Effect of Temporal and Spatial Smoothing on Speckle Tracking Derived Strain in Neonates

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Supplementary table 1: Effect of smoothing on 4 chamber average longitudinal strain

Layer	Complete set of strain values at all combinations of spatial and temporal smoothing (%)				P values for overall effects of smoothing (p≤0.05 highlighted in bold type)	Statistically significant mean changes in strain (%) with changing spatial and temporal smoothing settings, alongside 95% confidence intervals of these mean differences. Non-significant changes not included.
Endocardial		**TL**	**TD**	**TH**	$p_i=0.304$ **$p_s=0.001$** **$p_t=0.015$**	Spatial smoothing (no interaction with temporal smoothing): SL-SD: 0.3 (95% CI 0.1 to 0.5) SL-SH: 0.4 (95% CI 0.1 to 0.7) Temporal smoothing (average across spatial smoothing): TL-TD: 0.1 (95% CI 0.0 to 0.1)
	SL	-22.3±2.5	-22.3±2.5	-22.3±2.5		
	SD	-22.6±2.6	-22.5±2.5	-22.6±2.5		
	SH	-22.7±2.7	-22.7±2.7	-22.7±2.6		
Midwall		**TL**	**TD**	**TH**	**$p_i=0.041$** $p_s=0.168$ **$p_t=0.039$**	Temporal smoothing (provided spatial smoothing set at default) TL-TH: 0.1 (95% CI 0.0 to 0.1)
	SL	-19.9±2.3	-19.8±2.2	-19.9±2.2		
	SD	-20.0±2.4	-20.0±2.4	-19.9±2.4		
	SH	-20.1±2.5	-20.0±2.5	-20.0±2.5		
Epicardial		**TL**	**TD**	**TH**	$p_i=0.113$ $p_s=0.680$ **$p_t=0.017$**	Temporal smoothing (no interaction with spatial smoothing) TL-TD*
	SL	-17.9±2.1	-17.8±2.1	-17.8±2.1		
	SD	-17.8±2.3	-17.8±2.3	-17.8±2.3		
	SH	-17.8±2.5	-17.8±2.4	-17.8±2.4		

CI: Confidence Interval; p_i: p-value for interaction between spatial and temporal smoothing; p_s: p-value for spatial smoothing; p_t: p-value for temporal smoothing; TD: Temporal smoothing default; TH: Temporal smoothing high; TL: Temporal smoothing low; SD: Spatial smoothing default; SH: Spatial smoothing high; SL: Spatial smoothing low *The difference between the segments was less than 0.1%, yet still statistically significant.

