

Agreement between automated sleep apnea endotypes derived from PSG and reduced HSAT respiratory signals

E. Finnsson¹, S. Bjarkason¹, S. Sigþórsson¹, S. Jónsson¹, E. Arnardóttir¹, E. Erlingsson¹, D. Wilcox¹, K. Montazeri¹, G. Árnadóttir¹, A. Wellman², S. Sands², H. Riney³, J.S. Ágústsson¹

1. Nox Research, Nox medical ehf, Reykjavík, Iceland
2. Brigham & Women's Hospital, Boston, United States
3. Nox Research, Nox Health LLC., Alpharetta, GA, United States.

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thora@noxmedical.com

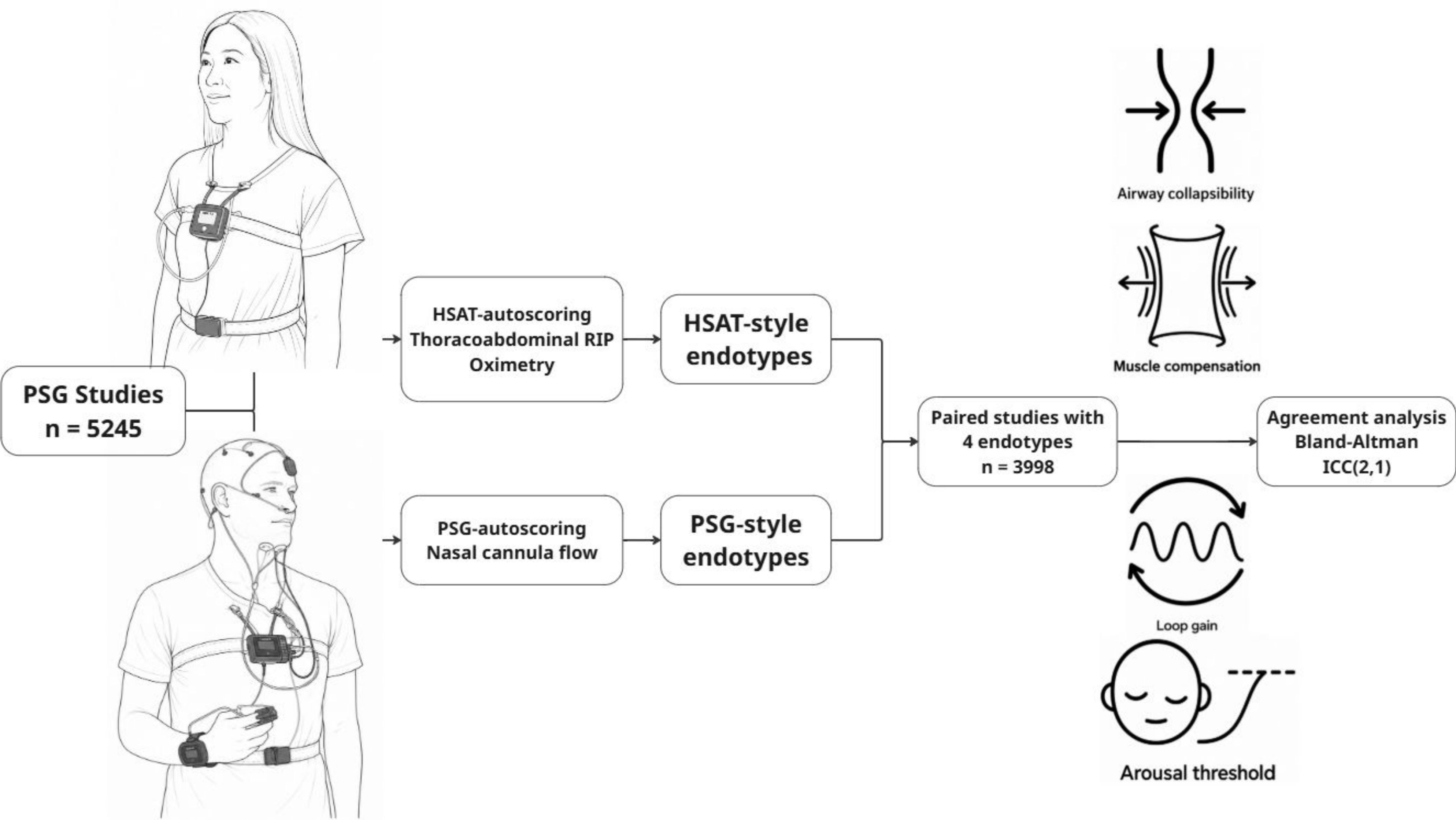


Introduction

Endotyping of obstructive sleep apnoea (OSA) quantifies physiological traits such as airway collapsibility, muscle compensation, arousal threshold and loop gain from scored sleep study data. These traits have typically required PSG, but recent developments in autoscoring now make it possible to derive them from HSAT signals alone. Whether they can be estimated reliably from reduced HSAT signal sets is uncertain.

We evaluated agreement between automated endotype estimates derived from PSG-autoscoring using standard signal montages as input for scoring and HSAT-autoscoring using respiratory inductance plethysmography (RIP) and oximetry alone as input signals.

Methods



