

ONLINE SUPPLEMENTAL MATERIALS – TABLE S2

Table S2

State of the Evidence Pertaining to SLP Treatment for Individuals with PVFM: Descriptive and Quantitative Outcomes

Study design	Citation	Outcome type (quantitative/ descriptive)	Outcome measure	Pre tx data	Post tx results/ <i>follow-up</i> <i>results</i>	Effect size/ p-value
Randomized controlled trials	Nacci et al. (2011)	Quantitative	# of dyspnea episodes/month	Low frequency tx group (A): M= 9.6 High frequency tx group (B): M= 9.9	A: M= 7.2 B: M= 0.9	Within-group: A: $p < .01$ B: $p < .01$ Between-group: $p < .01$ (favoring B)
		Quantitative	Dyspnea ratings (based on 0-10 scale, 10=severe)	Low frequency tx group (A): M=9.2 High frequency tx group (B): M=9.3	A: M=M=6.2 B: M=M=2.5	Within-group: A: $p < .01$ B: $p < .01$ Between-group: $p < .01$ (favoring B)
	Vertigan et al. (2008)	(See full manuscript, Table 2)				
Single subject	Mathers-Schmidt & Brilla (2005)	(See full manuscript, Table 1)				
Pre-post designs	Murry et al. (2006)	Quantitative	FVC	39 - 129% predicted (M=89.5%)	44 – 127% predicted (M=95.3%) <i>88 – 124% predicted</i> <i>(M=101.2%) (N=9)</i>	NS
		Quantitative	FIV ₁ /FIVC	0.37 – 1.0 (M=0.89)	0.85 – 1.0 (M=0.97) <i>0.96 – 1.0 (M=0.99) (N=9)</i>	NS
		Quantitative	FIV _{.5} /FIVC	0.32 – 0.86 (M=0.62)	0.44 – 0.96 (M=0.81) <i>0.77 – 0.95 (M=0.88) (N=9)</i>	Within-group: $p \leq .001$ (improvement)
	Ryan et al. (2009)	Quantitative	FVC	Median= 99.6% predicted (IQR= 29.1)	Median= 93.1% predicted (IQR=15.0)	NS

		Quantitative	FEV ₁ (% predicted)	Median= 90.8 (SEM=19.3)	Median= 90.7 (SEM=18.3)	NS
		Quantitative	FIF ₅₀	Median=2.97 L (IQR = 1.72 L) Median= 78.3% predicted (IQR= 30.0%)	Median= 2.85 L (IQR=1.10 L) Median= 70.6% predicted (IQR= 24.4%)	NS
		Quantitative	FEV ₁ /FVC	Median= 0.82 (IQR= 0.08)	Median= 0.82 (IQR=0.011)	NS
		Quantitative	FENO	Median= 13.7 (IQR= 8.8)	Median=12.9 (IQR=7.6)	NS
		Descriptive	Laryngoscopy	10/10 participants observed to show adduction of VF	8/10 participants with resolved PVFM	$p = .039$
		Quantitative	Ratings of laryngeal dysfunction (using LDQ)	Median = 5 (IQR= 4)	Median=3.5 (IQR=4)	Within-group $p = .008$ (improvement)
Case series	Chiang et al. (2013)	Descriptive	Report of PVFM symptoms	64/64 participants demonstrated signs and symptoms of PVFM	48/64 participants demonstrated complete resolution of symptoms	NR, not calculable
	Christopher et al. (1983)	Descriptive	Report of PVFM symptoms	5/5 participants with "dramatic episodes of wheezing"	5/5 participants with reduction in number and severity of PVFM attacks	NR, not calculable
	Doshi & Weinberger (2006)	Descriptive	Report of PVFM symptoms	8/8 participants reported PVFM symptoms	7/8 participants reported being asymptomatic	NR, not calculable
	Maturo et al. (2011)	Descriptive	Report of PVFM symptoms and/or activity level	56/56 participants with symptoms at rest or during exercise	35/56 participants were asymptomatic and/or were able to return to activity. <i>These patients did not report any change in symptom or activity level at follow-up.</i>	NR, not calculable
		Descriptive	Report of PVFM symptoms and/or activity level	Initial speech therapy only group: 38/38 participants presented with PVFM symptoms.	Initial speech therapy only group: 24/38 participants were asymptomatic and/or were able to return to activity.	$p = .001$