Supplementary table 2: Effect of smoothing on endocardial longitudinal strain

Segment	Complete set of strain values at all combinations of spatial and temporal smoothing (%)				P values for overall effects of smoothing (p≤0.05 highlighted in bold type)	Statistically significant mean changes in strain (%) with changing spatial and temporal smoothing settings. alongside 95% confidence intervals of these mean differences. Non-significant changes not included.
		TL	**TD**	**TH**		Spatial smoothing (across all temporal smoothing setting): SL-SD:-2.6 (95%CI: -1.5 to 3.7) SL-SH:-2.3(95%CI: -1.1-3.6) Temporal smoothing (provided spatial smoothing set at default): TL-TD:-0.1(95%CI -0.1 to 0.0) TL-TH:-0.1(95%CI -0.2 to 0.0) TD-TH* Temporal smoothing (provided spatial smoothing set at high): TL-TD* TL-TH:-0.1(95%CI -0.1 to 0.0) TD-TH*
Basoseptal	**SL**	-20.8±5.1	-20.7±5.1	-20.7±5.1	p_s=0.001 p_t=0.043 p_i=0.035	
	SD	-18.2±3.6	-18.1±3.6	-18.1±3.6		
	SH	-18.5±3.4	-18.4±3.3	-18.4±3.3		
		TL	**TD**	**TH**		Spatial smoothing (across all temporal smoothing setting): SL-SD:2.0 (95%CI:1.3 to 2.8) SL-SH:3.2(95%CI: 2.2 to 4.2) SD-SH:1.2(95%CI: 0.9 to 1.5)
Midseptal	**SL**	-18.0±3.1	-18.0±3.1	-18.0±3.1	p_s<0.001 p_t=0.342 p_i=0.279	
	SD	-20.0±2.8	-20.0±2.8	-20.0±2.8		
	SH	-21.2±2.9	-21.2±2.9	-21.2±2.9		
		TL	**TD**	**TH**		Spatial smoothing (across all temporal smoothing setting): SL-SD:-2.7 (95%CI: -3.4 to -2.0) SL-SH:-4.7 (95%CI: -5.7 to -3.6) SD-SH:-2.0 (95%CI: -1.5 to -2.4)
Apicoseptal	**SL**	-35.6±6.1	-35.6±6.1	-35.6±6.1	p_s<0.001 p_t=0.460 p_i=0.892	
	SD	-32.9±5.6	-32.9±5.6	-32.9±5.6		
	SH	-30.9±5.2	-30.9±5.2	-30.9±5.2		
		TL	**TD**	**TH**		
Apicolateral	**SL**	-30.9±4.1	-30.9±4.1	-30.9±4.1	p_s=0.060 p_t=0.070 p_i=0.800	
	SD	-31.4±4.6	-31.3±4.6	-31.3±4.6		
	SH	-30.3±4.8	-30.3±4.8	-30.3±4.8		
		TL	**TD**	**TH**		
Midlateral	**SL**	-17.8±4.3	-17.7±4.2	-17.8±4.2	p_s=0.001 p_t=0.441 p_i=0.479	Spatial smoothing (across all temporal smoothing setting): SL-SH:1.5 (95%CI: 0.4 to 2.6) SD-SH:1.4 (95%CI: 0.9 to 1.9)
	SD	-17.9±3.5	-17.8±3.5	-17.9±3.5		
	SH	-19.3±3.3	-19.3±3.3	-19.3±3.3		
		TL	**TD**	**TH**		
Basolateral	**SL**	-13.6±4.7	-13.6±4.8	-13.6±4.8	p_s=0.135 p_t=0.829 p_i=0.425	
	SD	-13.2±4.0	-13.2±4.0	-13.2±4.0		

| | **SH** | -14.0±3.8 | -14.0±3.8 | -14.0±3.8 | | |

CI: Confidence Interval; p_i: p-value for interaction between spatial and temporal smoothing; p_s: p-value for spatial smoothing; p_t: p-value for temporal smoothing; TD: Temporal smoothing default; TH: Temporal smoothing high; TL: Temporal smoothing low; SD: Spatial smoothing default; SH: Spatial smoothing high; SL: Spatial smoothing low
*The difference between the segments was less than 0.1%. yet still statistically significant.

Supplementary table 3: Effect of smoothing on midwall longitudinal strain

Segment	Complete set of strain values at all combinations of spatial and temporal smoothing (%)				P values for overall effects of smoothing ($p\leq0.05$ highlighted in bold type)	Statistically significant mean changes in strain (%) with changing spatial and temporal smoothing settings. alongside 95% confidence intervals of these mean differences. Non-significant changes not included.
		TL	**TD**	**TH**		Spatial smoothing (temporal smoothing low) SL-SD:-2.4(95%CI:-3.2 to -1.6) SL-SH:-1.9(95%CI:-2.8 to -1.0) SD-SH: 0.4(95%CI: -0.2 to -0.7) Spatial smoothing (temporal smoothing default) SL-SD:-2.4(95%CI:-3.2 to -1.6) SL-SH:-1.9(95%CI:-2.8 to -1.0) SD-SH: 0.4(95%CI: -0.2 to -0.7)
Basoseptal	**SL**	-19.3±4.1	-19.3±4.1	-19.3±4.1	**ps<0.001** pt=0.068 **pi=0.005**	
	SD	-17.0±3.3	-16.9±3.3	-16.9±3.2		Spatial smoothing (temporal smoothing default) SL-SD:-2.4(95%CI:-3.2 to -1.6) SL-SH:-2.0(95%CI:-2.8 to -1.1) SD-SH: 0.4(95%CI: -0.2 to -0.7) Temporal smoothing (spatial smoothing default) TL-TD:-0.1(95%CI:0.0 to -0.1) TL-TH:-0.1(95%CI: 0.0 to -0.2) TD-TH*
	SH	-17.4±3.1	-17.3±3.1	-17.3±3.1		Temporal smoothing (spatial smoothing high) TL-TD* TL-TH:-0.1(95%CI: 0.0 to -0.1) TD-TH*
		TL	**TD**	**TH**	**ps<0.001** pt=0.241 pi=0.293	Spatial smoothing (across all temporal smoothing setting): SL-SD: 1.4 (95%CI: 0.8 to 2.0) SL-SH: 1.9 (95%CI:1.0 to 2.7) SD-SH*
Midseptal	**SL**	-17.8±2.7	-17.7±2.8	-17.8±2.8		
	SD	-19.2±2.6	-19.2±2.6	-19.2±2.6		
	SH	-19.7±2.7	-19.6±2.7	-19.6±2.7		
		TL	**TD**	**TH**	**ps<0.001** pt=0.373 pi=0.279	Spatial smoothing (across all temporal smoothing setting): SL-SD: -2.3 (95%CI:-3.0 to -1.7) SL-SH: -3.9 (95%CI:-4.9 to -3.0) SD-SH: -1.6 (95%CI:-1.9 to -1.6)
Apicoseptal	**SL**	-28.5±4.8	-28.5±4.7	-28.5±4.7		
	SD	-26.1±5.0	-26.1±4.9	-26.1±4.9		
	SH	-24.5±4.9	-24.5±4.9	-24.5±4.9		
		TL	**TD**	**TH**	ps=0.068 pt=0.061 pi=0.688	
Apicolateral	**SL**	-23.9±3.6	-23.9±3.6	-23.9±3.6		
	SD	-24.6±4.1	-24.6±4.0	-24.6±4.0		
	SH	-23.8±4.3	-23.8±4.3	-23.8±4.3		
Midlateral		**TL**	**TD**	**TH**		

