

## RESEARCH REPORTS

Clinical

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# Human Temporomandibular Eminence Shape and Joint Load Minimization

## APPENDIX

**Appendix Table 1.** Results from Healthy Participants without TMJ Disc Displacement, Showing  $x$ ,  $x^2$ , and  $x^3$ -values for Polynomial Equations Describing Effective Sagittal TMJ Eminence Shapes Predicted by a Numerical Model and Measured at Sessions 1 and 2, and  $R^2$ -values and Constants of Proportionality ( $m$ ) for Comparisons of Model-predicted vs. Measured Data

Subject # Sex	Model-predicted Shape	Measured Shape, Session			Model-predicted vs. Measured Data, Session				
		1-Right	1-Left	2-Right	2-Left	1-Right	1-Left	2-Right	2-Left
003 Male	$x = -0.870$ $x^2 = 0.060$ $x^3 = 0.002$	$x = -0.319$ $x^2 = -0.246$ $x^3 = 0.067$	$x = -1.000$ $x^2 = 0.118$ $x^3 = -0.002$	$x = -0.305$ $x^2 = -0.261$ $x^3 = 0.061$	$x = -0.917$ $x^2 = 0.180$ $x^3 = -0.014$	$R^2 = 0.99$ $m = 0.87$	$R^2 = 0.98$ $m = 0.77$	$R^2 = 0.99$ $m = 0.74$	$R^2 = 0.99$ $m = 0.83$
031 Male	$x = -0.976$ $x^2 = 0.091$ $x^3 = -0.006$	$x = -1.095$ $x^2 = 0.172$ $x^3 = 0.003$	$x = -0.893$ $x^2 = 0.323$ $x^3 = -0.029$	$x = -1.477$ $x^2 = 0.176$ $x^3 = 0.006$	$x = -0.512$ $x^2 = 0.046$ $x^3 = 0.000$	$R^2 = 0.98$ $m = 1.02$	$R^2 = 0.99$ $m = 0.98$	$R^2 = 0.96$ $m = 1.36$	$R^2 = 0.99$ $m = 1.39$
035 Female	$x = -0.771$ $x^2 = 0.034$ $x^3 = 0.001$	$x = -0.888$ $x^2 = 0.173$ $x^3 = -0.007$	$x = -0.612$ $x^2 = 0.118$ $x^3 = -0.006$	$x = -0.887$ $x^2 = 0.148$ $x^3 = -0.006$	$x = -0.535$ $x^2 = 0.185$ $x^3 = -0.019$	$R^2 = 0.98$ $m = 1.15$	$R^2 = 0.99$ $m = 1.14$	$R^2 = 0.99$ $m = 1.19$	$R^2 = 0.98$ $m = 1.45$
044 Male	$x = -0.807$ $x^2 = 0.027$ $x^3 = 0.001$	$x = -0.973$ $x^2 = 0.044$ $x^3 = 0.010$	$x = -0.911$ $x^2 = 0.021$ $x^3 = 0.018$	$x = -0.659$ $x^2 = -0.020$ $x^3 = 0.006$	$x = -1.098$ $x^2 = 0.269$ $x^3 = -0.027$	$R^2 = 0.99$ $m = 0.86$	$R^2 = 0.99$ $m = 0.85$	$R^2 = 0.99$ $m = 0.87$	$R^2 = 0.99$ $m = 0.88$
045 Female	$x = -0.725$ $x^2 = 0.040$ $x^3 = 0.002$	$x = -0.706$ $x^2 = 0.046$ $x^3 = 0.002$	$x = -1.018$ $x^2 = 0.286$ $x^3 = -0.022$	$x = -0.506$ $x^2 = -0.040$ $x^3 = 0.003$	$x = -1.310$ $x^2 = 0.263$ $x^3 = -0.017$	$R^2 = 0.99$ $m = 0.89$	$R^2 = 0.98$ $m = 0.89$	$R^2 = 0.99$ $m = 0.93$	$R^2 = 0.99$ $m = 0.83$
