

Additional File 2: Table S2. Design iteration summary. Table summarizes features of each design iteration of the housing and frontend (including the headcap, patches, and wires) and assesses water intrusion and signal quality for each (Good vs. Scorable vs. Unscorable ECG – subjective judgment of accuracy level for automated peak detection [always accurate, not always accurate, apnea vs. eupnea not readily distinguishable]; Good vs. Scorable vs. Unscorable EEG – subjective judgment of ability to visually and quantitatively distinguish between SWS and REM [both distinguishable, visual but not quantitative, not readily distinguishable]).

		<i>Features</i>	<i>Design Iteration</i>		
			<i>V1</i>	<i>V2</i>	<i>V3</i>
Logger Housing		Material	High-density polycarbonate	6061-T6 Aluminum	7075-T6 Aluminum
		Pressure test	>10 msw (failed test at 1310 msw [1900 psi])	>2000 msw (passed test to 2068 msw [3000 psi])	>2000 msw (passed test to 2068 psi [3000 psi])
		Solution for light and Bluetooth transmission	Transparent housing	High-density polycarbonate window	High-density polycarbonate window
		Pressure sensor retaining strategy	Stainless steel retaining plate	Stainless steel retaining plate	Stainless steel retaining snap ring
Frontend (Headcap, patches, and wires)	Headcap & patches	Material - bottom layer	Neoprene foam	Neoprene foam	Neoprene foam
		Electrode brand (inside headcap)	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup
		Electrode insulation (inside headcap)	“Light-weight” Teflon®	“Light-weight” Teflon®	“No-tangle” Silicone
		Wire configuration maintenance	Hot glue	None	Permatex® Silicone RTV Sealant
		Material - top layer	Neoprene foam	Neoprene rubber (40A durometer)	Neoprene rubber (40A durometer)
	Wire exit from patch	Wire exit strategy	Wires exit side of patch through abraded marine-grade heat shrink	Wires exit top of patch through 3D mold	Wires exit top of patch through 3D mold
		Chemical bond at wire exit	No	No	Yes
		3D mold potting material	No 3D molds used	Polyurethane resin	Polyurethane resin
		Electrode brand (outside headcap)	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup	Technomed goldcup
		Electrode insulation (outside headcap)	“Light-weight” Teflon®	“Light-weight” Teflon®	Thermoplastic polyurethane
	Wires	Wire shielding	Copper braided	None	Ultra-lightweight Stainless steel
		Wire fortification - EEG	4-ft standard heat shrink (1/4”)	Liquid electrical tape or nylon braided sheathing	4-ft standard heat shrink (3/4”), liquid electrical tape
		Wire fortification - ECG	4-ft standard heat shrink (1/4”)	Liquid electrical tape	4-ft standard heat shrink (1/4”), liquid electrical tape
Design assessment	Headcap Water intrusion	Most (N=1)	Minimal (N=4); None (N=1)	Minimal (N=4); None (N=1)	
	Land EEG Signal Quality	Good (N=1)	Good (N=5)	Good (N=5)	
	Pre-ICA In-Water EEG Signal Quality	Unscorable (N=1)	Unscorable (N=4); Good (N=1)	Good (N=5)	
	Post-ICA In-Water EEG Signal Quality	Good (N=1)	Scorable (N=4); Good (N=1)	Good (N=5)	
	ECG Signal Quality	Good (N=1)	Scorable (N=5)	Good (N=5)	
	Overall assessment	Good	Scorable	Best	