

Table 2. Study Characteristics – Stem- en spraakfunctiebehoud via prehabilitatie en revalidatie

First author (year), country	Cancer diagnosis and treatment	Number of subjects - Intervention (I)/Control group (C)	Population characteristics	Intervention (timing, content & frequency)	Control (timing, content & frequency)	Outcome (timing & effect) measures
Tuomi 2014*, Sweden	Laryngeal carcinoma – (chemo)radiotherapy	33/36	<u>Male/Female:</u> I: 33/0 C: 36/0 <u>Mean age (SD):</u> I: 66.0 (12.7) C: 64.0 (9.9) <u>Primary tumor location:</u> Glottic: I: 27/33 C: 27/36 Supraglottic: I: 6/33 C: 7/36	<u>Timing:</u> 1 month after the completion of cancer treatment. <u>Content:</u> A combination of direct and indirect therapy approaches including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of pitch, general relaxation, and vocal hygiene. <u>Frequency:</u> The sessions took place 2 times/week during the first 2 weeks, once a week during weeks 3-6, and once every second week during the last 2 weeks: a total of 10 sessions. After each session the patients were encouraged to exercise at home with focus on the techniques taught.	The control group did not receive any voice rehabilitation but were given vocal hygiene advice.	1 and 6 months after the completion of cancer treatment: <u>Voice function:</u> <i>Audio-perceptual analysis:</i> -Hoarseness -Adequate loudness -Patient self-ratings of voice function/acceptability: Questions on a 100-mm visual analogue scale <i>Acoustical analysis:</i> -HNR -Jitter -Shimmer -F0

			Subglottic: I: 0/33 C: 2/36 <u>Primary tumor size:</u> Tis: I: 0/33 C: 2/36 T1: I: 23/33 C: 19/36 T2: I: 8/33 C: 10/36 T3: I: 1/33 C: 5/36 T4:			<i>Aerodynamic analysis:</i> -MPT <u>Speech function:</u> <i>Speech/communication-specific questionnaire:</i> -S-SECEL environment domain
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			I: 1/33 C: 0/36 <u>Cancer stage grouping:</u> Stage 0: I: 0/33 C: 2/36 Stage I: I: 23/33 C: 19/36 Stage II: I: 8/33 C: 10/36 Stage III: I: 1/33 C: 5/36 Stage IV:			
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			I: 1/33 C: 0/36 <u>Cancer treatment:</u> Conventional radiotherapy: I: 24/33 C: 26/36 Hyperfractionated radiotherapy: I: 9/33 C: 10/36 Induction chemotherapy: I: 2/33 C: 1/36			
Karlsson 2015*, Sweden	Laryngeal carcinoma – radiotherapy	37/37	<u>Male/Female:</u> I: 33/4 C: 33/4 <u>Mean age (SD):</u> I: 65.0 (12.4)	<u>Timing:</u> 1 month after the completion of cancer treatment. <u>Content:</u> A combination of direct and indirect therapy approaches	The control group did not receive any voice rehabilitation but were given vocal hygiene advice.	1 and 6 months after the completion of cancer treatment: <u>Voice function:</u> -

