The Day Reconstruction Method (DRM)
– An application to hand hygiene behavior

Svenja Diefenbacher & Laila Nockur
1. Self-reports & validity

Classical self-report measures (surveys)

**Characteristics:** direct, global, restrospective

**Problems:**

- social desirability, impression management (Roethlisberger & Dickson, 1967; Eckmanns, Bessert, Gastmeier & Rüden, 2006; Kohli, Smith, Taylor, Talbot & Kirldand, 2009)
- mental biases (perception, processing, recall)
  - most aspects of situations are not perceived/processed and therefore not stored in memory → they cannot be recalled (at least not long-term) (Mehl & Pennebaker, 2003)
- capacity of introspection/reflection required (Nisbett & Wilson, 1977)
1. Self-reports & validity

Experience Sampling Method (ESM)

**Original ESM** (Csikszentmihalyi, Larson & Prescott, 1977; Csikszentmihalyi & LeFevre, 1989)
- Ss carried a pocket-sized electronic paging device for a period of time
- They were signaled at random times during waking hours
- Signals asked the subjects to fill out a self report form (paper & pencil)
- Items about momentary activity, place, social context and quality of experience
  → study of daily life experiences: quantity & quality

**Nowadays**
- Smartphones as next step: paging function and questionnaire material in one
  (Ebener-Priemer & Kubiak, 2007)
- ESM as goldstandard in momentary self-reports (Mehl, 2014)

**Characteristics**: momentary, specific, direct and/or indirect
1. Self-reports & validity

A word about momentary instruments in general

Terms: Experience Sampling Method (ESM), Ambulatory Assessment (AA), Ecological Momentary Assessment (EMA), Experience Sampling…
→ AA as umbrella term is most useful approach

Types of AA:
• Self-report AA (e.g. ESM)
• Observational AA (e.g. Electronically Activated Recorder, EAR)
• Physiological AA (e.g. ambulatory ICG, HR) and behavioral AA (e.g. accelerometers)

AA more specifically:
• real-world environments
• “processes of interest” (e.g. mood, alcohol use) AND characteristics of the environment (e.g., location, time of day, presence of interpersonal conflict)
• momentary: current or very recent states or behaviors
• multiple assessments

(Trull & Ebner-Priemer, 2013)
1. Self-reports & validity

Development of the DRM (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004)

Interest: quantify time use, qualify time spent/well-being, accurate picture of the experience associated with activities (e.g., commuting) and circumstances (e.g., a job with time pressure)

Two step approach:

(1) revive memories of the previous day by constructing a diary consisting of a sequence of episodes

“Think of your day as a continuous series of scenes or episodes in a film. Give each episode a brief name that will help you remember it (for example, ‘commuting to work’, or ‘at lunch with B’). Write down the approximate times at which each episode began and ended. The episodes people identify usually last between 15 minutes and 2 hours. Indications of the end of an episode might be going to a different location, ending one activity and starting another, or a change in the people you are interacting with.”

(2) describe each episode by answering (structured) questions about the situation and the experienced feelings
1. Self-reports & validity

Development of the DRM (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004)

→ Evoking the context of the previous day is intended to elicit specific and recent memories, thereby reducing errors and biases of recall.

Characteristics: retrospective using memory technique, specific (not global), direct and/or indirect
## 1. Self-reports & validity

