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Validation Of A Novel, Non-Invasive System For Autonomic Profiling In Healthy Volunteers

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Noninvasive profiling of the autonomic nervous system has been shown to have prognostic value in patients with myocardial infarction, CHF and diabetes. The ANSAR system (ANX 3.0, Philadelphia, PA) is a new commercially available system that utilizes respiratory rate, HR and BP to assess on-going sympathovagal modulation during various maneuvers known to evoke autonomic perturbations. Instead of using conventional Fast Fourier Transform for frequency domain analysis, a Continuous Wavelet Transform (CWT) is used to generate numerical and graphical data. The system calculates Low Frequency Area (LFA, analogous to LF Power) and Respiratory Frequency Area (RFA, analogous to High Frequency Power.) A time domain index (pNN50) is also calculated. We independently tested the ability of the ANSAR system to detect sympathovagal modulation during: (1) Isometric Handgrip (IHG), a maneuver known to result in sympathetic activation, and (2) Deep Breathing (DB), a maneuver known to increase vagal modulation. We studied 15 healthy volunteers, aged 44.9±14.9 yrs (range 25-63 yrs) during IHG (33% of maximal contraction for 3 minutes or to point of fatigue) and during metronome DB (6 breaths/min.) A 4 min baseline (BL) period was allowed between maneuvers. Testing was performed in the post-absorptive state between the hours of 7:00 and 9:00 AM. Results are shown in the table below. We conclude that the ANSAR ANX 3.0 system accurately identified the sympathetic surge known to occur with IHG, as evidenced by increased HR, DBP and LFA/RFA ratio. The system also identified the vagal increase that occurred with DB, as evidenced by increased RFA and pNN50. This study validates the CWT methodology, and may allow the ANSAR system to become a clinically useful tool for autonomic profiling in various pathophysiologic states.

Variable	BL	IHG	p (BL vs. IHG)	DB	p (BL vs. DB)
HR (bpm)	71.8±6.1	84.3±7.4	<0.001	69.9±6.4	NS
DBP (mm Hg)	73.7±9.0	90.4±12.4	<0.001	70.3±7.0	NS
LFA/RFA	1.53±1.1	3.2±5.0	0.03	0.9±1.2	NS
RFA	4.17±1.0	1.87±1.9	NS	25.1±25.1	0.006
pNN50	12±16.6	4.5±5.6	NS	30.5±19.0	0.009

DBP=diastolic blood pressure; LFA=low frequency area; RFA=respiratory frequency area; pNN50=percentage of RR intervals that varied by ≥50 ms; BL= Baseline; IHG=Isometric Handgrip; DB=Deep Breathing.