative work. It is possible to say if some of the activities that the teachers do are emotionally better than those the doctors have to do, but in doing so we are not comparing two work similar situations as it would be if we compare the W-DRM of teachers working in different schools or different countries. It is possible to reduce this issue by comparing the W-DRM of workers with different jobs only at a work day level. This leads to what we could call in this situation a second form of the W-DRM.

To get this second form, it is necessary to calculate the weighted mean of affect at work that a worker experiences over the entire workday. The calculation is as follows:

$$\alpha = \frac{\sum_{i=1}^{i=n} d_i e_i}{\sum_{i=1}^{i=n} d_i}$$

where α is the weighted mean of the level of affect at work on the day studied, e_i is the level of affect experienced for the episode i and d_i is the duration of the episode.

This mean can be compared from one worker to another no matter what their job. Thus, the W-DRM can exist in two forms: one long form that must be calibrated based on the jobs and the people studied and a short version calculated using the long version. The former gives more information, while the latter fosters comparisons no matter what the type of work being compared.

It should be noted that the long version of the W-DRM can be the object of comparison, no matter who the workers are for every aspect other than the work done, for example, time of day, place, and professional environment. It should also be mentioned that there is at

least one type of episode in every workday that is common to all workdays, breaks, which can vary in length, in frequency, and in how much they can be planned.

3.3 Adapting the U-Index to the workday

Kahneman and Krueger (2006) put forward an index called the U-Index. This index is used to measure the proportion of time that a person spends in an unpleasant state.

A U-Index can be calculated using a DRM in which episodes must be classified as pleasant or unpleasant. If the strongest affect felt during an episode is unpleasant, then the episode is classified as unpleasant and its time is entered in the U-Index. Conversely, when the strongest affect is pleasant, or when the affects are equal, the episode's time is not entered in the U-Index.

The U-Index can be adapted for use with a W-DRM. In this case, it is used to measure the proportion of time a worker spends in an unpleasant state during a workday. To calculate this proportion, we have to add the duration of the episodes where a negative affect dominates and divide the total by the length of the workday. U-indexes at work could be compared at various levels: within workers and between workers, within and between departments or companies, from a job to another, and between countries as it is suggested for the U-index by Krueger et al. (2009b).

It would be possible to calculate a P-index, P stands for "pleasant", that would be the proportion of time spent in a pleasant state. Such a choice could be made in the case of an approach stemming from positive psychology. Kahneman and Krueger make a different choice and give three reasons for this choice. One: most of the time, the majority of people live in a positive state. Consequently, negative episodes are more salient. Two: the selection of a negative affect stronger than all positive affects can be a deliberate choice. This maximum evaluation is significant, particularly when it is negative, because negative affects are relatively rare. Three: the correlation between negative affects is much weaker than the correlation between positive affects. In other words, a negative affect can colour an entire episode, this generally does not occur when a positive affect is experienced.

3.4 Comparison with Bakker and Oerlemans' work (2016)

There are at least three differences between Bakker and Oerlemans' adaptation of the DRM to the work setting and our W-DRM adaptation.

3.4.1 Job specific classification of activities

We talked to people who held the job we wanted to study, sales representative, spent one day observing a sales representative and had more discussions to validate the episode categories. These steps were possible because the population we studied was homogeneous in terms of occupation, working in the same firm and sharing the same occupational practices. Bakker and Oerlemans (2016) studied heterogeneous participants in terms of occupations and working for various organizations.

The pre-selected list of activities were partially different. For example, we did not use work activities such as interaction with colleagues or attending a meeting, while Bakker and Oerlemans (2016) did not use work activities such as commute/work travel and preparation for meetings and/or prospecting. While we had to adapt work activities to a specific job in a specific firm, Bakker and Oerlemans (2016) had to propose activities applicable

to various jobs and organizations, which led them to find a different solution to solve the issue of the heterogeneity of jobs and firms. While we proposed selecting different work activities for different jobs and compare only final workday results, Bakker and Oerlemans (2016) choose to use less specific work activities. Regarding the break activity, we treated a meal break as an activity, which Bakker and Oerlemans did not. This is possibly a consequence of studying French participants, who spend time lunching, and/or having a French author for this article.