### Development of the DRM *(Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004)*

<table>
<thead>
<tr>
<th>Activities</th>
<th>Positive</th>
<th>Negative</th>
<th>Competent</th>
<th>Impatient</th>
<th>Tired</th>
<th>Mean hours/day</th>
<th>Proportion of sample reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intimate relations</td>
<td>5.10</td>
<td>0.36</td>
<td>4.57</td>
<td>0.74</td>
<td>3.09</td>
<td>0.2</td>
<td>0.11</td>
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<tr>
<td>Socializing</td>
<td>4.59</td>
<td>0.57</td>
<td>4.32</td>
<td>1.20</td>
<td>2.33</td>
<td>2.3</td>
<td>0.65</td>
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<tr>
<td>Relaxing</td>
<td>4.42</td>
<td>0.51</td>
<td>4.05</td>
<td>0.84</td>
<td>3.44</td>
<td>2.2</td>
<td>0.77</td>
</tr>
<tr>
<td>Pray/worship/meditate</td>
<td>4.35</td>
<td>0.59</td>
<td>4.45</td>
<td>1.04</td>
<td>2.95</td>
<td>0.4</td>
<td>0.23</td>
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<tr>
<td>Eating</td>
<td>4.34</td>
<td>0.59</td>
<td>4.12</td>
<td>0.95</td>
<td>2.55</td>
<td>2.2</td>
<td>0.94</td>
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<td>Exercising</td>
<td>4.31</td>
<td>0.50</td>
<td>4.26</td>
<td>1.58</td>
<td>2.42</td>
<td>0.2</td>
<td>0.16</td>
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<tr>
<td>Watching TV</td>
<td>4.19</td>
<td>0.58</td>
<td>3.95</td>
<td>1.02</td>
<td>3.54</td>
<td>2.2</td>
<td>0.75</td>
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<td>Shopping</td>
<td>3.95</td>
<td>0.74</td>
<td>4.26</td>
<td>2.08</td>
<td>2.66</td>
<td>0.4</td>
<td>0.30</td>
</tr>
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<td>Preparing food</td>
<td>3.93</td>
<td>0.69</td>
<td>4.20</td>
<td>1.54</td>
<td>3.11</td>
<td>1.1</td>
<td>0.62</td>
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<tr>
<td>On the phone</td>
<td>3.92</td>
<td>0.85</td>
<td>4.35</td>
<td>1.92</td>
<td>2.92</td>
<td>2.5</td>
<td>0.61</td>
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<tr>
<td>Napping</td>
<td>3.87</td>
<td>0.60</td>
<td>3.26</td>
<td>0.91</td>
<td>4.30</td>
<td>0.9</td>
<td>0.43</td>
</tr>
<tr>
<td>Taking care of my children</td>
<td>3.86</td>
<td>0.91</td>
<td>4.19</td>
<td>1.95</td>
<td>3.56</td>
<td>1.1</td>
<td>0.36</td>
</tr>
<tr>
<td>Computer/e-mail/Internet</td>
<td>3.81</td>
<td>0.80</td>
<td>4.57</td>
<td>1.93</td>
<td>2.62</td>
<td>1.9</td>
<td>0.47</td>
</tr>
<tr>
<td>Housework</td>
<td>3.73</td>
<td>0.77</td>
<td>4.23</td>
<td>2.11</td>
<td>3.40</td>
<td>1.1</td>
<td>0.49</td>
</tr>
<tr>
<td>Working</td>
<td>3.62</td>
<td>0.97</td>
<td>4.45</td>
<td>2.70</td>
<td>2.42</td>
<td>6.9</td>
<td>1.00</td>
</tr>
<tr>
<td>Commuting</td>
<td>3.45</td>
<td>0.89</td>
<td>4.09</td>
<td>2.60</td>
<td>2.75</td>
<td>1.6</td>
<td>0.87</td>
</tr>
<tr>
<td>Interaction partners</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends</td>
<td>4.36</td>
<td>0.67</td>
<td>4.37</td>
<td>1.61</td>
<td>2.59</td>
<td>2.6</td>
<td>0.65</td>
</tr>
<tr>
<td>Relatives</td>
<td>4.17</td>
<td>0.80</td>
<td>4.17</td>
<td>1.70</td>
<td>3.06</td>
<td>1.0</td>
<td>0.38</td>
</tr>
<tr>
<td>Spouse/SO</td>
<td>4.11</td>
<td>0.79</td>
<td>4.10</td>
<td>1.53</td>
<td>3.46</td>
<td>2.7</td>
<td>0.62</td>
</tr>
<tr>
<td>Children</td>
<td>4.04</td>
<td>0.75</td>
<td>4.13</td>
<td>1.65</td>
<td>3.40</td>
<td>2.3</td>
<td>0.53</td>
</tr>
<tr>
<td>Clients/customers</td>
<td>3.79</td>
<td>0.95</td>
<td>4.65</td>
<td>2.59</td>
<td>2.33</td>
<td>4.5</td>
<td>0.74</td>
</tr>
<tr>
<td>Co-workers</td>
<td>3.76</td>
<td>0.92</td>
<td>4.43</td>
<td>2.44</td>
<td>2.35</td>
<td>5.7</td>
<td>0.93</td>
</tr>
<tr>
<td>Boss</td>
<td>3.52</td>
<td>1.09</td>
<td>4.48</td>
<td>2.82</td>
<td>2.44</td>
<td>2.4</td>
<td>0.52</td>
</tr>
<tr>
<td>Alone</td>
<td>3.41</td>
<td>0.69</td>
<td>3.76</td>
<td>1.73</td>
<td>3.12</td>
<td>3.4</td>
<td>0.90</td>
</tr>
<tr>
<td>Duration-weighted mean</td>
<td>3.89</td>
<td>0.84</td>
<td>4.31</td>
<td>2.09</td>
<td>2.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% time &gt; 0</td>
<td>97%</td>
<td>66%</td>
<td>90%</td>
<td>59%</td>
<td>76%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Self-reports & validity

