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LETTER TO THE EDITOR

On the validity of using the Polar RS800 heart rate monitor for heart rate variability research

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Dear Editor,

We read with interest the report of Wallén et al. (2012) concerning the validity of the Polar RS800 heart rate monitor (HRM) as compared to a 5-min supine electrocardiogram (ECG) with respect to the calculation of various indices of heart rate variability (HRV). The Polar system consists of an HRM with bundled software (Polar Pro Trainer 5; PPT) which is used to derive HRV values. Wallén et al. (2012) compare the results from hand-corrected ECG data to this system, and conclude that traditional ECGs should be preferred as "…the Polar system did not identify errors satisfactorily, or return valid values of HRV for certain groups…".

It should be noted first that within a research context, inaccuracy of a bundled hardware/software system is somewhat moot. Research groups overwhelmingly utilize the Polar system as a source of RR intervals, which are exported from the PPT software, and corrected if necessary to a normal-to-normal approximation then analysed using separate software. Recent work within this journal, for example, bears this out (e.g., Mateo et al. 2012; Mendonca et al. 2011; Vieira et al. 2012). As Wallén et al. (2012) note, the accuracy of this method is not in question, as previous research (e.g., Weippert et al. 2010) compared the accuracy of ECG-derived and Polar-derived RR intervals and concluded that the RR intervals are sufficiently interchangeable when analysed through identical methods.

Wallén et al. (2012) note that recorded RR intervals (as provided from the Polar HRM) are less than ideal for the identification of cardiac dysrhythmia, as a normative ECG waveform is not available. This is undoubtedly the case, but as might be expected from a system designed primarily for tracking HR in a sporting context, the Polar system makes no systematic claims about its ability to identify and eliminate ectopy in groups that may display persistent ectopy at baseline (e.g., the elderly). Thus, the appropriate question is whether Polar-recorded data can optimally produce ECG-comparable measures of HRV, not whether the HRM system is able to identify and deal with cardiac dysrhythmia. Several recent implementations of correction methods applicable to RR series exist (e.g. Barbieri and Brown 2006; Clifford and Tarassenko 2005) but were not attempted by Wallén et al. (2012).

The presence and correction of cardiac dysrhythmia (e.g., ectopy, premature atrial contraction) is a well-known source of error in the calculation for HRV, especially in the frequency domain as even one ectopic beat can bias the analysis of a short-term recording (Berntson and Stowell 1998). However, with regard to analytical methods, Wallén et al. (2012) did not provide an explicit methodology for the identification of ectopic beats in their ECG recording beyond visual inspection. The Task Force (1996) paper cited does not specify a methodology beyond stating that interpolation or regression methods may improve the bias conferred by ectopy. The lack of a uniform methodology for the detection of ectopy has the potential for unintended bias in the comparative ECG recording against which the HRM intervals were compared, especially if the assessors are not blind to the overall research question (which was the case in the report by Wallén et al. 2012). Furthermore,

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using the same analysis software for ectopy detection and correction would have contributed to a more consistent comparison of the two devices.

It seems possible that the PPT software package, designed to detect QRS complexes during sporting or other exercise activity (when benign ectopy is typically reduced in healthy participants), is not ideally equipped to deal with above-average ectopy and a decreased signal-to-noise ratio. Even healthy elderly hearts may display a loss of QRS complex height and increased presence of supraventricular beats (Simonson 1972). The fact that Wallén et al. (2012) report unacceptable accuracy in older women may also be due to general gender differences in ECG morphology—women may display smaller precordial lead amplitude (Simonson et al. 1960). However, it is our opinion that this does not sufficiently represent the conclusion of Wallén et al. (2012)—that "whenever possible, traditional ECGs should be used for both gathering and editing of HRV data".

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