Biofeedback to improve the safety and efficiency of swallow function in people with Parkinson's Disease and dysphagia: A systematic review.

I.Battel[1]; I.Calvo.; M. Walshe[1]. [1]Department of Clinical Speech and Language Studies, Trinity College Dublin, Dublin, Ireland; [2]Department of Neurorehabilitation Sciences-Casa Cura Policlinico Milano-italy

batteli@tcd.ie

Background

Biofeedback as a rehabilitation technique is one approach that shows some promise clinically in people with dysphagia and PD. It is well recognised that the neural impairments in PD are manifested as reduced ability to plan motor acts based on internal cues and these could result in freezing and a coordination deficit during swallowing. In particular, sensory–perceptual deficits both prior to movement planning and during movement execution are important factors contributing to the impairments of motor coordination and movements execution. The effect of external feedback has already been demonstrated in physiotherapy and voice rehabiliation, suggesting that people with PD benefit from visual information more than other patient groups because visual feedback helps integrate different movement components by increasing the sensory motor information.

Aims

To conduct a systematic review on the efficacy and effectiveness of biofeedback treatment to improve swallowing function in adults with PD.
A secondary objective was to evaluate its safety and identify adverse effects associated with this intervention k in adults with PD.

Methods

A systematic review was planned and the protocol was published on PROSPERO 2017. All published and unpublished RCTs and non RCTs with no language restrictions were sought. Twelve databases (EMBASE, PubMed, CINAHL, Web of Science, Scopus, Science Direct, AMED, The Cochrane Database of Systematic Reviews, ProQuest Dissertations and Theses A & I, Google Scholar) were searched from inception to May 2017. Screening of titles was conducted using Covidence (www.covidence.org) by two review authors independently examined the data. Methodological quality of the included studies was assessed using Downs and Black checklist and Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) tool.

Fig. 1: PRISMA Diagram

Results

Four studies with a total of 62 participants were included. Overall, methodological quality of the included studies was poor. Data was analysed descriptively. Despite the heterogeneity of the studies on type of biofeedback used, study design, outcome measures, and small sample sizes, visual biofeedbacks have positive effects on improving quality of life. Two types of visual swallowing biofeedback were selected: video-assisted swallowing therapy using fiberendosopic and signal with surface elecctro-miography (sEMG)
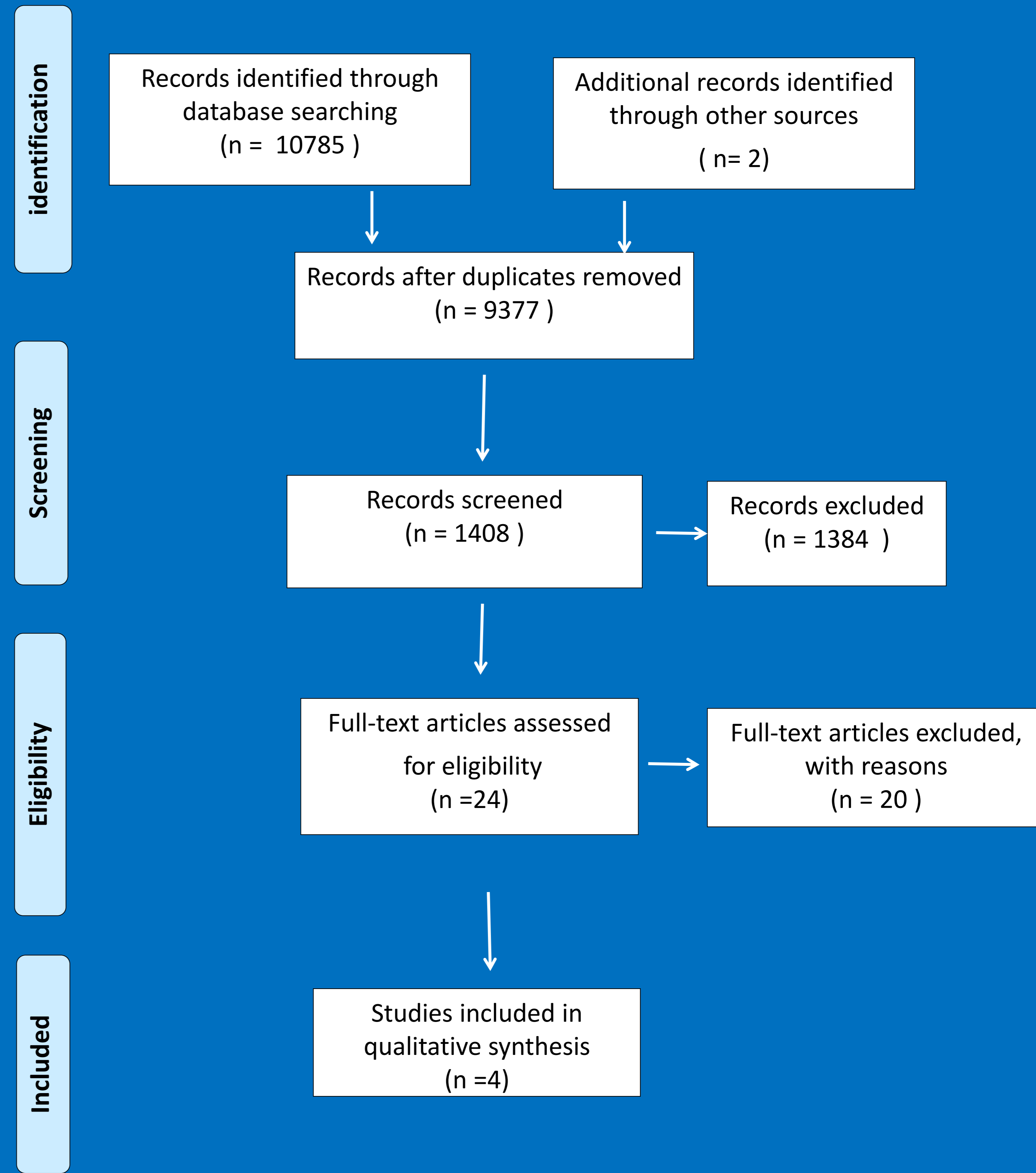
Discussion and Conclusion:

This systematic review evaluated the efficacy, effectiveness and safety of biofeedback for the recovery of swallowing functions in PD persons. There was considerable heterogeneity within the included studies in terms of type of biofeedback, study design, outcome measures used with limitations of small sample sizes and no serious investigation of the long term effects of the interventions trialled. However, it is suggested that visual biofeedback cues are likely to be beneficial in swallowing rehabilitation treatment in PD with specific impact on improved quality of life for people with PD. In addition, patients at II° and III° stages of H&Y scale seem to benefit from a swallowing treatment using biofeedback

Table 1: Summey of the selceted studies

Primary Author	Study Design	Objective	Study Duration	Participants	Disease Duration	Medication	Severity	Outcome measures	Comparator Group	Intervention Group	Swallowing Tasks	Methodological Quality	Outcome
Alves da Silva et al. 2014	Case control study	Primary	15 therapy sessions, 3 times per week, 3 therapy session (1 per week)	6 (Males 73.1±6.2 yrs)	NA	NA	H&Y 2.3	FOIS DOSS (using VFSS) SWAL-QOL post-treatment; 3 months 6 months	Oral facial, respiratory and voice exercises. Mendelsohn maneuver, effortful swallow	Biofeedback Swallowing using sEMG	Oral facial, respiratory and voice exercises. Mendelsohn maneuver, Effortful swallow	ROBINS: Severe Down and Black: 14/18 (Moderate quality)	Difference pre vs post treatment: DOSS (p<0.01) SWAL-QOL (p<0.01). Significant differences between groups, SWAL-QOL (p=0.04).
Athukorala et al. 2014	Within Subject Study	Primary	10 therapy sessions over a 2-week period.	10 (3 females, 7 males; 67.4±8.6 yrs)	6.6±4	On Phase (Carbidopa/ levodopa)	H&Y 2.7±0.4	TWST and TOMASS	----	Biofeedback Swallowing Skill Training (BiSSKiT)	Saliva swallows	ROBINS: Moderate Down and Black:12/18 (Good quality)	TWST (p=.034) TOMASS (p<.001). SWAL-QOL (P=.018)
Felix et al. 2008	Case series	Primary	14 therapy sessions for 2 week period	4 (1 females, 3 male, 70.25 yrs)	9.25	On phase (Levodopa and Benserazide)	H&Y 3	Clinical swallowing assessment	Conventional Therapy	Biofeedback using an air balloon placed it in the anterior part of neck which was connected to a digital manometer	Effortful swallows	ROBINS: Critical Down and Black:4/18 (Poor quality)	A significant increase in pressure was observed for both the swallowing of saliva and the biscuit at the end of the rehabilitation program (p < 0.001).
Manor et al. 2013	RCT	Primary	5 therapy sessions over a 2-week period	42 (18 females 24 males; 67.66±8.26 yrs)	7.43±4.66	NA	H&Y 2.21 ± 0.79	FEES; SWAL-QOL; SWA-CARE; POE	No treatment	Biofeedback Swallowing treatment using videos of FEES examination	. Swallowing using compensatory manoeuvres	ROBINS: Low Down and Black:17/18 (Good quality)	Differences among group: reduced food residues at FEES (p<0.05) SWAL-QOL (p<0.01). POE (p<0.005)

References

Miller N. Swallowing in Parkinson's disease: clinical issues and management. Neurodegener Dis Manag 2017;7(3):205–17.
Van Hooren MRA, Baijens LWJ, Voskuilen S, Oosterloo M, Kremer B. Treatment effects for dysphagia in Parkinson's disease: A systematic review. Park Relat Disord 2014;20(8):800–7
Rocha PA, Ferraz HB, Trevisani VFM. Effects of external cues on gait parameters of Parkinson's disease patients: A systematic review. Clin Neurol Neurosurg 2014;124:127–34.
Athukorala RP, Jones RD, Sella O, Huckabee M. Skill Training for Swallowing Rehabilitation in Patients With Parkinson ' s Disease. Arch Phys Med Rehabil 2014;95(7):1374–82.
Alves Da Silva. Biofeedback electromiografico come coadjuvante no tratamento das disfagias orofaringeas em idosos com doença de Parkinson [tese]. Barau: Faculdade de Odontologia de Barau, Universidade de San Paulo; 2014. 2014.
Felix VN, Corrêa SMA, Soares RJ. A therapeutic maneuver for oropharyngeal dysphagia in patients with Parkinson's disease. Clinics 2008 ;63(5):661–6.
Manor Y, Mootanah R, Freud D, Giladi N, Cohen JT. Video-assisted swallowing therapy for patients with Parkinson's disease. Parkinsonism Relat Disord 2013;19(2):207–11.