	SL	-16.4±4.0	-16.4±4.0	-16.4±4.0	**ps=0.003** pt=0.196 pi=0.685	Spatial smoothing (across all temporal smoothing setting): SL-SH: 1.3 (95%CI: 0.2 to 2.3) SD-SH: 0.9 (95%CI: 0.5 to 1.4)
	SD	-16.8±3.2	-16.7±3.2	-16.8±3.2		
	SH	-17.7±3.0	-17.7±3.0	-17.7±3.0		
		TL	**TD**	**TH**		
Basolateral	**SL**	-12.6±4.0	-12.6±4.0	-12.6±4.0	**ps=0.011** pt=0.935 pi=0.365	Spatial smoothing (across all temporal smoothing setting): SD-SH: 1.0 (95%CI:0.6 to 1.4)
	SD	-12.5±3.7	-12.4±3.7	-12.4±3.7		
	SH	-13.4±3.5	-13.4±3.5	-13.4±3.5		

CI: Confidence Interval; p_i: p-value for interaction between spatial and temporal smoothing; p_s: p-value for spatial smoothing; p_t: p-value for temporal smoothing; TD: Temporal smoothing default; TH: Temporal smoothing high; TL: Temporal smoothing low; SD: Spatial smoothing default; SH: Spatial smoothing high; SL: Spatial smoothing low
*The difference between the segments was less than 0.1%. yet still statistically significant.