3.4.2 Time slots

Bakker and Oerlemans (2016) asked participants to indicate from half hour to half hour the kind of activity they were doing, while we left participants free to choose how to indicate their schedule. The advantage of Bakker and Oerlemans method is it gives more guidance to the respondents while ours gave more freedom.

3.4.3 Affects

The questions asked about momentary happiness at work differ between the two questionnaires: while Bakker and Oerlemans (2016) ask one question about happiness for every work episode, we asked four questions, each of them on a specific affect. Bakker and Oerlemans (2016) also add questions about psychological need satisfaction during each work episode. We asked questions about location and the people around the respondent for each episode. Asking just one question on the affective state reduces the time spent by respondents to respond the questionnaire, while asking questions about one positive and one negative affect at least allowed us to compute the U-Index (Kahneman and Krueger 2006) and to recognize the difference between positive and negative affects (Fredrickson 2001).

Beyond these differences, there are also similarities between the two questionnaires, the main similarities are that the DRM methodology is applied only to the workday and that all the episodes are work-oriented.

3.5 Advantages and limitations of the W-DRM

The advantages of the W-DRM over the ESM are the same as the advantages of the DRM over the ESM. The W-DRM provides for an assessment of contiguous episodes over a full work day, gives more information about uncommon or brief events, and does change the experience of a work day as the ESM may. Due to the work context, some of the advantages of the DRM are more salient with the W-DRM. The W-DRM does not disrupt normal activities, this is an important advantage in the work context: no moment of concentration is broken, no meeting is interrupted, there is no need to park a car or a truck to respond, and there is no mental charge for responding during the work day. The W-DRM also gives effectively time-budget information, this can be an important source of information for an organization to improve its performance.

The W-DRM may have one advantage over the DRM: in the work context the W-DRM may help to get better data. Many workers have a calendar, paper calendar or software calendar, that can help them reconstruct work days, for many workers this is the organization that decides their work day or part of it, however, this advantage is not effective for any kind of workers.

The W-DRM has the limitations of the DRM, see Sect. 2.2 on this topic. We want to highlight three ideas. One, although the W-DRM is less time-consuming than the DRM, it takes more time to respond to than a few questions on job satisfaction and its possible determinants. Two, when a work is not organized or almost unorganized, in episodes, the W-DRM brings nothing good in comparison with the DRM. Three, as we were not allowed to use ESM method when using the W-DRM, see Sect. 4, we cannot say to what extent we would have obtained similar results using the W-DRM and the ESM. We can just quote the results of research on comparisons between DRM and ESM. Although there can be some differences, most studies tend to demonstrate that the DRM is a valid instrument to collect and use data, however, it is possible that in certain cases DRM taps something different from ESM, see Subsection 2.3.

The W-DRM, as we designed it, has at least one important limitation. We chose to reduce the number of affects measured to reduce the time spent by workers to respond a W-DRM questionnaire. This reduction is valuable in the work context, managers do not want to give employees much time to respond a questionnaire, but this reduction raises issues from a scientific perspective. The correlation of the intensity among various positive affects across episodes is higher than the correlation among negative affects (Krueger et al. 2009b). Hence, limiting the number of positive affect questions has a limited impact on analyses, but reducing the number of negative affect questions runs the risk of missing major hedonic events. For example, anger and worries can play an important role in the work context. The number of affects measured does not define a W-DRM. It is possible to measure more affects if companies allow researchers, or consulting firms, to propose a more time-consuming questionnaire, and if employees agree to take more time to respond a W-DRM questionnaire.

4 Trial case study using the W-DRM with sales representatives in a French insurance company

In this section, we present an example of the kind of results we can get using a W-DRM survey, so the results are given theory-free. We applied the W-DRM in a French insurance company with sales representatives, which allowed us to calculate the average affects of the sales representatives for a workday, and to compare these results with single rating retrospective estimates for the same work day, to study affects throughout the workday, to assess affects during particular work activities and social situations, and to evaluate the part of the workday dominated by negative affects.