Development of the DRM (Kahneman, Krueger, Schkade, Schwarz, & Stone, Science, 2004)

“Despite demographic differences between the samples, the diurnal cycles of affect and tiredness produced by both methods are remarkably similar.”

“These results suggest that participants were generally successful in recovering their actual experience.”

Fig. 1. Comparison of diurnal patterns of tiredness (A) and negative affect (B) for DRM and ESM studies. Points are standard scores computed across hourly averages within each sample.
2. Using the DRM to measure specific behaviors

Hand hygiene behavior of health care workers

Two elements:

• *Episode diary:* Ss recall their last six work episodes

• *Task list:* Ss indicate the tasks realized on a task list comprising nineteen health-care related tasks including hand disinfection
2. Using the DRM to measure specific behaviors

Hand hygiene behavior of health care workers

Episode diary

<table>
<thead>
<tr>
<th>Number of episode</th>
<th>Name of the episode</th>
<th>Starting time</th>
<th>Ending time</th>
<th>Your notes: What happened, what did you do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

→ number of hand disinfections over all episodes
2. Using the DRM to measure specific behaviors

Hand hygiene behavior during food preparation

Cooking diary

<table>
<thead>
<tr>
<th>Wochentag bzw. Datum</th>
<th>Mahlzeit 1</th>
<th>Mahlzeit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was haben Sie zubereitet?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wie lange haben Sie ungefähr gebraucht? (in Minuten)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ihre Notizen: Wie sind Sie vorgegangen? Was passierte?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

→ frequency of hand washing during all episodes

Task list

- Gemüse/Obst schneiden
- Fleisch schneiden, klopfen, panieren o.ä.
- Brot schneiden/ Brotkorb richten
- Teig zubereiten
- Tisch decken
- Einkäufe aufräumen
- Geschirr spülen
- Arbeitsfläche/ Tisch abwischen
- Hande waschen
- Braten
- Garen/ dünsten
- Eier aufschlagen
- Backen
- Fleisch waschen
- Gemüse/ Obst waschen
- Essensabfälle wegwerfen
- Wasser kochen
- Gläser / Dosen öffnen
- Sonstiges
3. Comparative evaluation of DRM- and other self-reports

Hand hygiene measures and social desirability

_Idea:_

- Direct self-report measures are very susceptible to socially desirable responses
- Hand hygiene is an especially sensitive issue in health care settings

→ Is a DRM-based self-report measure less susceptible to social desirability?

_Hypotheses:_

Positive relation between direct measures and social desirability.

No relation between indirect DRM measures and social desirability.
3. Comparison of DRM- and other self-reports

Study 1 (HDH)

Hand hygiene
- DRM-measure (diary sheet + task list)
- Two direct (and global) measures:
  - Single item. “I adhere to all hand hygiene guidelines, while caring for a patient.”, 1=“not true at all”, 7=“completely true”
  - Estimated number of work episodes with adequate hand disinfection out of 100 work episodes

Social desirability
- German 6 item-version of the impression management subscale of the Balanced Inventory of Desirable Responding. Cronbach’s α=.654, sample item: “I never swear.”, 1=“not true at all”, 7=“completely true” (Musch, Brockhaus & Bröder, 2002)
3. Comparison of DRM- and other self-reports

