

original article

Time-sampling research in Health Psychology: Potential contributions and new trends

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Retrospective self-reports are the primary tool used to investigate inter-individual differences in thoughts, behaviours, and feelings across the social and behavioural sciences including Health Psychology (Schwarz, 1999; Shiffman & Stone, 1998). For example, a typical question might ask a research participant to think back over a specific number of weeks or months and rate the extent to which s/he used a certain coping strategy over the respective time period. However, individuals do not only differ in their general behavioural tendencies as captured by such an inter-individual differences approach. They also adapt their behaviours to the changing characteristics of momentary circumstances resulting in substantial intra-individual variability. For example, individuals might use different kinds of coping strategies when they are confronted with a social conflict as compared to having to deal with a piece of broken merchandise. In fact, recent evidence suggests that the lion's share of variability in such key health psychological constructs as coping and everyday problem-solving, as well as important health behaviors such as physical activity, originates at the level of the situation and not at the level of the person (Scholz, Keller, & Perren, 2009; DeLongis & Holtzman, 2005; Hoppmann & Blanchard-Fields, 2011). Furthermore, retrospective self-reports covering longer time periods can be surprisingly difficult, as we will elaborate upon. The purpose of this paper is to illustrate how obtaining repeated daily life assessments as individuals engage in their typical routines using time-sampling methods may complement and

extend previous health psychological research by addressing the daily life mechanisms underlying the interplay between psychosocial factors and health.

Key elements of time-sampling and new trends

Time-sampling research is characterized by repeated assessments of momentary experiences as individuals engage in their typical daily life routines in their natural environment (Bolger, Davis, & Rafaeli, 2003; Shiffman & Stone, 1998). We use the term time-sampling methods but want to point out the existing array of related research methodologies that are identified by distinct labels such as diary methods, ambulatory assessment, experience sampling, real-time data monitoring, ecological momentary-assessment, intensive repeated-measures methods, or measurement bursts (Hoppmann & Riediger, 2009).

Typically, all of these methods include self-report based assessments of current cognitions, behaviours, or feelings. Yet, it is important to highlight that time-sampling methods are not restricted to self-reports. In fact, innovative new trends in time-sampling research are increasingly moving beyond an exclusive reliance on self-reports and toward an inclusion of objective measures. This helps alleviate common concerns about socially desirable responding. For example, if individuals are painfully aware that they fail to meet physical activity guidelines despite the fact that their doctor has repeatedly recommended that they be more active, they might be tempted to over-report physical

activity for the purpose of being 'good' patients or research participants. If researchers are concerned that their study may elicit socially desirable responding then they might want to add a control group or consider pairing self-report based time-sampling with concurrent objective measures. For instance, it is possible to combine daily self-reports with different kinds of ambulatory devices, such as heart rate monitors or accelerometers to gauge physical activity, or to implement supplementary measures as is often done by using saliva samples, for example, to assess stress-related substances such as cortisol (Hoppmann & Klumb, 2006; Hoppmann & Riediger, 2009). Another important feature is represented in the fact that time-sampling takes research out of the lab into individuals' real world environments, thus maximising the ecological validity of health psychological research employing such methods (Feldman-Barrett & Barrett, 2001). Hence, there are many available options for complementing self-report based time-sampling protocols using additional devices and this can be done in an ecologically valid fashion.

Researchers can draw on a broad spectrum of assessment methods ranging from daily phone interviews and paper diaries to pager-prompted, pocket computer, or cell phone assessments when conducting time-sampling research (Hoppmann & Riediger, 2009). All of these approaches offer unique insights into health-related processes and they all have their specific benefits and pitfalls (Bolger, et al., 2003). Therefore, time-sampling methods should be chosen based on the targeted phenomenon and the specific study population. For example, pocket computers may be the data collection tool of choice if the best assessment of a specific phenomenon involves the administration of timed tasks, random schedules, or branched questionnaires. Although still novel, pocket computers have been used successfully in many

different populations including older adults and various patient populations. However, computerized assessments also pose minimum requirements regarding cognitive functioning and sensory-motor skills that render them unsuitable for certain patient populations (Hoppmann & Riediger, 2009). In this scenario, other tools such as daily telephone interviews may be the assessment method of choice (DeLongis & Holzman, 2005). Researchers can therefore choose from a broad array of different time-sampling tools to examine daily life processes that ought to be selected based on the specifics of the research question and the targeted population.