4.1 Method and participants

The first step was to adapt the W-DRM to an insurance sales representative's workday in this company. To accomplish this, we first talked to the sales representatives' supervisor to understand what the various tasks of a sales representative were. We then spent a day observing one of the sales representatives. Finally, we validated our choice of events with the sales representative we observed and the supervisor. The types of episodes we kept were travel/transport, preparing client meetings and prospecting, client meetings, administrative work, meal breaks and breaks. The sales representatives received an email with a link to the W-DRM survey on an on-line platform, Survey Monkey, and a help document to support the computerized questionnaire. The sales representatives could use the Outlook

Table 1 W-DRM results for the four measured affects

| | Median | Mean | Standard deviation | Actual range | Possible range |
|-------------------------|--------|------|--------------------|--------------|----------------|
| Happy | 4.21 | 4.53 | 1.38 | [1.63; 7] | [1; 7] |
| Competent | 5.83 | 5.76 | 0.83 | [4.06;7] | [1; 7] |
| Stressed/nervous | 1.36 | 2.34 | 0.99 | [1; 4.71] | [1; 7] |
| Impatient for it to end | 3.22 | 3.37 | 1.39 | [1; 6.37] | [1; 7] |

calendar to help them remember their workday. They were asked to use their current work day to respond the W-DRM questionnaire if they were answering the questionnaire at the end of their work day, and their previous workday if they were responding at another time.

The second step was to gather data. From 197 sales representatives, 44 sales representatives agreed to fill out the questionnaire, see the questionnaire and the help document in the online appendix. Of the 44 completed questionnaires, we kept 33, which meant we lost 25% of our sample. Questionnaires were rejected when part of the workday had not been filled out. Of the 33 final participants, 19 were women (58%) and 14 men (42%). Three were younger than 30 years old (9%), 16 between 30 and 39 years old (48%), 9 between 40 and 49 years old (27%), and 5 older than 50 (15%). Seven did not have an university education (21%), 19 had an undergraduate education (58%), and 7 had a graduate education (21%).

4.2 Affect averages

We questioned respondents about four affects for each episode. These four affects were “happy,” “competent,” “stressed/nervous”, and “impatient for it to end”. The first two are positive affects, the second one refers to a eudaimonic notion of happiness. The last two are negative affects.

We then found the weighted mean by time of each affect measured during the course of the day for each respondent whose responses were kept, and averaged the results of all the respondents to obtain the results given below.

The measures of time use showed that the respondents had a low level of happiness at work and, a high level of feeling competent, a low level of stress and a slightly higher level of boredom, see Table 1. For stress, the fact that the mean that is significantly higher than the median can be explained by a small number of sales representatives who claimed they were more stressed/nervous than the others on the workday the questionnaire was used.

4.3 Difference between affect averages and single rating retrospective estimates for the same work day

We also measured satisfaction and feelings of competence among our insurance sales representatives using single rating retrospective estimates for the same work day, we compared the results of the W-DRM to those results.

The correlation between the affect “happy” measured with the W-DRM and satisfaction with the workday measured with a single rating measure was 0.54. This correlation is medium and may come either from the difference in the measurement tools, or the fact that the constructs are not the same but similar, or both.

The correlation between feeling of competency measured by the W-DRM and feeling of competency measured using a single rating was 0.33 and was not statistically significant to 5%.

As a feeling of competency can be a dimension of a eudaimonic model of happiness at work (Dagenais-Desmarais and Savoie 2012), the low correlation between feeling of competency measured by the W-DRM and feeling of competency measured using a single rating suggests that the problem raised by Kahneman (1999) with respect to the hedonic measure of happiness¹ also exists with an eudaimonic measure of happiness: there was a difference between the experienced feeling of competency measured by the W-DRM and the remembered feeling of competency measured using a single rating.

It should be noted that although our questionnaire to reconstruct the workday can be reused, it would be interesting to develop it further by asking respondents to evaluate generally each affect used in the discretized time use measures. This would facilitate a more systematic analysis and more precise work.