048 Female	$x = -0.922$ $x^2 = 0.229$ $x^3 = -0.019$	$x = -0.491$ $x^2 = -0.056$ $x^3 = 0.015$	$x = -0.646$ $x^2 = 0.041$ $x^3 = 0.003$	$x = -0.321$ $x^2 = -0.134$ $x^3 = 0.020$	$x = -1.235$ $x^2 = 0.337$ $x^3 = -0.028$	$R^2 = 0.75$ $m = 0.37$	$R^2 = 0.71$ $m = 0.42$	$R^2 = 0.80$ $m = 0.49$	$R^2 = 0.85$ $m = 0.59$
049 Female	$x = -1.086$ $x^2 = 0.072$ $x^3 = 0.002$	$x = -1.123$ $x^2 = 0.046$ $x^3 = 0.031$	$x = -1.009$ $x^2 = 0.287$ $x^3 = -0.029$	$x = -0.861$ $x^2 = -0.162$ $x^3 = 0.061$	$x = -1.607$ $x^2 = 0.526$ $x^3 = -0.036$	$R^2 = 0.99$ $m = 0.83$	$R^2 = 0.99$ $m = 0.87$	$R^2 = 0.98$ $m = 0.87$	$R^2 = 0.94$ $m = 1.01$
051 Female	$x = -0.734$ $x^2 = 0.041$ $x^3 = 0.002$	$x = -0.834$ $x^2 = 0.060$ $x^3 = 0.008$	$x = -0.694$ $x^2 = 0.021$ $x^3 = 0.006$	$x = -0.604$ $x^2 = 0.013$ $x^3 = 0.013$	$x = -0.887$ $x^2 = 0.178$ $x^3 = -0.018$	$R^2 = 0.99$ $m = 0.77$	$R^2 = 0.99$ $m = 0.78$	$R^2 = 0.99$ $m = 0.65$	$R^2 = 0.99$ $m = 0.69$
053 Female	$x = -0.783$ $x^2 = 0.052$ $x^3 = 0.002$	$x = -0.569$ $x^2 = -0.017$ $x^3 = 0.012$	$x = -0.956$ $x^2 = 0.188$ $x^3 = -0.012$	$x = -0.494$ $x^2 = -0.034$ $x^3 = 0.008$	$x = -1.579$ $x^2 = 0.519$ $x^3 = -0.051$	$R^2 = 0.99$ $m = 0.87$	$R^2 = 0.97$ $m = 0.81$	$R^2 = 0.99$ $m = 0.84$	$R^2 = 0.99$ $m = 0.99$
058 Male	$x = -0.956$ $x^2 = 0.224$ $x^3 = -0.019$	$x = -0.868$ $x^2 = 0.153$ $x^3 = -0.006$	$x = -0.150$ $x^2 = -0.225$ $x^3 = 0.052$	$x = -0.750$ $x^2 = 0.159$ $x^3 = -0.007$	$x = -0.439$ $x^2 = -0.126$ $x^3 = 0.029$	$R^2 = 0.93$ $m = 0.53$	$R^2 = 0.89$ $m = 0.47$	$R^2 = 0.86$ $m = 0.56$	$R^2 = 0.86$ $m = 0.50$
062 Male	$x = -0.868$ $x^2 = 0.059$ $x^3 = 0.002$	$x = -0.952$ $x^2 = 0.119$ $x^3 = -0.003$	$x = -1.413$ $x^2 = 0.293$ $x^3 = -0.024$	$x = -0.761$ $x^2 = -0.037$ $x^3 = 0.024$	$x = -0.874$ $x^2 = 0.102$ $x^3 = -0.005$	$R^2 = 0.99$ $m = 0.91$	$R^2 = 0.99$ $m = 1.02$	$R^2 = 0.99$ $m = 0.77$	$R^2 = 0.99$ $m = 0.85$
064 Female	$x = -0.642$ $x^2 = 0.044$ $x^3 = 0.001$	$x = -1.25$ $x^2 = 0.220$ $x^3 = -0.010$	$x = -0.732$ $x^2 = 0.136$ $x^3 = -0.013$	$x = -0.732$ $x^2 = -0.005$ $x^3 = 0.009$	$x = -0.689$ $x^2 = 0.004$ $x^3 = 0.008$	$R^2 = 0.96$ $m = 0.68$	$R^2 = 0.96$ $m = 0.75$	$R^2 = 0.99$ $m = 0.81$	$R^2 = 0.98$ $m = 0.75$
065 Male	$x = -0.597$ $x^2 = 0.029$ $x^3 = 0.001$	$x = -0.933$ $x^2 = -0.323$ $x^3 = 0.124$	$x = -1.479$ $x^2 = 0.393$ $x^3 = -0.028$	$x = -3.042$ $x^2 = 1.612$ $x^3 = -0.292$	$x = -0.679$ $x^2 = 0.028$ $x^3 = 0.007$	$R^2 = 0.97$ $m = 0.68$	$R^2 = 0.97$ $m = 0.55$	$R^2 = 0.99$ $m = 0.72$	$R^2 = 0.99$ $m = 0.79$