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			C: 62.6 (9.7) <u>Primary tumor location:</u> Glottic: I: 31/37 C: 27/37 Supraglottic: I: 6/37 C: 9/37 Subglottic: I: 0/37 C: 1/37 Transglottic: I: 0/37 C: 0/37 <u>Primary tumor size:</u> Tis:	including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of pitch, general relaxation, and vocal hygiene. The same protocol as in the study by Tuomi (2014). <u>Frequency:</u> The sessions took place 2 times/week during the first 2 weeks, once a week during weeks 3-6, and once every second week during the last 2 weeks: a total of 10 sessions. After each session the patients were encouraged to exercise at home with a focus on the techniques taught.		<u>Speech function:</u> <i>Speech/communication-specific questionnaire:</i> -S-SECEL domains: General, Environmental, Attitudinal, Total score <u>HRQOL:</u> <i>HRQOL questionnaire:</i> -EORTC QLQ-C30 Functional domains: Role, Social, Global QOL -EORTC QLQ-C30 Single items: Financial difficulties -EORTC QLQ-H & N35 Symptom scales: Speech, Social contact
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			I: - C: - T1: I: - C: - T2: I: - C: - T3: I: - C: - T4: I: - C: - <u>Cancer stage grouping:</u> Stage 0:			
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			I: 0/37 C: 1/37 Stage I: I: 25/37 C: 19/37 Stage II: I: 10/37 C: 12/37 Stage III: I: 1/37 C: 5/37 Stage IV: I: 1/37 C: 0/37 <u>Cancer treatment:</u> Conventional radiotherapy: I: 27/37			
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			C: 25/37 Hyperfractionated radiotherapy: I: 10/37 C: 12/37 Induction chemotherapy: I: 0/37 C: 0/37			
Bergstrom 2016*, Sweden	Laryngeal carcinoma – radiotherapy	30/31	<u>Male/Female:</u> I: 26/4 C: 27/4 <u>Mean age (SD):</u> I: 65 (?) C: 62 (?) <u>Primary tumor location:</u> Glottic: I: 24/30	<u>Timing:</u> Between 1 and 6 months after the completion of cancer treatment. <u>Content:</u> A combination of direct and indirect therapy approaches including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of pitch, general relaxation, and vocal hygiene. The same protocol as in the study by Tuomi (2014).	The control group did not receive any voice rehabilitation but received general voice education, such as vocal hygiene advice.	1, 6, and 12 months after the completion of cancer treatment: <u>Voice function:</u> <u>Audio-perceptual analysis:</u> -GBRAS Likert scale

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			C: 24/31 Supraglottic: I: 6/30 C: 7/31 Subglottic: I: 0/30 C: 0/31 <u>Primary tumor size:</u> Tis: I: 0/30 C: 2/31 T1: I: 21/30 C: 14/31 T2: I: 7/30 C: 7/31	<u>Frequency:</u> Ten sessions took place over the period of 10 weeks using a structured hierarchy consisting of both direct and indirect therapy approaches.		
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			T3: I: 1/30 C: 5/31 T4: I: 1/30 C: 0/31 <u>Cancer stage grouping:</u> Not reported <u>Cancer treatment:</u> Conventional radiotherapy: I: 23/30 C: 21/31 Hyperfractionated radiotherapy: I: 7/30 C: 10/31			
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			Induction chemotherapy: I: 37/30 C: 0/31			
Bergstrom 2017*, Sweden	Laryngeal carcinoma – radiotherapy	31/32	<u>Male/Female:</u> I: 27/4 C: 28/4 <u>Mean age (SD):</u> I: 65.8 (?) C: 62.1 (?) <u>Primary tumor location:</u> Glottic: I: 25/31 C: 24/32 Supraglottic: I: 6/31 C: 8/32 Subglottic:	<u>Timing:</u> Between 1 and 6 months after the completion of cancer treatment. <u>Content:</u> A combination of direct and indirect therapy approaches including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of pitch, general relaxation, and vocal hygiene. The same protocol as in the study by Tuomi (2014). <u>Frequency:</u> Ten sessions took place over the period of 10 weeks using a structured hierarchy consisting of both direct and indirect therapy approaches.	The control group did not receive any voice rehabilitation but received general voice education, such as vocal hygiene advice.	1, 6, and 12 months after the completion of cancer treatment: <u>Voice function:</u> <i>Audio-perceptual analysis:</i> -Patient self-ratings of voice function/acceptability: Likert scale (0-3) <u>Mental health:</u> <i>Affective symptom questionnaire:</i> -HADS