4.4 Affects throughout the workday

We studied the evolution of the four selected affects, “happy”, “competent”, “stressed/nervous” and “impatient for it to end” throughout the workday of our insurance sales representatives.

When an affect was given on the hour, such as 9:00, 10:00, 11:00, etc., this indicated that it was the affect that was reported for the episode that started before that time and finished after. For example, if an episode began at 9:45 and ended at 10:30, the affects reported for that episode would be the ones used to describe the sales representative’s emotional state at 10:00. If an episode ended on the hour and another episode started at the same time, then we took into account the values for the affects of the first episode. We assumed that the affects of an episode that was ending were more relevant than the affects of an episode that was just starting.

Note: we had fewer results for affects at the end of the day, especially those for 8.00 p.m., and therefore care should be taken when we look at these results.

Overall, it seems that morning was the best part of the day in terms of happiness at work. Positive affects were stronger then and negative affects were weaker. In the afternoon, negative affects continued to increase, the affect “competent” continued to decrease, and the affect “happy” started to decrease making the afternoon the least pleasant part of the workday. See Figs. 1, 2, 3 and 4. This pattern is congruent with what was found in the first DRM (Kahneman et al. 2004) and in ESM and PATS (Princeton Affect and Time Survey) samples (Krueger et al. 2009b).

4.5 Affect during particular work activities

We divided a sales representative’s workday into four activities: travel, preparing for meetings and prospecting, client meetings, and administrative work. We added two other activities: meal breaks and breaks. After reading the results, we eliminated the last activity, breaks, because none of the sales representatives had used it in their responses.

¹ Namely that remembered happiness is not the same as experienced happiness, which biases general measures and makes time use measures necessary and informative.

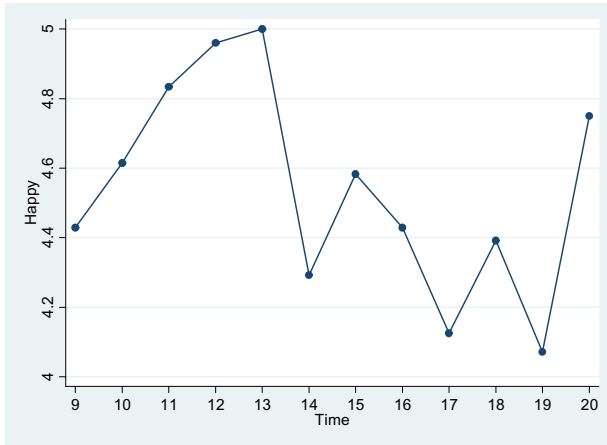


Fig. 1 The affect “happy” throughout the workday

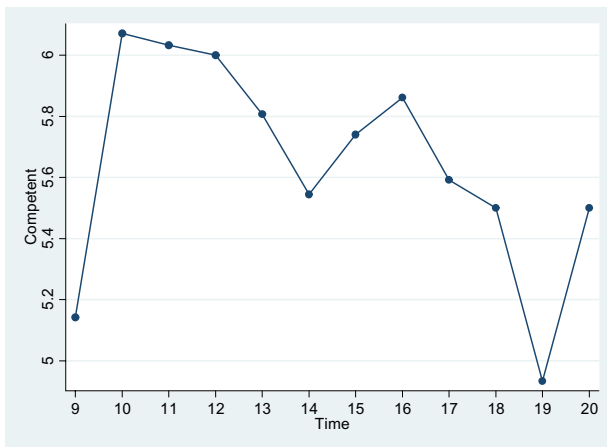


Fig. 2 The affect “competent” throughout the workday

First we carried out an assessment of the average time used for each activity, see Table 2.

We calculated the average of each affect weighted by time for each activity.

With regard to positive affects, client meetings were the activity that produced the most positive affects. Preparing for meetings and prospecting was the activity that produced the least positive affects, see Table 3.

Regarding negative affects, travel and administrative work were the activities that produced the most unpleasantness, while client meetings produced the least negative affects, see Table 4.

