

# Conclusive AHI from RIP-Only Type III HSAT: Comparison of RIP-Based vs Cannula-Based AI Analyses in a Large Multicenter Cohort

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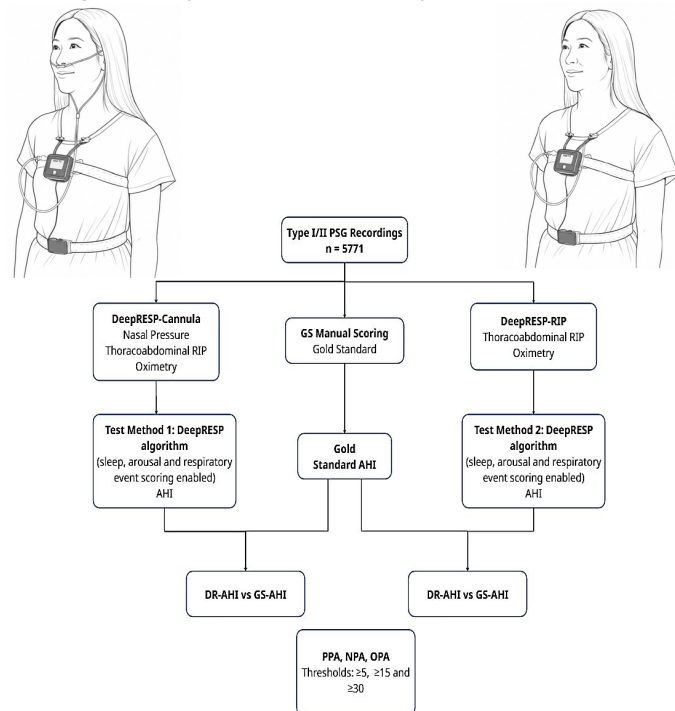


## Introduction

Type III home sleep apnea tests (HSAT) rely on respiratory flow measurement to score apneas and hypopneas. Although respiratory inductance plethysmography (RIP) has traditionally been viewed as an effort signal, contemporary implementations can capture respiratory morphology with sufficient fidelity to support RIP as a primary measurement of breathing. **We evaluated whether a RIP-only Type III HSAT configuration (without nasal cannula) can deliver conclusive AHI-based severity classification comparable to full-montage attended polysomnography (PSG)**

## Methods

A retrospective multicenter study was performed using 5,771 Type I/III PSGs manually scored by registered technologists and board-certified sleep physicians. **Two HSAT signal configurations** were simulated from the same recordings: (1) a **nasal-cannula** HSAT configuration (nasal pressure, thoracoabdominal RIP, oximetry) and (2) a **RIP-only** HSAT configuration (thoracoabdominal RIP, oximetry). Both were processed by DeepRESP v2.0 (K252330), an FDA-cleared medical device, to score sleep/wake, respiratory events, and derive the AHI. PSG-scored AHI served as the reference. Positive-, negative-, and overall percentage agreement (PPA, NPA, OPA) with AHI thresholds ( $\geq 5$ ,  $\geq 15$ ,  $\geq 30$  events/hour) were computed with 95% confidence intervals. Subgroup summaries characterized heterogeneity across age, sex, body mass index, race/ethnicity, and AHI.



**Figure 1: A flow diagram illustrating how the original gold standard PSG recordings were utilised to achieve comparable performance results between test method 1 (using nasal cannula) and test method 2 (using RIP belts)**

## Conclusions

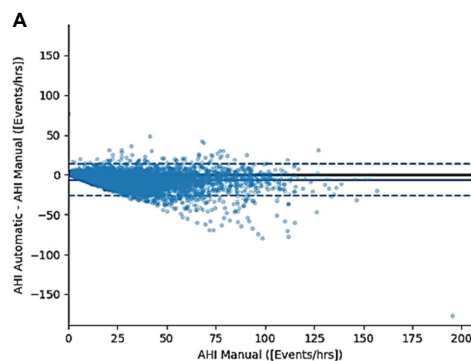
RIP-only Type III HSAT analyzed by AI can yield conclusive AHI-based severity classification that closely tracks attended PSG and performs comparably to a nasal-cannula-based HSAT configuration. These findings demonstrate that high-quality RIP signals, without a nasal cannula, can provide robust breathing information for AHI estimation, reducing inconclusive HSAT studies and decreasing the likelihood of repeat testing

## Results

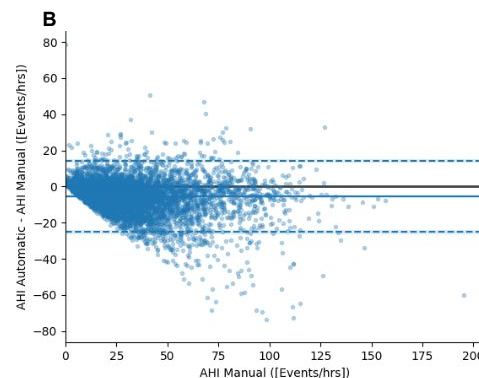
The cohort was clinically diverse: adults 18–88 years old, 35% female, 58% with body mass index  $\geq 30$  kg/m<sup>2</sup>, with AHI values spanning normal to severe. For AHI  $\geq 5$ , RIP-only HSAT achieved PPA 93.7%, NPA 63.5%, OPA 92.8%, compared with nasal-cannula HSAT PPA 91.0%, NPA 78.0%, OPA 90.6%. For AHI  $\geq 15$ , RIP-only HSAT achieved PPA 81.0%, NPA 91.1%, OPA 83.4%, versus nasal-cannula PPA 78.1%, NPA 93.9%, OPA 81.7%. Agreement at AHI  $\geq 30$  remained similarly high for both configurations. Across thresholds, RIP-only performance was within a few percentage points of the nasal-cannula configuration.

**Table 1: PPA, NPA, and OPA of scoring performed by DeepRESP using either nasal cannula and RIP, or only RIP to score respiratory events. Both automatic scorings were compared to the gold standard, with regards to classifying AHI  $\geq 5$ , AHI  $\geq 15$ , and AHI  $\geq 30$**

	Sensitivity % [95%CI]	Specificity % [95%CI]	Accuracy % [95%CI]
<b>AHI <math>\geq 5</math></b>			
DeepRESP-RIP	93.7 [93.1, 94.4]	63.5 [56.1, 70.7]	92.8 [92.2, 93.5]
DeepRESP-Cannula	91.0 [90.2, 91.7]	78.0 [71.9, 83.9]	90.6 [89.9, 91.4]
<b>AHI <math>\geq 15</math></b>			
DeepRESP-RIP	81.0 [79.8, 82.2]	91.1 [89.5, 92.5]	83.4 [82.5, 84.3]
DeepRESP-Cannula	78.1 [76.8, 79.2]	93.9 [92.4, 95.1]	81.7 [80.7, 82.7]
<b>AHI <math>\geq 30</math></b>			
DeepRESP-RIP	72.0 [70.2, 73.6]	96.5 [95.8, 97.1]	85.4 [84.4, 86.2]
DeepRESP-Cannula	69.9 [68.2, 71.6]	97.5 [96.9, 98.0]	85.0 [84.0, 85.9]



**Figure 2A: Bland-Altman for AHI, with mean bias and LOA, from DeepRESP-Cannula configuration compared to manual gold standard scoring.**



**Figure 2B: Bland-Altman for AHI, with mean bias and LOA, from DeepRESP-RIP configuration compared to manual gold standard scoring.**