This retrospective methodological study used adult PSG studies analysed with DeepRESP auto scoring and parameter extraction. PSG endotypes were generated from PSG-autoscoring using nasal cannula flow. HSAT-style endotypes were generated from HSAT-autoscoring using thoracic and abdominal RIP signals together with oximetry, without cannula flow. Analyses were restricted to studies with non-missing values for all four traits in both autoscoring conditions. Agreement was assessed with Bland-Altman analysis and ICC(2,1).

Figure 1: Flow chart explaining how the retrospective dataset was scored using two separate methods. One where PSG-autoscoring utilising nasal cannula signals was used to obtain PSG endotypes, and one where HSAT-style endotypes were obtained via HSAT-autoscoring using RIP and oximetry signals but no nasal cannula. Only those studies where all 4 endotypes could be obtained were used in the final comparison analysis presented.

Results

Of 5245 matched studies, 3998 had complete paired data for all four traits. In the cohort, mean age was 49.1 (SD: 16.0) years, body mass index (BMI) was 30.74 (SD: 7.70) kg/m², apnea-hypopnea index (AHI) was 25.88 (SD: 22.25) events/h, and 1831 female, 2160 male and 7 unknown. Agreement by ICC was highest for collapsibility (0.943), followed by arousal threshold (0.884) and loop gain (0.870), compensation showed lower agreement (0.653). Trait-specific Bland-Altman mean bias (HSAT minus PSG) was 0.62 for collapsibility, -2.71 for arousal threshold, -0.85 for compensation, and -0.035 for loop gain.