(continued)

**Appendix Table 1.** (continued)

Subject # Sex	Model-predicted Shape	Measured Shape, Session			Model-predicted vs. Measured Data, Session				
		1-Right	1-Left	2-Right	2-Left	1-Right	1-Left	2-Right	2-Left
066 Male	x = -0.911 x <sup>2</sup> = 0.066 x <sup>3</sup> = -0.0002	x = -0.702 x <sup>2</sup> = -0.219 x <sup>3</sup> = 0.025	x = -1.233 x <sup>2</sup> = 0.226 x <sup>3</sup> = -0.016	x = -0.939 x <sup>2</sup> = -0.747 x <sup>3</sup> = 0.144	x = -1.384 x <sup>2</sup> = 0.177 x <sup>3</sup> = 0.003	R <sup>2</sup> = 0.95 m = 0.55	R <sup>2</sup> = 0.95 m = 0.54	R <sup>2</sup> = 0.99 m = 0.75	R <sup>2</sup> = 0.99 m = 0.69
068 Female	x = -0.878 x <sup>2</sup> = 0.036 x <sup>3</sup> = 0.001	x = -0.454 x <sup>2</sup> = -0.506 x <sup>3</sup> = 0.100	x = -0.792 x <sup>2</sup> = 0.072 x <sup>3</sup> = 0.002	x = -0.354 x <sup>2</sup> = -0.493 x <sup>3</sup> = 0.087	x = -0.526 x <sup>2</sup> = -0.048 x <sup>3</sup> = 0.013	R <sup>2</sup> = 0.98 m = 0.74	R <sup>2</sup> = 0.97 m = 0.73	R <sup>2</sup> = 0.99 m = 0.84	R <sup>2</sup> = 0.99 m = 0.85
072 Female	x = -1.041 x <sup>2</sup> = 0.062 x <sup>3</sup> = 0.001	x = -0.786 x <sup>2</sup> = -0.409 x <sup>3</sup> = 0.083	x = -1.223 x <sup>2</sup> = 0.225 x <sup>3</sup> = -0.010	x = -0.432 x <sup>2</sup> = -0.417 x <sup>3</sup> = 0.073	x = -1.088 x <sup>2</sup> = 0.072 x <sup>3</sup> = 0.001	R <sup>2</sup> = 0.97 m = 0.74	R <sup>2</sup> = 0.97 m = 0.73	R <sup>2</sup> = 0.99 m = 0.81	R <sup>2</sup> = 0.99 m = 0.79
074 Male	x = -0.524 x <sup>2</sup> = 0.036 x <sup>3</sup> = 0.002	x = -0.450 x <sup>2</sup> = -0.041 x <sup>3</sup> = 0.013	x = -2.030 x <sup>2</sup> = 0.581 x <sup>3</sup> = -0.037	x = -0.487 x <sup>2</sup> = -0.072 x <sup>3</sup> = 0.020	x = -1.431 x <sup>2</sup> = 0.422 x <sup>3</sup> = -0.028	R <sup>2</sup> = 0.93 m = 0.63	R <sup>2</sup> = 0.96 m = 0.73	R <sup>2</sup> = 0.98 m = 0.45	R <sup>2</sup> = 0.99 m = 0.42

Sub-category information for type of disc displacement, based on Research Diagnostic Criteria for temporomandibular disorders (Dworkin and LeResche, 1992), is also provided according to: (a) with reduction, (b) without reduction with limited opening, (c) without reduction without limited opening, and (nd) not displaced.

