2324Edu1003 Game-based swallowing rehabilitation for older adults and adults with swallowing disorders			
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Effectiveness of game-based oromotor exercises on laryngeal elevation in healthy adults

Introduction

- Reduced laryngeal elevation is one of the key characteristics of dysphagia, which may impact on swallowing safety and increase the risk of aspiration pneumonia (Murry et al., 2020).
- Shared anatomy and physiology between laryngeal elevation in pitch variation and swallowing may suggest the treatment potential of pitch elevation or pitch gliding on swallowing outcomes (Kim, 2010; Malandraki et al., 2011; Miloro, 2014).
- In addition, game-based exercises may potentially increase the willingness to engage in home training, thereby enhancing treatment outcomes (Li et al., 2016; Park et al., 2019).
- However, there is limited evidence on the effectiveness of game-based pitch glide exercises in improving swallowing function. Hence, further investigation is suggested.

Objectives

1. To examine the effectiveness between game-based and traditional oromotor exercise on improving the laryngeal elevation function in adults.
2. To investigate the adherence between game-based and traditional oromotor exercise in adults in conducting home training.

Assuming intact laryngeal function in the healthy participants and the fixed training dosage for both groups, it is hypothesized that no significant difference could be found on the effectiveness of game-based training on laryngeal elevation, and a significantly higher adherence would be obtained for the game-based training group.

Methods

Participants

- Twenty-six healthy adults were recruited, of which 14 were females and 12 were males.
- Participants were randomly assigned to the game-based training group (n=13) and the traditional training group (n=13) using block randomization.

Oromotor exercises

- Participants in both the game-based and traditional group were introduced to a 7-day home training on pitch glide (day 1 to day 7) with a suggested total dosage of 175 pitch glide sets.
- The game-based group were given an iPad with a pitch glide game installed for conducting home training. The number of training sets completed was recorded by the iPad app for tracking of adherence.
- The traditional group was instructed to conduct the pitch glide exercise without the game. They were given a charting form to manually record the number of training sets they completed during the home training period.
- A practice round of 25 pitch glide sets was implemented in both groups to ensure the participants were familiar with the home training procedures.

Outcome measurements

- Baseline assessment was conducted on day 1, with post-training assessment completed within two days after the last training day (day 7) to evaluate the training effect.
- In the assessments, 10 pitch glide trials were conducted, and the pitch range of each trial was recorded and converted to the number of semitones for easier analysis.
- A post-training questionnaire was administrated in the post-training assessment to explore their home training experiences. This included their motivation, willingness to continue for long-term training, level of physical effort, level of pain or discomfort, and overall enjoyment. 1 was the minimum rating and 10 was the maximum rating.

References

Kim, S. J. (2010). Music therapy protocol development to enhance swallowing training for stroke patients with dysphagia. *The Journal of Music Therapy, 47*(2), 102–119. https://doi.org/10.1093/jmt/47.2.102

Li, C. M., Wang, T. G., Lee, H. Y., Wang, H. P., Hsieh, S. H., Chou, M., & Jason Chen, J. J. (2016). Swallowing training combined with game-based biofeedback in poststroke dysphagia. *PM & R: the journal of injury, function, and rehabilitation, 8*(8), 773–779. https://doi.org/10.1016/j.pmrj.2016.01.003

Malandraki, G. A., Hind, J. A., Gangnon, R., Logemann, J. A., & Robbins, J. (2011). The utility of pitch elevation in the evaluation of oropharyngeal dysphagia: Preliminary findings. *American Journal of Speech-Language Pathology, 20*(4), 262–268. https://doi.org/10.1044/1058-0360(2011/10-0097)

Miloro, K. V., Pearson, W. G., Jr, & Langmore, S. E. (2014). Effortful pitch glide: a potential new exercise evaluated by dynamic MRI. *Journal of speech, language, and hearing research: JSLHR, 57*(4), 1243–1250. https://doi.org/10.1044/2014_JSLHR-S-13-0168