			Initial PPI only group: 7/7 participants presented with PVFM symptoms at rest or during exercise.	Initial PPI only group: 0/7 participants were asymptomatic and/or were able to return to activity	
	Descriptive	Report of PVFM symptoms and/or activity level	Initial speech therapy only group: 38/38 participants presented with PVFM symptoms. Speech therapy + PPI group: 6 participants presented with PVFM symptoms	Initial speech therapy only group: 24/38 participants were asymptomatic and/or were able to return to activity. Speech therapy + PPI group: 5/6 participants were asymptomatic and/or were able to return to activity	$p = .65$
Murry et al. (2004)	Quantitative	FVC	2.36 -3.76 L (M=3.11 L); 83 – 105% predicted (M=92%)	2.33 – 3.81 L (M=3.18 L); 90 – 99% predicted (M=95%)	NS
	Quantitative	FIV ₅ /FIVC	0.32 – 0.7 (M=0.58)	0.89 – 0.99 (M=0.94)	Significant (p -value not reported)
Murry et al. (2010)	Descriptive	Laryngoscopy	16/16 participants showed PVFM during oral and/or nasal quiet breathing	12/16 participants showed PVFM resolution. 3/16 participants showed improved PVFM. 1/16 participants continued to show PVFM during quiet breathing	NR, not calculable
	Descriptive	Presence/absence of dyspnea	7/16 clients with dyspnea present	2/16 clients with dyspnea present	$p > .01$ NS
	Descriptive	Presence/absence of hoarseness	8/16 with complaints of hoarseness	1/16 with complaints of hoarseness	$p \leq .01$
Powell et al. (2007)	Descriptive	Report of PVFM symptoms	14/14 participants with audible inspiratory stridor and 13/14 with additional PVFM symptoms	14/14 participants achieved resolution or significant improvement of PVFM symptoms	NR, not calculable

	Rameau et al. (2012)	Descriptive	Report of PVFM symptoms	22/22 participants with PVFM symptoms either with or without exercise	<i>19/22 participants reported improvement in PVFM symptom frequency or severity</i>	NR, not calculable
	Sullivan et al. (2001)	Descriptive	Report of PVFM symptoms	20/20 participants reported PVFM symptoms during exercise	<i>19/20 participants reported the ability to control symptoms 13/20 reported no PVFM episodes 6/20 reported one to three uncontrolled PVFM episodes 1/20 reported continued frequent PVFM episodes</i>	NR, not calculable
	Towey et al. (2012)	Descriptive	Report of PVFM symptoms	7/7 participants reported PVFM symptoms	7/7 participants reported PVFM symptom resolution	NR, not calculable
Case studies	Altman et al. (2000)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	1/2: Symptoms resolved or improved 1/2: No improvement or decline in symptoms	NR, not calculable
	Archer et al. (2000)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable
	Bahrainwala et al. (2001)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
		Descriptive	Flow volume loops	Attenuation of the inspiratory flow volume loop and abrupt drop and rise of the expiratory flow volume loop	Normal flow volume loops	NR, not calculable
	Barnes et al. (1986)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable
	Bittleman et al. (1994)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
	Campaignha et	Descriptive	Report of PVFM	Symptoms of PVFM	Symptoms resolved or	NR, not calculable

al. (2012)		symptoms		improved	
Chawla et al. (1984)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable
Chiang et al. (2008)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Corren & Newman (1992)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Craig et al. (1992)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable
Earles et al. (2003)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Echternach et al. (2008)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Harbison et al. (2000)	Descriptive	Laryngoscopy	Vocal fold adduction while breathing	Normal vocal fold motion	NR, not calculable
	Quantitative	PIFR	36% predicted	79%	NR, not calculable
Hatzelis & Murry (2012)	Quantitative	Laryngoscopy	>50% VF adduction on inspiration	>50% VF adduction (at end of treatment) <50% VF adduction (at 1 and 3 mo. follow up)	NR, not calculable
	Quantitative	Dyspnea severity rating (based on 1-5 scale, 5=severe)	4.5	2 (at end of treatment) 1.5 (at 1 mo. follow up) 1 (at 3 mo. and 1 yr. follow up)	NR, not calculable
	Quantitative	FVC	4.82 L	4.89 L	NR, not calculable
	Quantitative	% predicted value	107	109	NR, not calculable
	Quantitative	FIV _{.5} /FIVC	.71	.74	NR, not calculable