n = 3998

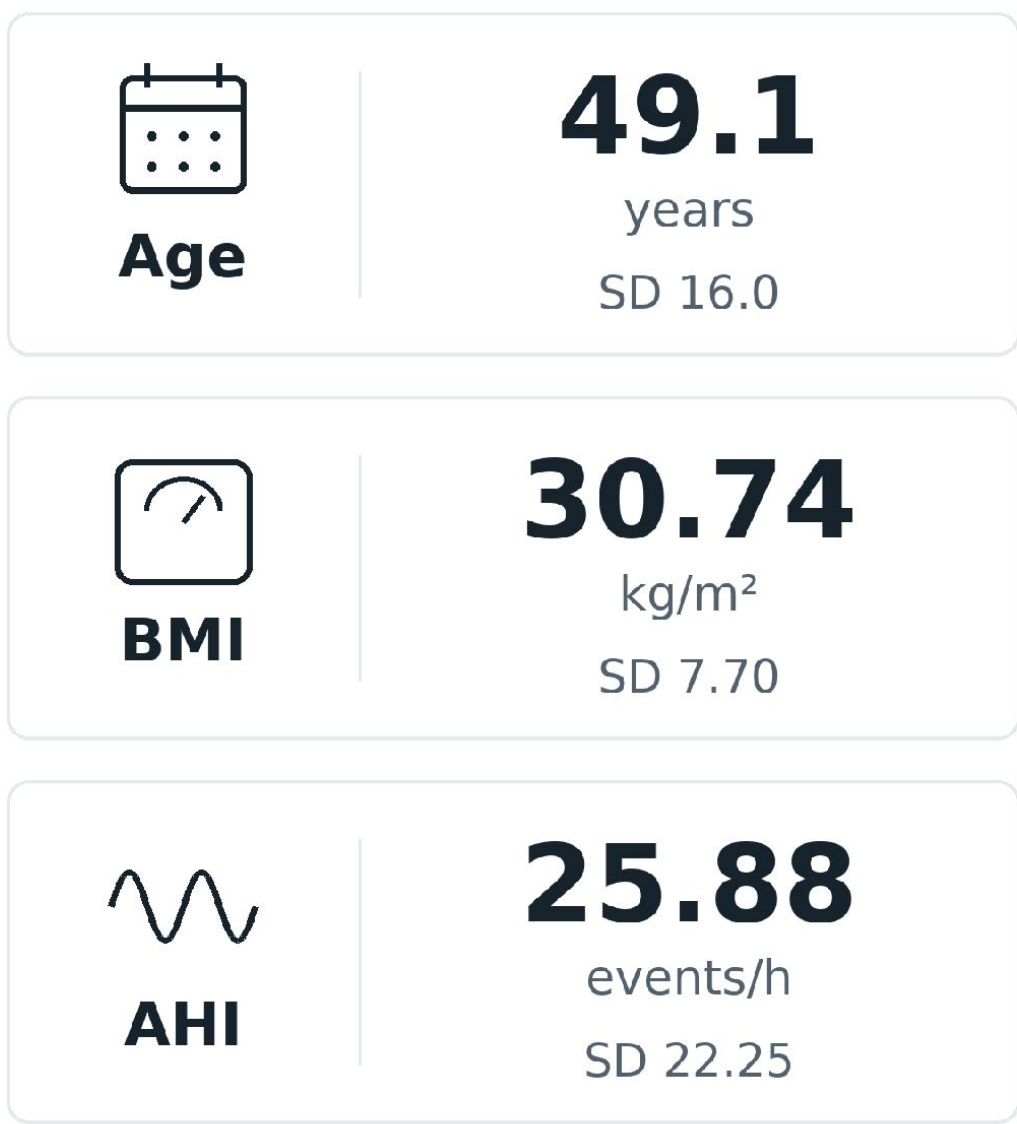


Figure 2: Visual summarisation of the study cohorts demographical and clinical characteristics

Conclusions

Automated endotypes from HSAT-autoscoring without cannula flow showed strong ICC agreement with PSG for collapsibility, arousal threshold and loop gain, but only moderate agreement for compensation. These findings support the feasibility of reduced-signal endotyping for selected traits. Lower agreement for compensation was expected because this trait routinely shows higher variance in comparison studies.

Disclaimer

Project conducted by Nox Health. These analyses are investigational and were not part of the DeepRESP 510(k) submission; they are not intended to represent official device performance, support promotional claims, or modify product labelling.