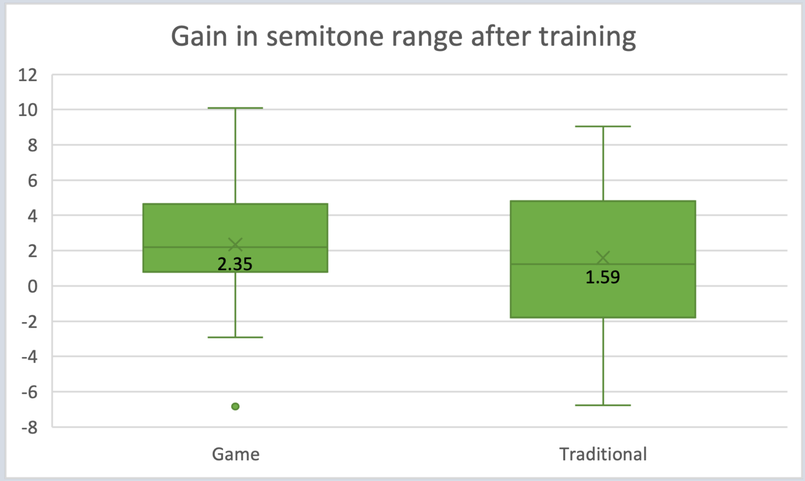
Murry, T., Carrau, R. L., & Chan, K. M. K. (2020). *Clinical management of swallowing disorders* (Fifth edition.). Plural.

Park, J., Lee, G., & Jung, Y. (2019). Effects of game-based chin tuck against resistance exercise vs head-lift exercise in patients with dysphagia after stroke: An assessor-blind, randomized controlled trial. *Journal of Rehabilitation Medicine, 51*(10), 749–754. https://doi.org/10.2340/16501977-2603

Results

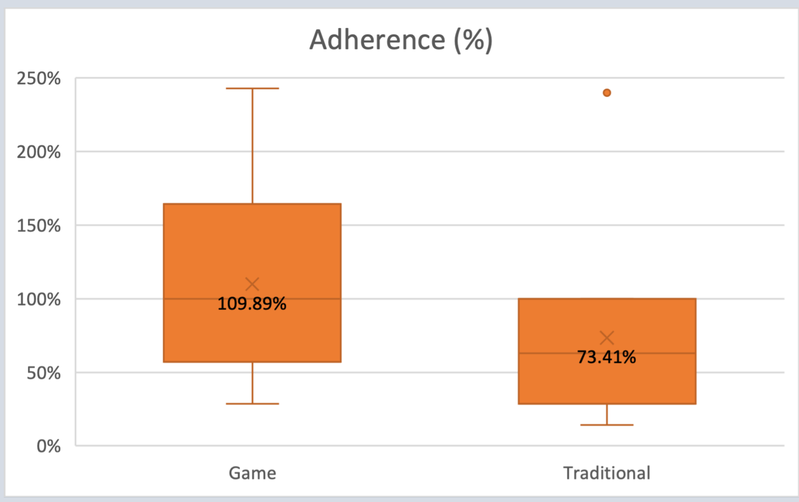
Effects on semitone range

- Only 25 participants were included in the analysis of changes in semitone range, as one participant completed the training phase but was absent in the post-training assessment.
- Independent samples t-test suggested that the gain in semitone range in the game-based group was not significantly higher than the traditional group [t (23) = 0.44, p = .33].



Effects on adherence

- Independent samples t-test suggested that the percentage adherence in the game-based group was not significantly higher than the traditional group [t (24) = 1.49, p = .07].



Results from the questionnaires

- Significant difference was found in 4 of the questions. The game-based group demonstrated a significantly higher motivation, willingness in long-term training, as well as overall enjoyment, and a significantly lower level of pain or discomfort feeling after the exercises.

	Motivation	Willingness in LT training	Level of physical effort	Pain or discomfort	Overall enjoyment
Game	M = 7.54, SD = 2.47	M = 7.15, SD = 2.85	M = 2.92, SD = 2.78	M = 1.23, SD = 0.60	M = 7.15, SD = 1.57
Traditional	M = 5.69, SD = 2.53	M = 4.38, SD = 2.53	M – 3.92, SD = 3.04	M = 2.31, SD = 2.06	M – 4.62, SD = 2.36
	t (24) = 1.88, **p = .04**	t (24) = 2.62, **p = .01**	t (24) = -0.87, p = .20	t (24) = -1.81, **p = .04**	t (24) = 3.22, **p = .002**

Discussions

- No significant difference was found between the two groups in terms of effectiveness and adherence, which was partially consistent to the hypothesis.
- However, notable differences were observed in self-perceived ratings, particularly in training motivation, willingness to continue training and overall enjoyment, which could be attributed to the engaging and goal-oriented nature of the game.
- Limitations for this study include the small sample size with age variations between the two groups, and the differences in the quality of exercise implemented due to the lack of monitoring in the traditional group. The effects of varying health conditions in the assessments could also affect the reliability of the pitch outcomes.

Conclusion

- Overall, no significant effect was found for the effectiveness and adherence of game-based exercise as compared to the traditional group.
- Provided the positive self-perceived outcomes, further investigation could be done on the group of participants with dysphagia to further examine the treatment effects of game-based oromotor home training in terms of effectiveness and adherence.