	Quantitative	FEV ₁ /FVC	.79	.79	NR, not calculable
Hayes et al. (1993)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	3/3: No improvement or decline in symptoms	NR, not calculable
Kayani et al. (1998)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2: Symptoms resolved or improved	NR, not calculable
Kivity et al. (1986)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Koester & Amundson (2002)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Leo & Konakanchi (1999)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Marsh et al. (1994)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Maschka et al. (1997)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	1/2: No improvement or decline in symptoms 1/2: Symptoms resolved or improved	NR, not calculable
Mathers-Schmidt (2001)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	1/2: Symptoms resolved or improved 1/2: No improvement or decline in symptoms	NR, not calculable
Mobeireek et al. (1995)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2: Symptoms resolved or improved	NR, not calculable
Mullinax & Kuhn (1996)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Murry (1998)	Quantitative	Speaking F ₀ (range)	191 Hz (178-216 Hz)	201 Hz (188-242 Hz)	NR, not calculable
	Quantitative	Sustained /a/	9 seconds	16 seconds	NR, not calculable

Nacci et al. (2007)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	3/3: Symptoms resolved or improved	NR, not calculable
Niven et al. (1992)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	1/3: No improvement or decline in symptoms (Case 1) 2/3: Symptoms resolved or improved (Cases 2 & 3)	NR, not calculable
Pinho et al. (1997)	Descriptive	Laryngoscopy	Atypical movements of the arytenoid cartilages	Paradoxical arytenoid movement controlled	NR, not calculable
	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Reisner & Nelson (1997)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	4/4: Symptoms resolved or improved	NR, not calculable
Renz et al. (2000)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2: Symptoms resolved or improved	NR, not calculable
Rhodes (2008)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Rogers & Stell (1978)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2 Symptoms resolved or improved	NR, not calculable
Ruddy et al. (2004)	Quantitative	Dyspnea ratings (based on 0-5 scale, 5=severe)	5	1.5	NR, not calculable
	Quantitative	Maximum inspiratory pressure	73 cm H ₂ O	166 cm H ₂ O	NR, not calculable
	Quantitative	Maximum duration of rowing activity	0 minutes	18 minutes	NR, not calculable
Rusakow et al. (1991)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Sandage & Zelanzny (2004)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable

Sette et al. (1993)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Shao et al. (1995)	Descriptive	Pulmonary function test	Reduced inspiratory flow rate	Normal flow volume curve	NR, not calculable
	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Sharma & Singh (2007)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Skinner & Bradley (1989)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Smith et al. (1993)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Suri et al. (2002)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable
Suttithawil et al. (2006)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Tajchman & Gitterman (1996)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Tan et al. (1997)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Tilles (2010)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Von Berg et al. (1999)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2: Symptoms resolved or improved	NR, not calculable
Walaschek et al. (2010)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	Symptoms resolved or improved	NR, not calculable
Warnes & Allen (2005)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	No improvement or decline in symptoms	NR, not calculable

Weir (2002)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	2/2: Symptoms resolved or improved	NR, not calculable
Wilson et al. (2009)	Descriptive	Report of PVFM symptoms	Symptoms of PVFM	1/2: Symptoms resolved or improved 1/2: No improvement or decline in symptoms	NR, not calculable

Note. cm H₂O= centimeters water; FENO = fractional expired nitric oxide; FEV₁= forced expiratory volume in 1 second; FIF₅₀= forced inspiratory flow at 50% of the vital capacity; FIV.5 (FIV₁)= forced inspiratory vital capacity in the first .5 second (1 second); FIVC= forced total inspiratory vital capacity; F_o= fundamental frequency; FVC= forced vital capacity; Hz= hertz; IQR= interquartile range; L= liters; M= mean; NR= not reported; NS= not significant; PIFR= peak inspiratory flow rate; PPI= proton pump inhibitor; PVFM= paradoxical vocal fold movement; SEM= standard error of measurement; tx= treatment; VF= vocal folds.