Results – different hand hygiene measures

<table>
<thead>
<tr>
<th></th>
<th>single item (direct)</th>
<th>100 episodes (direct)</th>
<th>DRM (indirect)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>single item</strong></td>
<td><strong>r</strong></td>
<td><strong>1</strong></td>
<td><strong>.480</strong>**</td>
</tr>
<tr>
<td></td>
<td><strong>p</strong></td>
<td><strong>.000</strong></td>
<td><strong>.174†</strong></td>
</tr>
<tr>
<td></td>
<td><strong>n</strong></td>
<td><strong>64</strong></td>
<td><strong>60</strong></td>
</tr>
<tr>
<td><strong>100 episodes</strong></td>
<td><strong>r</strong></td>
<td><strong>1</strong></td>
<td><strong>.102</strong></td>
</tr>
<tr>
<td></td>
<td><strong>p</strong></td>
<td></td>
<td><strong>.223</strong></td>
</tr>
<tr>
<td></td>
<td><strong>n</strong></td>
<td><strong>60</strong></td>
<td><strong>58</strong></td>
</tr>
</tbody>
</table>

68 nurses participated, variations in n are due to missing data on the required measures.
3. Comparison of DRM- and other self-reports

Results – social desirability and hand hygiene

<table>
<thead>
<tr>
<th></th>
<th>single item (direct)</th>
<th>100 episodes (direct)</th>
<th>DRM (indirect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>social desirability</td>
<td>$r$</td>
<td>.338**</td>
<td>.279**</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>.004</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>$n$</td>
<td>60</td>
<td>59</td>
</tr>
</tbody>
</table>

68 nurses participated, variations in $n$ are due to missing data on the required measures.

→ Evidence suggests that the DRM-based self-report is less prone to social desirable responding
3. Comparison of DRM- and other self-reports

Habit and behavior

*Idea:*

- Research on the relation between habits and behaviors often finds high correlations (for different behaviors).
- Behavior is usually measured by a direct, global, retrospective single item.

(Verplanken & Orbell 2003)

*Hypotheses:*

The intensity of the relation between habit and behavior depends on the measure used to assess behavior.
3. Comparison of DRM- and other self-reports

Study 1 to 3

Hand hygiene
- DRM-measure (cooking diary + task list) – Study 1 & 2
- Direct and global measures:
  - Estimated number of episodes of food preparation with hand washing (out of 100 episodes) – Study 2 & 3
  - Single item. “Please indicate the frequency with which you engage in behavior XY” (never – once a month – twice a month – … – five times a day – more than five times a day; coded 0 to 16) – Study 1
- Observation during food preparation (6 tasks) – Study 3

Habit
- Self-Report Habit Index (SRHI) (Verplanken & Orbell 2003). Cronbachs α ≥ .88. Beispielitem: „Washing hands is typical for me.\“

Study 1 (Online)
N = 105, 84 female, 18 male, age: M = 24.9, SD = 4.6, range: 18-47

Study 2 (Ersti 2014)
N = 128 students, 88 female, 39 male, age: M = 21.4, SD = 5.2, range: 18-52

Study 3 (EyeCueLabor)
N = 55 students, 42 female, 13 male, age: M = 21.2, SD = 4.4, range: 18-48
3. Comparison of DRM- and other self-reports

Results – habit and behavior

Correlations between habit and behavior for different behaviors

- Watch TV-Programm: 0.74
- Eating candy: 0.55
- Listening to music: 0.63
- Eating fruits: 0.66
- Eating meat: 0.67

For all correlations $p < .001$

Correlations between habits and hand hygiene behavior for different measurement methods

- Study 1: 0.29
- Study 1 (n.s.): 0.06

(1) Ceiling effect, in study 1 - 72% of Ss with maximum value 6, in study 2 56% of Ss.
4. Conclusions

What can we say about the DRM

- DRM has been developed in reference to ESM, but is itself not a tool for ambulatory assessment
- DRM is useful compared to classical self-reports
  - especially to study sensitive behaviors (e.g. hand hygiene)
    from retrospective, global and direct to reconstructed, specific and indirect
- strengths:
  - reduced recall bias due to reconstruction
  - reduced need for introspection/reflection due to specific situations
  - reduced social desirability due to indirect approach
- DRM is a valid tool to study specific behaviors
4. Conclusions

What we could do next

- compare behavior measured by DRM and actual behavior
  -> accuracy
- compare DRM and classical self-reports of behavior regarding intention
  -> process
Thank you for your interest!