Supplementary table 4: Effect of smoothing on epicardial longitudinal strain

Segment	Complete set of strain values at all combinations of spatial and temporal smoothing (%)				P values for overall effects of smoothing (p≤0.05 highlighted in bold type)	Statistically significant mean changes in strain (%) with changing spatial and temporal smoothing settings. alongside 95% confidence intervals of these mean differences. Non-significant changes not included.
Basoseptal		**TL**	**TD**	**TH**		Spatial smoothing (temporal smoothing low) SL-SD:-2.2(95%CI:-2.9 to -1.4) SL-SH:-1.6(95%CI:-2.5 to -0.8) SD-SH: 0.5(95%CI:0.8 to 0.3) Spatial smoothing (temporal smoothing default) SL-SD: -2.2(95%CI:-2.9 to -1.5) SL-SH: -1.7(95%CI:-2.5 to -0.9) SD-SH: 0.5(95%CI:0.8 to 0.3)
	SL	-18.0±3.7	-18.0±3.6	-18.0±3.6	**ps<0.001** pt=0.124 **pi=0.009**	Spatial smoothing (temporal smoothing default) SL-SD: -2.3(95%CI:-3.0 to -1.5 SL-SH: -1.7(95%CI:-2.5 to -0.9 SD-SH: 0.5(95%CI:0.3 to 0.8 Temporal smoothing (spatial smoothing default) TL-TH:-0.1(95%CI:-0.2 to 0.0) TD-TH*
	ST	-15.8±3.1	-15.8±3.1	-15.8±3.1		Temporal smoothing (spatial smoothing high) TL-TD:-0.1(95%CI:-0.1 to 0.0) TL-TH:-0.1(95%CI:-0.1 to 0.0) TD-TH*
	SH	-16.4±3.0	-16.3±3.0	-16.3±3.0		
Midseptal		**TL**	**TD**	**TH**	**ps=0.013** pt=0.219 pi=0.403	Spatial smoothing (across all temporal smoothing setting): SL-SD: 0.8 (95%CI:0.3 to 1.4)
	SL	-17.6±2.9	-17.6±2.9	-17.6±2.9		
	ST	-18.5±2.6	-18.4±2.6	-18.4±2.6		
	SH	-18.2±2.7	-18.2±2.7	-18.2±2.7		
Apicoseptal		**TL**	**TD**	**TH**		Spatial smoothing (temporal smoothing low) SL-SD:-2.8(95%CI:-3.7 to -1.9) SL-SH:-4.4(95%CI:-5.6 to -3.2) SD-SH: -1.6(95%CI:-1.9 to -1.3) Spatial smoothing (temporal smoothing low) SL-SD:-2.8(95%CI:-3.7 to -1.9) SL-SH:-4.4(95%CI:-5.6 to -3.3) SD-SH: -1.6(95%CI:-1.9 to -1.3)
	SL	-23.9±4.0	-23.9±4.0	-23.9±3.9	**ps<0.001** pt=0.413 **pi=0.041**	Spatial smoothing (temporal smoothing low) SL-SD:-2.8(95%CI:-3.7 to -1.9) SL-SH:-4.4(95%CI:-5.6 to -3.3) SD-SH: -1.6(95%CI:-1.9 to -1.3)
	ST	-21.1±4.9	-21.1±4.9	-21.1±4.8		Spatial smoothing (temporal smoothing low) SL-SD:-2.8(95%CI:-3.7 to -1.9) SL-SH:-4.4(95%CI:-5.6 to -3.3)
	SH	-19.5±5.1	-19.5±5.1	-19.5±5.1		

		TL	TD	TH		SD-SH: -1.6(95%CI:-1.9 to -1.3) Temporal smoothing (spatial smoothing high) TL-TD*
Apicolateral		**TL**	**TD**	**TH**	p_s=0.111 p_t=0.131 p_i=0.759	
	SL	-19.3±3.4	-19.3±3.4	-19.3±3.4		
	ST	-19.8±4.0	-19.7±4.0	-19.7±3.9		
	SH	-19.0±4.3	-18.9±4.3	-18.9±4.3		
Midlateral		**TL**	**TD**	**TH**	**p_s=0.016** p_t=0.063 p_i=0.418	Spatial smoothing (across all temporal smoothing setting): SL-SH: 1.1 (95%CI:0.0 to 2.2) SD-SH: 0.6 (95%CI:0.1 to 1.1)
	SL	-15.3±4.0	-15.2±4.1	-15.2±4.1		
	ST	-15.8±3.1	-15.8±3.1	-15.8±3.1		
	SH	-16.4±2.9	-16.4±2.9	-16.4±2.9		
Basolateral		**TL**	**TD**	**TH**	**p_s=0.001** p_t=0.957 p_i=0.374	Spatial smoothing (across all temporal smoothing setting): SL-SH: 1.2 (95%CI:0.2 to 2.1) SD-SH: 1.1 (95%CI:0.7 to 1.5)
	SL	-11.7±4.2	-11.7±4.1	-11.7±4.1		
	ST	-11.8±3.7	-11.7±3.7	-11.7±3.7		
	SH	-12.9±3.6	-12.9±3.6	-12.9±3.6		

p_i: p-value for interaction between spatial and temporal smoothing; p_s: p-value for spatial smoothing; p_t: p-value for temporal smoothing; TD: Temporal smoothing default; TH: Temporal smoothing high; TL: Temporal smoothing low; SD: Spatial smoothing default; SH: Spatial smoothing high; SL: Spatial smoothing low

*The difference between the segments was less than 0.1%. yet still statistically significant.