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			I: 0/31 C: 0/32 <u>Primary tumor size:</u> Tis: I: 0/31 C: 1/32 T1: I: 21/31 C: 16/32 T2: I: 8/31 C: 10/32 T3: I: 1/31 C: 5/32 T4: I: 1/31			
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			C: 0/32 <u>Cancer stage grouping:</u> Not reported <u>Cancer treatment:</u> Conventional radiotherapy: I: 19/31 C: 23/32 Hyperfractionated radiotherapy: I: 12/31 C: 9/32 Induction chemotherapy: I: 0/31 C: 0/32			
Millgard 2018*, Sweden	Laryngeal carcinoma – radiotherapy	37/37	<u>Male/Female:</u> I: 33/4 C: 33/4	<u>Timing:</u> Between 1 and 6 months after the completion of cancer treatment.	The control group did not receive any voice rehabilitation but received general voice education, such as vocal hygiene advice.	1, 6, 12, and 24 months after the completion of cancer treatment:

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			<u>Mean age (SD):</u> I: 65.2 (12.3) C: 62.9 (10.0) <u>Primary tumor location:</u> Glottic: I: 31/37 C: 29/37 Supraglottic: I: 6/37 C: 7/37 Subglottic: I: 0/37 C: 1/37 <u>Primary tumor size:</u> Not reported	<u>Content:</u> A combination of direct and indirect therapy approaches including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of pitch, general relaxation, and vocal hygiene. The same protocol as in the study by Tuomi (2014). <u>Frequency:</u> Ten sessions took place over the period of 10 weeks using a structured hierarchy consisting of both direct and indirect therapy approaches. After each session the patients were encouraged to exercise at home with a focus on the techniques taught.	Voice function: <i>Audio-perceptual analysis:</i> -GBRAS Likert scale Acoustical analysis: -CPPS
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			<u>Cancer stage grouping:</u> Stage 0: I: 0/37 C: 2/37 Stage I: I: 25/37 C: 19/37 Stage II: I: 10/37 C: 11/37 Stage III: I: 1/37 C: 5/37 Stage IV: I: 1/37 C: 0/37			
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			<u>Cancer treatment:</u> Conventional radiotherapy: I: 27/37 C: 26/37 Hyperfractionated radiotherapy: I: 10/37 C: 11/37 Induction chemotherapy: I: 0/37 C: 0/37			
Karlsson 2021, Sweden	Laryngeal carcinoma – radiotherapy	<u>Baseline:</u> 37/37 → see Karlsson 2015 for patient characteristics <u>At 36 months follow-up:</u> 15/22	<u>Male/Female:</u> I: 2/13 C: 4/18 <u>Mean age (SD):</u> I: 64.6 (13.5) C: 61.5 (9.8)	<u>Timing:</u> Between 1 and 6 months after the completion of cancer treatment. <u>Content:</u> A combination of direct and indirect therapy approaches including, but not limited to, diaphragmatic breathing, coordination of breathing and phonation, control and variation of	The control group did not receive any voice rehabilitation but received general voice education, such as vocal hygiene advice.	1, 12, and 36 months after the completion of cancer treatment: <u>Voice function:</u> <i>Audio-perceptual analysis:</i> -GBRAS Likert scale <u>Acoustical analysis:</u>