Free time is generally reported as to be happier than work time (e.g. Kahneman et al. 2004). Our results are consistent with this phenomenon. The meal break was the

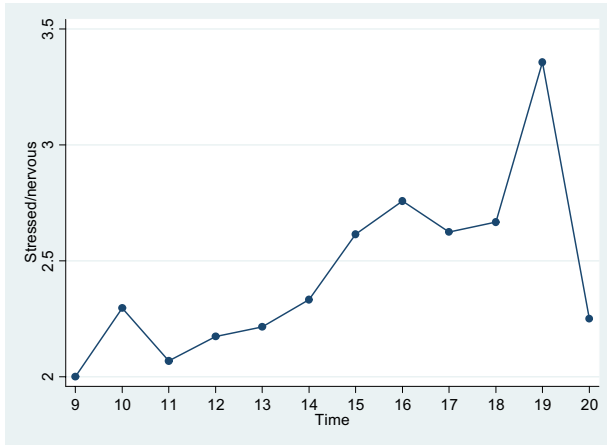


Fig. 3 The affect “stressed/nervous” throughout the workday

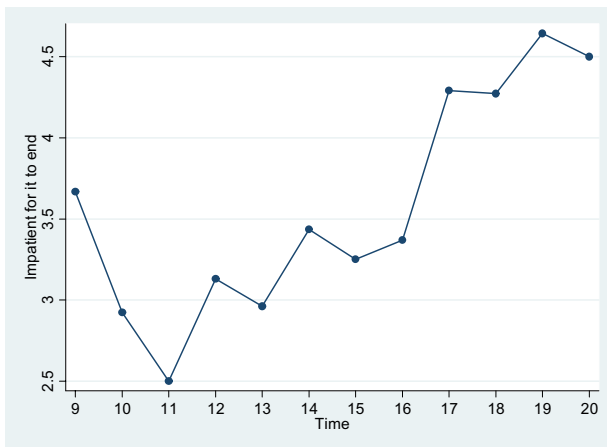


Fig. 4 The affect “impatient for it to end” throughout the workday

Table 2 Average daily time for each activity

| | Average time |
|--|--------------|
| Travel | 2:12 |
| Administrative work | 2:21 |
| Meetings with clients | 3:15 |
| Preparing for meetings and prospecting | 1:44 |
| Meal break | 1:01 |

Table 3 Positive affects based on activities

| | Travel | Administrative work | Client meetings | Preparing for meetings and prospecting |
|-----------|--------|---------------------|-----------------|--|
| Happy | 4.59 | 4.25 | 4.80 | 3.92 |
| Competent | 5.45 | 5.88 | 6.04 | 5.3 |

Table 4 Negative affects based on activities

| | Travel | Administrative work | Client meetings | Preparing for meeting and prospecting |
|-------------------------|--------|---------------------|-----------------|---------------------------------------|
| Stressed/nervous | 2.81 | 2.88 | 2.18 | 2.40 |
| Impatient for it to end | 4.28 | 4.39 | 2.71 | 3.72 |

Table 5 Positive affects during meal breaks

| | Meal break |
|-----------|------------|
| Happy | 5.21 |
| Competent | 5.44 |

Table 6 Negative affects during meal breaks

| | Meal break |
|-------------------------|------------|
| Stressed/nervous | 1.78 |
| Impatient for it to end | 2.23 |

Table 7 Positive affects based on human environment

| | Alone | With one or more clients | With one or more colleagues |
|-----------|-------|--------------------------|-----------------------------|
| Happy | 4.51 | 4.59 | 4.70 |
| Competent | 5.47 | 5.97 | 5.50 |

activity that produced the strongest positive affects and the weakest negative affects, see Tables 5 and 6.

4.6 Affect in social situations

We identified four categories of human environments: alone, with one or more clients, with one or more colleagues, with one or more superiors. Since the last situation very rarely occurred, we only considered the results for the first three environments.