**Appendix Table 2.** Results from Participants with TMJ Disc Displacement, Showing  $x$ ,  $x^2$ ,  $x^3$ -values for Polynomial Equations Describing Effective Sagittal TMJ Eminence Shapes Predicted by a Numerical Model and Measured at Sessions 1 and 2, and  $R^2$ -values and Constants of Proportionality ( $m$ ) for Comparisons of Model-predicted vs. Measured Data

Subject # Sex Side: type	Model-predicted Shape			Measured Shape, Session			Model-predicted vs. Measured Data, Session		
	1-Right	1-Left	2-Right	2-Left	1-Right	1-Left	2-Right	2-Left	
004 Female Right: a Left: a	$x = -0.797$ $x^2 = 0.056$ $x^3 = -0.001$	$x = -0.787$ $x^2 = 0.092$ $x^3 = 0.001$	$x = -1.058$ $x^2 = 0.155$ $x^3 = -0.002$	$x = -1.218$ $x^2 = 0.246$ $x^3 = -0.011$	$R^2 = 0.99$ $m = 0.90$	$R^2 = 0.99$ $m = 0.76$	$R^2 = 0.99$ $m = 0.87$	$R^2 = 0.98$ $m = 0.76$	
010 Female Right: b Left: b	$x = -0.734$ $x^2 = 0.055$ $x^3 = 0.006$	$x = -1.118$ $x^2 = 0.322$ $x^3 = -0.026$	$x = -0.776$ $x^2 = 0.141$ $x^3 = -0.008$	$x = -0.354$ $x^2 = -0.087$ $x^3 = 0.016$	$R^2 = 0.88$ $m = 0.56$	$R^2 = 0.95$ $m = 0.76$	$R^2 = 0.98$ $m = 0.81$	$R^2 = 0.87$ $m = 0.75$	
011 Female Right: a Left: nd	$x = -0.665$ $x^2 = 0.044$ $x^3 = 0.002$	$x = -0.671$ $x^2 = 0.004$ $x^3 = 0.006$	$x = -1.736$ $x^2 = 0.421$ $x^3 = -0.033$	$x = -0.756$ $x^2 = 0.072$ $x^3 = -0.001$	$R^2 = 0.99$ $m = 0.65$	$R^2 = 0.99$ $m = 0.55$	$R^2 = 0.99$ $m = 0.71$	$R^2 = 0.98$ $m = 0.66$	
016 Male Right: a Left: a	$x = -0.625$ $x^2 = 0.051$ $x^3 = -0.0001$	$x = -0.565$ $x^2 = 0.049$ $x^3 = -0.004$	$x = -0.526$ $x^2 = 0.102$ $x^3 = -0.006$	$x = -0.465$ $x^2 = 0.033$ $x^3 = -0.003$	$R^2 = 0.98$ $m = 0.70$	$R^2 = 0.99$ $m = 0.79$	$R^2 = 0.98$ $m = 0.81$	$R^2 = 0.98$ $m = 0.81$	
019 Female Right: c Left: c	$x = -0.648$ $x^2 = 0.036$ $x^3 = 0.001$	$x = -1.123$ $x^2 = 0.314$ $x^3 = -0.024$	$x = -0.531$ $x^2 = -0.092$ $x^3 = 0.014$	$x = -2.863$ $x^2 = 0.989$ $x^3 = -0.104$	$R^2 = 0.33$ $m = 0.55$	$R^2 = 0.99$ $m = 0.84$	$R^2 = 0.98$ $m = 0.83$	$R^2 = 0.99$ $m = 0.89$	
037 Female Right: a Left: a	$x = -1.053$ $x^2 = 0.114$ $x^3 = -0.010$	$x = -1.217$ $x^2 = 0.317$ $x^3 = -0.024$	$x = -1.356$ $x^2 = 0.123$ $x^3 = 0.005$	$x = -0.415$ $x^2 = 0.074$ $x^3 = -0.008$	$R^2 = 0.99$ $m = 0.78$	$R^2 = 0.99$ $m = 0.78$	$R^2 = 0.97$ $m = 1.13$	$R^2 = 0.98$ $m = 1.19$	
042 Male Right: a Left: a	$x = -0.849$ $x^2 = 0.042$ $x^3 = 0.001$	$x = -1.126$ $x^2 = 0.308$ $x^3 = -0.013$	$x = -0.822$ $x^2 = 0.086$ $x^3 = 0.010$	$x = -1.123$ $x^2 = 0.264$ $x^3 = -0.016$	$R^2 = 0.99$ $m = 1.33$	$R^2 = 0.99$ $m = 1.23$	$R^2 = 0.95$ $m = 1.21$	$R^2 = 0.99$ $m = 1.28$	
047 Female Right: a Left: a	$x = -0.842$ $x^2 = 0.055$ $x^3 = 0.003$	$x = -1.074$ $x^2 = 0.179$ $x^3 = -0.010$	$x = -0.949$ $x^2 = 0.077$ $x^3 = 0.003$	$x = -0.571$ $x^2 = -0.028$ $x^3 = 0.015$	$R^2 = 0.96$ $m = 0.65$	$R^2 = 0.97$ $m = 0.66$	$R^2 = 0.98$ $m = 0.74$	$R^2 = 0.97$ $m = 0.72$	
052 Female Right: a Left: a	$x = -1.143$ $x^2 = 0.030$ $x^3 = 0.001$	$x = -1.977$ $x^2 = 0.341$ $x^3 = -0.029$	$x = -1.272$ $x^2 = 0.044$ $x^3 = 0.012$	$x = -2.322$ $x^2 = 0.326$ $x^3 = 0.043$	$R^2 = 0.99$ $m = 0.88$	$R^2 = 0.99$ $m = 0.88$	$R^2 = 0.99$ $m = 0.91$	$R^2 = 0.98$ $m = 0.92$	