			<u>Primary tumor location:</u> Glottic: I: 13/15 C: 17/22 Supraglottic: I: 2/15 C: 5/22 Subglottic: I: 0/15 C: 0/22 <u>Primary tumor size:</u> Tis: I: 0/15 C: 1/22 T1: I: 11/15 C: 10/22	pitch, general relaxation, and vocal hygiene. The same protocol as in the study by Tuomi (2014). <u>Frequency:</u> Ten sessions took place over the period of 10 weeks using a structured hierarchy consisting of both direct and indirect therapy approaches.		-HNR -Jitter -Shimmer <i>Aerodynamic analysis:</i> -MPT <u>Speech function:</u> <i>Speech/communication-specific questionnaire:</i> -S-SECEL domains: General, Environmental, Attitudinal, Total score
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			T2: I: 3/15 C: 10/22 T3: I: 1/15 C: 1/22 T4: I: 0/15 C: 0/22 <u>Cancer stage grouping:</u> Stage 0: I: 0/15 C: 1/22 Stage I: I: 11/15 C: 10/22			
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			Stage II: I: 3/15 C: 10/22 Stage III: I: 1/15 C: 1/22 Stage IV: I: 0/15 C: 0/22 <u>Cancer treatment:</u> Conventional radiotherapy: I: 11/15 C: 12/22 Hyperfractionated radiotherapy: I: 4/15 C: 10/22			
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			Induction chemotherapy: I: 0/15 C: 0/22			
Eriksson 2021, Sweden	Head & neck cancer – (chemo)radiotherapy	24/26	<u>Male/Female:</u> I: 16/8 C: 20/6 <u>Mean age (SD):</u> I: 63.6 (9.0) C: 63.4 (7.0) <u>Primary tumor location:</u> Tonsil: I: 10/24 C: 10/26 Base of the tongue: I: 8/24 C: 11/26	<u>Timing:</u> At least 6 months after the completion of cancer treatment. All subjects received gold standard dysphagia treatment before randomization. After randomization the Shaker exercise. <u>Content:</u> -Gold standard dysphagia treatment before randomization consisting of personalized advice on consistency of food or liquids and on body and head positioning during swallowing. In some subjects also advice on swallowing particular maneuvers. -Shaker exercise consists of head-lifts from supine position. <u>Frequency:</u> Shaker exercise: 60 seconds of sustained head-lifts (isometric)	<u>Timing:</u> At least 6 months after the completion of cancer treatment. All subjects received gold standard dysphagia treatment before randomization. <u>Content:</u> -Gold standard dysphagia treatment before randomization consisting of personalized advice on consistency of food or liquids and on body and head positioning during swallowing. In some subjects also advice on swallowing particular maneuvers.	6 and 8 months after the completion of cancer treatment: <u>Voice function:</u> <i>Voice-specific questionnaire:</i> -VHI <i>Audio-perceptual analysis:</i> -GBRAS <u>Speech function:</u> -

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			Larynx: I: 5/24 C: 2/26 Hypopharynx: I: 1/24 C: 3/24 <u>Primary tumor size:</u> Tis: I: - C: - T1: I: - C: - T2: I: - C: - T3:	repeated three times with 1 minute rest in between, followed by 30 consecutive repetitions of head-lifts (isokinetic). The program was to be performed three times daily for 8 weeks.		
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			I: - C: - T4: I: - C: - <u>Cancer stage grouping:</u> Stage 0: I: - C: - Stage I+II: I: 4/24 C: 4/26 Stage III+IV: I: 20/24 C: 22/26			
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			<u>Cancer treatment:</u> Conventional radiotherapy: I: 22/24 C: 23/26 Hyperfractionated radiotherapy: I: 2/24 C: 3/26 Brachytherapy after radiotherapy: 17/50 I: unclear C: unclear Induction chemotherapy: 9/50 I: unclear C: unclear			
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			Concomitant chemotherapy: 32/50 I: unclear C: unclear			
<i>HNR, harmonics to noise ratio; F0, fundamental frequency; MPT, maximum phonation time; S-SECEL, the Swedish version of the Self-Evaluation of Communication Experiences after Laryngeal cancer; HRQOL, health-related quality of life; EORTC QLQ-C30, The European Organisation for Research and Treatment of Cancer Quality-of-Life Questionnaire Core-30; QOL, quality of life; EORTC QLQ-H&N35, The European Organisation for Research and Treatment of Cancer quality of life Questionnaire Head and Neck 35; HADS, Hospital Anxiety and Depression Scale; GRBAS, the grade, roughness, breathiness, asthenia, and strain scale; CPPS, Smoothed cepstral peak prominence; VHI, voice handicap index.</i> <i>*Included from the systematic review of Taito (2019)</i>						