Table 8 Negative affects based on human environment

| | Alone | With one or more clients | With one or more colleagues |
|-------------------------|-------|--------------------------|-----------------------------|
| Stressed/nervous | 2.53 | 2.02 | 2.88 |
| Impatient for it to end | 3.56 | 2.85 | 4.03 |

Table 9 Results for the U-Index at work

| | Median | Mean | Standard deviation | Actual range | Possible range |
|---------|--------|------|--------------------|--------------|----------------|
| U-Index | 0.15 | 0.26 | 0.29 | [0; 1] | [0; 1] |

Being with one or more colleagues was the human environment most associated with the feeling “happiness”, but there were few differences found between this environment and the two other environments, see Table 7.

The human environment least associated with negative affects was when one or more clients were present, while the one most associated with negative affects was when colleagues were present, see Table 8.

The most favourable environment for happiness at work was when clients were present because the level of positive affects was high and the level of negative affects was the lowest. Being with colleagues produced both the most “happy” affect and the most negative affects. Being alone produced fewer negative affects, but also fewer positive ones, even though the difference for negative affects was slight.

4.7 The U-Index adapted for the workday

The U-Index adapted for the workday, or U-Index at work, was used to represent the proportion of time where a negative affect dominated the positive affects of our insurance sales representatives. The results are spread from 0, no portion of time dominated by a negative affect, to 1, every portion of time dominated by a negative affect.

On average, the insurance sales representatives stated that their strongest affect was negative during a quarter of their workday. At the median, negative affects only dominated for 15% of the workday, see Table 9.

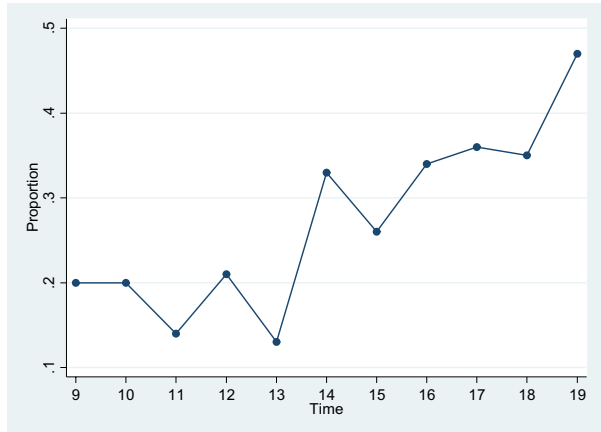
The difference between the mean and the median indicates great disparities in the different experiences of the sales representatives. Thus 25% of the sales representative stated that negative affects were stronger for more than half of the workday.

Although there were differences between sales representatives, we should also take the method of reconstructing the workday functions into account to understand these results. There are two biases that we can assume had an amplifying effect on the U-Index at work compared to actual differences. One: we measured a positive affect against two negative affects, which fosters the expression of negative affects. Two: since it is not possible to ask a person every moment of the day how he or she feels, we asked for mood during episodes of the workday, but if a person stated that a certain affect was dominant during an episode, it does not mean that the other affects were absent.

Table 10 U-Index by activities

| | Travel | Administrative work | Meetings with clients | Preparing for meetings and prospecting | Meal break |
|-----------------------|--------|---------------------|-----------------------|--|------------|
| U-Index by activities | 0.38 | 0.35 | 0.20 | 0.41 | 0.04 |

Fig. 5 Proportion of sales representatives experiencing more negative emotions throughout the workday



Despite these biases, the U-Index at work showed that there were differences in the way sales representatives experienced positive and negative affects throughout the course of the workday.

We calculated the U-Index by activities, see Table 10. One work activity is better than the other one, meetings with clients, with a U-Index of 0.20, while the other work activities have a U-Index between 0.35 and 0.41. The U-Index of the meal break is almost 0.

We calculated how the proportion of sales representatives experiencing more powerful negative emotions evolves throughout the workday, see Fig. 5. We can see that this proportion is lower in the morning than in the evening. The lowest proportion is reached around 1 PM, when most sales representatives are eating. The highest proportion is reached at the end of the workday.

4.8 Limitations

This trial case has important limitations. The sample was small. In a population of 197 sales representatives, only 44 agreed to fill out the questionnaire. Of the 44 completed questionnaires, we kept 33. As we were not allowed by the company to use ESM method when using the W-DRM, we cannot say to what extent we would have obtained similar results using ESM in conjunction with W-DRM. We were also not allowed to ask sales representatives to respond another W-DRM, which made it impossible to test the stability of the results.

