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"Capturing life as it is lived"—Ambulatory Assessment for physical activity, sport and exercise research

The special issue "'Capturing life as it is lived'—Ambulatory assessment for physical activity, sport and exercise" of the *German Journal of Exercise and Sport Research* aims to introduce the Ambulatory Assessment (AA) methodology into exercise, sport and movement science. In brief, AA enables to capture physical behavior data (on physical activity, sedentary behavior, and sleep) and its correlates in humans' everyday life and in real-time, i.e., at any given moment.

» AA describes a class of methods for data assessment to enable ecologically valid findings

AA is not a novel invention. Rather, the teaser of this special issue "'Capturing life as it is lived'—Ambulatory assessment for physical activity, sport and exercise" is inspired by an pioneering AA paper published nearly 20 years ago (Bolger, Davis, & Rafaeli, 2003). Although researchers have applied AA for decades and mainly within psychological studies (e.g., Trull & Ebner-Priemer, 2013), it has just recently gained increasing interest within exercise, sport and movement science (e.g., Reichert et al., 2020b), with the association between physical activity and mood being one of the first research fields investigated by applying AA (e.g., Kanning & Schlicht, 2010; Liao, Shonkoff, & Dunton, 2015).

By definition, AA describes a class of methods for data assessment (and interventions) in near real-time and in real-world settings to enable ecologically valid findings (Society for Ambulatory Assessment, 2022). In particular, multiple data assessments across time and within subjects result in so-called intensive longitudinal data (ILD; e.g., Bolger, 2013; Conner & Mehl, 2015). For example, these data allow scientists to garner in-depth insights into within-person associations between physical behavior and behavioral, biological, physiological, as well as psychological factors in the everyday life of humans. Therefore, AA comprises methods such as physical activity monitoring (e.g., via Accelerometry; Burchartz et al., 2020; von Haaren-Mack, Bussmann, & Ebner-Priemer, 2021), physiological function assessment (e.g., via Mobile Electro-Cardiogram; Ebner-Priemer & Kubiak, 2007), contextual sensing (e.g., via geolocation tracking; Tost et al., 2019), and self-reporting via e-diaries (e.g., Ecological Momentary Assessment [EMA] and Experience Sampling Method [ESM]; Trull & Ebner-Priemer, 2009).

Translated to research practice, a prototypical AA study may therefore investigate associations between accelerometry-based physical activity and e-diary-based self-reports. Since AA enables researchers to capture physical activity, sport and exercise "as it is" (real-time, real-life, etc.) and within a very broad range of research applications, this method is predestined to advance many subfields of exercise, sport, and movement science beyond traditional study formats. A small pretaste of the AA potential to move exercise, sport, and movement science forward is perfectly demonstrated by the various studies published in this special issue (**Table 1**). Therewith, the current special issue aims to provide a basis, for example, to combine expertise, to develop shared definitions and to further develop and validate AA in the field of exercise, sport, and movement science.

Of course, like other research methods, AA comes with challenges and limitations that, for example, comprise a time-consuming preprocessing of the 'big data', the need for advanced statistical methods such as multilevel models, and devices causing financial costs. However, we argue that the following AA advantages directly benefit research insights in exercise, sport, and movement science as shown by the papers published in this special issue:

Table 1 Papers published in the special issue "'Capturing life as it is lived'—Ambulatory assessment for physical activity, sport and exercise research"

Burchartz et al. (2022)	Impact of weekdays versus weekend days on accelerometer measured physical behavior among children and adolescents: Results from the MoMo Study Journal
Fiedler, Seiferth, Eckert, Woll, and Wunsch (2022)	Sleep quality, valence, energetic arousal, and calmness as predictors of device-based measured physical activity during a three-week mHealth intervention: An ecological momentary assessment study within the SMARTFAMILY trial
Hysenllari, Ottenbacher, and McLennan (2022)	Validation of human activity recognition using a convolutional neural network on accelerometer and gyroscope data
Jakowski (2022)	Self-tracking via smartphone app: Potential tool for athletes' recovery self-management? A survey on technology usage and sleep behaviour
Van Laerhoven, Hoelzmann, Pahmeier, Teti, and Gabrys (2022)	Validation of an open-source ambulatory assessment system in support of replicable activity studies
Nigg, Burchartz, Reichert, Woll, and Niessner (2022)	Children and adolescents do not compensate for physical activity but do compensate for sedentary behavior
Reichert et al. (2022)	The association of stress and physical activity: Mind the ecological fallacy
Schilling et al. (2022)	Does dispositional self-control moderate the association between stress at work and physical activity after work? A real-life study with police officers
Schleitzer, Wirtz, Ross, and Eils (2022)	Development and evaluation of an IMU system for jump detection and jump height estimation in beach volleyball
Utesch, Piesch, Busch, Strauss, and Geukes (2022)	Self-tracking of daily physical activity using Fitbits and the effect of the 10,000 steps goal: A six-week randomized controlled parallel group trial

- Ecological validity of findings is increased through assessments in everyday life,
- Biases of retrospective measurements and recall are decreased through the application of wearables such as smartphones, activity sensors and electronic diaries,
- Within-person/intra-individual investigations across time are added to the traditional between-person/inter-individual level and can be analyzed simultaneously, for example, via multilevel modelling, and
- Contextual factors (e.g., environmental exposures, social contexts) are considered through applying sensing methods such as geolocation-tracking

For the upcoming years, we are convinced that AA offers a huge potential for exercise, sport, and movement science even beyond the evident advantages described above. For example, AA can be combined with laboratory research to uncover (neuro)biological mechanisms (e.g., Reichert et al., 2020a), additional sensors can be embedded and advances in sensing technologies can be applied (von Haaren et al., 2016), triggered e-diaries can help to optimize assessment strategies (Kanning, Niermann, Ebner-Primer, & Giurgiu, 2021), and ambulatory assessment interventions can enable the integration of experimental manipulation into everyday life (Heron & Smyth, 2010), just to name a few.

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