Novel health psychological questions best addressed by time-sampling research

In Health Psychology, there are several research questions that would particularly benefit from an implementation of time-sampling methods. For example, time-sampling methods allow researchers to take health psychological research out of the lab and into individuals' *daily life environments*. Hence, intra-individual variability in thoughts, behaviours, and feelings across different daily life situations is not treated as a nuisance. Instead, changing characteristics of momentary circumstances become a key part of the phenomenon under study (Almeida, 2005; DeLongis & Holzman, 2005). Importantly, by investigating inter-individual differences in intra-individual variability, health psychological research may elucidate the complex interplay between the person and the situation. For example, it has been shown that individuals high in Neuroticism (inter-individual differences) encounter more daily life stressors than individuals low in Neuroticism and that the former also react more strongly to daily life stressors (situation-specificity) than the latter (Bolger & Zuckerman, 1995). Time-sampling research thus provides means of addressing research questions that

uniquely capture between- and within-person differences in study variables of interest over and above what can be examined using retrospective self-reports. There are also ways to extend time-sampling research that might benefit health psychology to an even greater extent. One such means is the fruitful implementation of time-sampling to examine the daily dynamics inherent in social systems thereby allowing researchers to go beyond the level of the individual. For example, it is possible to simultaneously collect information regarding daily life stressors from multiple family members to examine how mothers, fathers, and children may influence each other to ultimately contribute to the health and well-being of everyone involved.

Furthermore, time-sampling research allows for the study of momentary, often fleeting, experiences that may go by undetected using retrospective self-reports (Shiffman & Stone, 1998). Specifically, time-sampling can capture *short term fluctuations and time-ordered relationships* in health-relevant processes that occur on small time scales. Modeling the temporal order of daily life processes can be used to detect intra-individual changes as well as inter-individual differences in such intra-individual changes (Bolger et al., 2003). As such, time-sampling research may shed light on the daily life dynamics of health related processes during transitional periods. For example, it may be of incredible value to know if patients who leave the hospital after major surgery with the instruction to be physically active experience less pain after they do their stretching exercises, or if they only do their stretching exercises when they experience little pain.

In addition, time-sampling methods may provide unique insights into the *association between intra-individual variability and long-term change* (Bolger et al., 2003; Hoppmann &

Riediger, 2009). This makes it possible to study health-related processes that occur on different time scales. For example, we have shown that older adults' engagement in daily activities relating to health, cognitive, and social goals was associated with concurrent elevated positive affect. In addition, older adults who reported many goal-related activities also had a higher probability of survival over a 10-year period than older adults who engaged in few or no goal-related activities (Hoppmann, Gerstorf, Smith, & Klumb, 2007). Hence, time-sampling research may provide an opportunity to identify daily life processes that may accumulate over time to affect long-term outcomes that could then be targeted in health psychological interventions.

Finally, time-sampling methods *reduce retrospective self-report biases and memory distortions* (Almeida, 2005; Bolger et al., 2003; Feldman-Barrett & Barrett, 2001; Schwarz, 1999; Shiffman & Stone, 1998) thereby enhancing data quality. Retrospective self-reports require complicated reconstructions of past thoughts, behaviours, and feelings that are cognitively demanding and prone to systematic biases (Almeida, 2005; Schwarz, 1999). For example, mood-dependent memory may reduce the accuracy of retrospective self-reports. In other words, if an individual who is in a good mood is instructed to think back over a period of weeks or months and rate how s/he coped with problems then s/he might have a hard time recalling information on past problems with obvious consequences for the accuracy of coping ratings. Similarly, if an individual is asked to report how much s/he used a particular coping strategy on average over the course of weeks, then s/he might try to answer this question by thinking of how s/he coped with a problem the previous day. In such a scenario, the individual's coping reports would be impacted by a recency-effect wherein s/he utilizes the most recent

memory of using this strategy to gauge an average rating. Related, individuals may also draw on particularly salient problems when rating their overall coping strategy use (Schwarz, 1999). Finally, honest forgetfulness may further distort average reports on coping with problems. The use of cognitive heuristics as outlined in the previous examples may provide a biased representation of the behaviour or experience under focus. To minimize the operation of retrospective biases, time-sampling research assesses thoughts, behaviours, and feelings as they occur. It therefore does not place the same demands on an individual's memory and it incorporates current situational influence as part of the design. Taken together, time-sampling methods may advance health psychological research because they (1) target daily life processes as they occur in an individual's own environment, (2) facilitate the detection of time-ordered relationships, (3) allow studying processes that occur on different time-scales, and (4) reduce problems associated with retrospective self-reports. Time-sampling methods therefore provide novel means of addressing multiple types of health psychological research questions because they uniquely capture daily life variability in study variables of interest that cannot be investigated using one time retrospective self-reports.

Conclusion

Time-sampling research has the potential to offer insights into health psychological phenomena that could not be obtained using other methods. It may thus offer valuable and promising means of contributing to research in the field of health psychology that may complement traditional retrospective self-reports or even experimental approaches. The use of time-sampling methods is particularly appropriate when one suspects that a targeted behaviour or experience changes across different daily life situations and/or if it is particularly

prone to self-report biases.

In addition, time-sampling research benefits from a combination of subjective and objective measures. For example, it might be interesting to examine how situation-specific changes in emotional experiences as measured by subjective self-reports could be associated with important health behaviours such as physical activity that can be assessed using accelerometers. We thus believe that Health Psychology may benefit from the implementation of time-sampling research and that there are many different ways to capitalize on and extend its potential. ■

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