Making the choice of reducing the number of the studied affects has the side effect of studying a part of the concepts of positive and negative affects. This choice has a limited impact on the quality of the study of positive affect because positive affects go together (Krueger et al. 2009b), but this is not the case when it comes to negative affects, and reducing the number of negative affects studied runs the risk of missing major hedonic events.

5 Conclusions

Our goal with this article was to present an adaptation of the DRM to the work setting. This adaptation has the main characteristics of the DRM as they were determined by Kahneman et al. (2004), but it is adapted to the work setting: it consists of asking for a

respondent's detailed description of his or her previous workday, with the goal of giving an approximation of a continuous, real-time measure of experiences, procedures to encourage the remembering of specific episodes, the evocation of objective circumstances of the episodes, and the multidimensional description of the affective experience for each episode.

Like the DRM, the W-DRM allows many variations, with affects, for example. For episodes, these variations are necessary to adapt the W-DRM to the differences in work contexts. It is also possible to vary the questions depending on the nature of the episodes chosen for study.

The W-DRM includes a U-Index at work, this was possible because we measured at least one positive and one negative affect.

The W-DRM can also be used to study concepts other than affects at work, for example it is possible to study phenomena such as momentary work engagement, momentary perceived productivity and momentary occupational stress throughout the workday, based on activity and human environment.

The W-DRM also enables study of the relationship between affects at work and performance in a new way, whether it be subjective performance by asking for the workday, and/or by episode at what point the respondent felt efficient at work, or objective performance when objective measures of performance are possible. Thus, it is possible to study the relationship between affects at work and performance over a short period of time in a work context.

The W-DRM has the same problems and unresolved issues as those of the DRM. Diener and Tay (2014) reviewed the issues of the DRM. Since then, some improvements have been made. For example, Anusic et al. (2017) have demonstrated that variability in emotional ratings of episodes replicates what has been found in prior studies,

The W-DRM is a useful tool for organization, consulting firms in management and workers to use to understand better how a workday works, how positive and negative affects evolve during a workday, how work activities and social environment may influence a workday, how much negative affects can dominate a work day, and how work engagement and subjective productivity evolve throughout a workday.

The W-DRM can be hybridized with the DRM. It is possible to use a W-DRM to study a worker's work day and a DRM to study the worker's day time before and after their work day. Hybridizing the W-DRM with the DRM may help get more precise data on the studied day and the worker.

Finally, it is possible to imagine other adaptations of the DRM to specific contexts. Managers in certain economic sectors may find useful to develop a specific DRM, for example amusement parks. Consumers often spend a day in an amusement park, and it is possible to adapt a DRM to study in-depth the affective content of this day to improve the consumer experience. As we have suggested a Work Day Reconstruction Method, it is possible to suggest a Leisure Day Reconstruction Method (L-WDRM). This questionnaire would be useful to respond to questions such as: what are the differences in affect between someone taking vacation at the seaside and someone taking vacation in the mountains when using specific DRM questionnaires?

The most important adaptation of the DRM to a new context, in our opinion, is to develop a School Day Reconstruction Method (S-DRM) to study the affects of pupils throughout the school day, to calculate averaged affects at school, to study the difference with single rating retrospective estimates for the same school day, to assess affects during each lesson and other school day's events, and to evaluate the part of the school day dominated by negative affects, that is a U-Index at school. This can be done by dividing a school day according to the main activities that happen during a school day, for example

transportation from home to school, the different courses studied, each course being considered as one activity to differentiate the impact of the different subject areas and to have more precise data on specific aspects of a school day, breaks if any, meal during school time if any, and homework assignment if any.

More generally, adapting the DRM to specific contexts means that we need to imagine the activities of this context. This can be done by observing what people do in that context as we did in our trial case with sales representatives or we can imagine what the subjects do as we did above with our explanation of what activities might be in a S-DRM context.

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