(continued)

**Appendix Table 2.** (continued)

Subject # Sex	Model- predicted Shape	Measured Shape, Session						Model-predicted vs. Measured Data, Session							
		1-Right		1-Left		2-Right		2-Left		1-Right		1-Left		2-Right	
055 Female Right: nd Left: a	x = -1.006 x <sup>2</sup> = 0.095 x <sup>3</sup> = 0.007	x = -0.870 x <sup>2</sup> = 0.066 x <sup>3</sup> = 0.011	x = -0.738 x <sup>2</sup> = 0.046 x <sup>3</sup> = 0.0001	x = -1.043 x <sup>2</sup> = 0.033 x <sup>3</sup> = 0.014	x = -0.814 x <sup>2</sup> = 0.130 x <sup>3</sup> = -0.011	R <sup>2</sup> = 0.87 m = 0.63	R <sup>2</sup> = 0.83 m = 0.63	R <sup>2</sup> = 0.82 m = 0.63	R <sup>2</sup> = 0.84 m = 0.60						
059 Male Right: c Left: c	x = -0.362 x <sup>2</sup> = 0.032 x <sup>3</sup> = 0.001	x = -0.055 x <sup>2</sup> = -0.532 x <sup>3</sup> = 0.056	x = 0.273 x <sup>2</sup> = -0.055 x <sup>3</sup> = -0.001	x = -1.225 x <sup>2</sup> = -0.031 x <sup>3</sup> = 0.018	x = -0.398 x <sup>2</sup> = 0.085 x <sup>3</sup> = -0.009	R <sup>2</sup> = 0.99 m = 0.44	R <sup>2</sup> = 0.99 m = 0.47	R <sup>2</sup> = 0.99 m = 1.10	R <sup>2</sup> = 0.99 m = 1.21						
061 Male Right: b Left: nd	x = -0.857 x <sup>2</sup> = 0.036 x <sup>3</sup> = 0.001	x = -1.572 x <sup>2</sup> = 0.217 x <sup>3</sup> = -0.013	x = -1.146 x <sup>2</sup> = 0.247 x <sup>3</sup> = -0.017	x = -0.693 x <sup>2</sup> = -0.057 x <sup>3</sup> = 0.010	x = -1.671 x <sup>2</sup> = 0.564 x <sup>3</sup> = -0.057	R <sup>2</sup> = 0.97 m = 0.77	R <sup>2</sup> = 0.98 m = 0.87	R <sup>2</sup> = 0.99 m = 0.97	R <sup>2</sup> = 0.98 m = 0.98						
063 Male Right: a Left: a	x = -1.002 x <sup>2</sup> = 0.047 x <sup>3</sup> = 0.001	x = -0.551 x <sup>2</sup> = -0.164 x <sup>3</sup> = 0.026	x = -0.839 x <sup>2</sup> = 0.088 x <sup>3</sup> = 0.008	x = -1.114 x <sup>2</sup> = 0.117 x <sup>3</sup> = 0.005	x = -1.174 x <sup>2</sup> = 0.221 x <sup>3</sup> = -0.018	R <sup>2</sup> = 0.99 m = 0.88	R <sup>2</sup> = 0.99 m = 0.93	R <sup>2</sup> = 0.99 m = 0.94	R <sup>2</sup> = 0.99 m = 0.81						