Table 1: Bland Altman results for trait specific comparison between HSAT and PSG

HSAT - PSG	Collapsibility	Arousal Threshold	Loop Gain	Compensation
Bland Altman mean Bias	0.620	-2.710	-0.850	-0.035
Lower 95% LoA	-7.9	-24.0	-0.2	-23.6
Upper 95% LoA	9.1	18.6	0.1	21.9

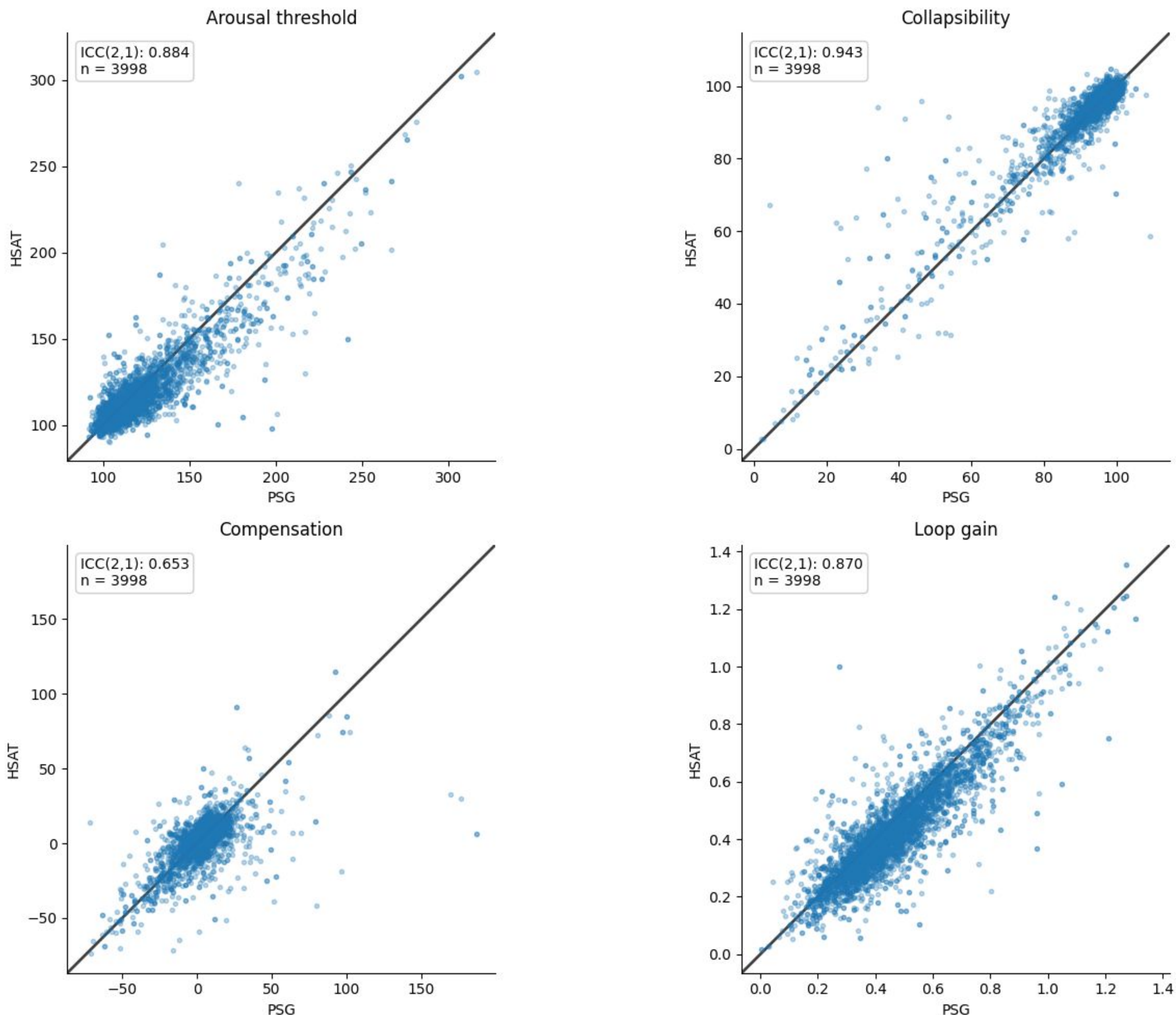


Figure 3: ICC (2,1) agreement between PSG and HSAT-style endotypes