067 Male Right: nd Left: c	x = -0.618 x <sup>2</sup> = 0.040 x <sup>3</sup> = 0.001	x = -0.716 x <sup>2</sup> = 0.059 x <sup>3</sup> = 0.007	x = -0.095 x <sup>2</sup> = -0.040 x <sup>3</sup> = 0.004	x = -0.650 x <sup>2</sup> = 0.042 x <sup>3</sup> = 0.002	x = -0.186 x <sup>2</sup> = 0.054 x <sup>3</sup> = -0.005	R <sup>2</sup> = 0.98 m = 0.71	R <sup>2</sup> = 0.98 m = 0.75	R <sup>2</sup> = 0.94 m = 2.88	R <sup>2</sup> = 0.89 m = 4.57						
069 Female Right: c Left: a	x = -1.258 x <sup>2</sup> = 0.235 x <sup>3</sup> = -0.026	x = -1.179 x <sup>2</sup> = 0.120 x <sup>3</sup> = 0.003	x = -1.3862 x <sup>2</sup> = 0.241 x <sup>3</sup> = -0.016	x = -0.227 x <sup>2</sup> = -0.139 x <sup>3</sup> = 0.019	x = -1.105 x <sup>2</sup> = 0.221 x <sup>3</sup> = -0.013	R <sup>2</sup> = 0.98 m = 1.37	R <sup>2</sup> = 0.99 m = 1.32	R <sup>2</sup> = 0.99 m = 0.76	R <sup>2</sup> = 0.98 m = 0.77						
071 Male Right: a Left: a	x = -1.170 x <sup>2</sup> = 0.037 x <sup>3</sup> = 0.001	x = -0.988 x <sup>2</sup> = -0.019 x <sup>3</sup> = 0.012	x = -1.104 x <sup>2</sup> = -0.023 x <sup>3</sup> = 0.013	x = -1.264 x <sup>2</sup> = 0.082 x <sup>3</sup> = 0.007	x = -1.052 x <sup>2</sup> = 0.029 x <sup>3</sup> = 0.006	R <sup>2</sup> = 0.99 m = 0.92	R <sup>2</sup> = 0.99 m = 0.93	R <sup>2</sup> = 0.99 m = 0.91	R <sup>2</sup> = 0.99 m = 0.88						
073 Male Right: a Left: a	x = -0.561 x <sup>2</sup> = 0.030 x <sup>3</sup> = 0.001	x = -0.428 x <sup>2</sup> = -0.012 x <sup>3</sup> = 0.004	x = -1.219 x <sup>2</sup> = 0.168 x <sup>3</sup> = -0.005	x = -0.222 x <sup>2</sup> = -0.084 x <sup>3</sup> = 0.011	x = -0.992 x <sup>2</sup> = 0.130 x <sup>3</sup> = -0.003	R <sup>2</sup> = 0.95 m = 0.87	R <sup>2</sup> = 0.95 m = 0.87	R <sup>2</sup> = 0.998 m = 0.45	R <sup>2</sup> = 0.99 m = 0.44						