Ekoloji 28(108):487-491 (2019)

LETTER TO THE EDITOR

Method of Note Cognition of Disabled Children Based on Ecological Cognitive Neuroscience

Changyu Pan*
College of Art Education, Jilin University of Art, Changchun 130021, China
*Email: panchangyu1@126.com

The new approach of cognitive science and environmental science is used to uncover the brain mechanisms of human cognitive activity. The traditional method of the note recognition training performs training through detailed notation, which mainly trains visual memory, but does not train listening and language ability, and the accuracy is poor. In response to the problems, the interactive musical cognitive neural training method based on cognitive environmental science is proposed. The software Sound and Heyond's test of musical cognition, the melody contour, is used to train disabled children after hearing intervention. Finally, it is concluded that the use of cognitive environmental science can effectively enhance the ability of note recognition in the training of children with disabilities.

I Introduction

Irina E. Sokolovskaya, Aleksandr V. Grinenko, Dmitriy V. Miroshkin, Alexey G. Udodov, Eleonora V. Egorova, Ekaterina V. Diatlova. Buslaev published "The Eco-Psychological Approach in the Psychological Follow-Up Program for Children with Limited Abilities" on Issue 107, Pages: 659-664, Article No: e107083, Year: 2019, in the article. This article describes the process of psychological and pedagogical follow-up of participants in an inclusive educational environment from the standpoint of the eco-psychological approach. The emphasis is placed on building a special type of interaction with students, directed to ensuring their subjective position in the educational space, taking account of the peculiarities of the environment. The following support strategies have been proposed: developing and formative ones. The developing follow-up strategy is focused on creating conditions that stimulate the child's attitude with self-analysis towards difficulties (Dekhtyar et al. 2016). The formative strategy includes the development and implementation of programs for the formation of social skills and skills of constructive behavior in difficult situations.

II Methods

The base frequency of the musical recognition neural training software Sound and Heyond is A5 (880 Hz). There are four levels of it. The lower the level is, the greater the difference of frequency between notes is, and the greater the difficulty of the corresponding resolution is. All disabled children are given 5 days of training and 30 minutes of training time for 4 weeks. Each training is divided into 25 sequence melody and randomly selected. If the pair is selected, the new melody is played. If you choose the wrong one, the correct answer and the audible feedback will be displayed, and the user can perform repeated comparison exercises (Vielsmeier et al. 2015, Tao et al.

2017). The difficulty of the next training will be adjusted according to the results of training (Adelman et al. 2015). The software test will be carried out immediately after the training and will be retested after 3 months.
The test is performed using Vi rtual 320 audiometer with the rise of 5 and fall of 10, masked with white noise. At the beginning of the test, the experiment should be informed how to respond correctly to the test, and repeat the demonstration and training several times until the test method is understood and the test is started.
The examiner has knowledge of the application of anatomy, physiology and audiology in the ear, and can identify problems in the examination (Duvedi et al. 2015). In the room with an ambient noise of less than 50 dB, talk to them at different distances (1, 2, 3, and 4 m) to understand the effects of low and high frequency hearing loss on language comprehension.
All children with disabilities tested are regularly assessed their speech hearing and language skills (0 months, 3 months, 6 months, 9 months, and 12 months) (Mcnulty et al. 2015). For ease of presentation, note recognition training time starts from the first wearing of the hearing aid or the cochlear implant (Tunc et al. 2019). The evaluators are trained in uniform. The Hearing and Language Proficiency Assessment Standards and Methods for Hearing Impaired Children, CAP and SIR questionnaires are scored by the evaluator based on the condition of the disabled children. The IT-MAIS, MUSS and Little EARS questionnaires provide details for parents and trainers to view information about them, but it has personal feelings, so the evaluator scores based on the parent's narrative (Maccà et al. 2015) .

III Results

The note recognition correct rate before training is 23.71±9.45%, and the note recognition correct rate after training is 39.41±9.94%. The difference is statistically significant (t=4.5672, P=0.0002). The differences between the pre-training and post-training data are statistically significant (P<0.01).
The data are compared before training and 3 months after training, and the difference is statistically significant (P<0.01).
There is no statistically significant difference between the data after training and 3 months after training (P>0.05). The data are shown in Table 1.

Table 1. Comparison of correct rate of melody contours in 30 children with disabilities

Project	Correct rate before training (%)	Correct rate after training (%)	Correct rate of three months after training (%)
Environmental sound	59.46±12.45	77.9±13.78	74.12±17.44
Vowel recognition	44.58±11.68	56.14±14.31	52.44±13.57
Consonant recognition	42.78±8.94	54.17±17.85	52.44±19.45
Tone Recognition	44.22±18.41	59.45±20.46	58.26±24.44
Musical notes	13.19±3.22	35.41±9.03	26.91±9.02
Positive number string	1.45±0.31	1.74±0.46	1.73±0.72
Anti digital string	1.52±0.38	1.75±0.76	1.62±0.52

Steady state threshold	35.89±10.47	31.59±9.04	32.94±11.21
Dynamic threshold	35.24±14.31	36.41±10.47	36.29±15.10
HOUSEshort sentence	42.00±20.09	52.00±20.86	50.00±18.68
301 short sentence	30.00±13.41	41.00±14.52	44.00±16.47
301Double word	37.00±12.19	52.69±16.41	49.58±20.47

The average hearing threshold of speech frequency in Table 2 refers to the arithmetic mean of 0.5 KHz, 1 KHz and 2 KHz; the high frequency average hearing threshold refers to the arithmetic mean of 4 KHz and 8 KHz; the mantissa after the decimal point is corrected to the nearest whole decibel. Through statistical processing, it is known that as the high frequency hearing loss increases, the average hearing threshold of speech frequency also increases. There was a good correlation between the two ($P<0.05$).

Table 2. Average distribution of language frequency and high frequency hearing threshold in all age groups （dBHL）

Age group	Number of cases	Language frequency	High frequency
4-6	7	38.06±6.24	42.24±8.65
6-8	9	39.26±5.38	43.68±8.68
8-10	2	42.25±6.08	45.32±7.53
10-12	2	44.03±6.45	48.66±7.22
12-14	2	45.66±5.83	51.36±6.86
14-16	2	49.36±6.68	54.32±6.23
16-18	2	48.32±5.58	56.32±3.36

From Tables 3, it can be seen that the note recognition rate and the scores of CAP, IT-MAIS and Little EARS in the evaluation stages of note recognition neural training are gradually increased. Correlation analysis show that the note recognition rate is linearly correlated with the scores of CAP ($r=0.635$, $p<0.01$), IT-MAI ($r=0.536$, $p<0.01$) and Little EARS ($r=0.618$, $P<0.01$).

The note recognition age and the scores of SIR and MUSS in each training stage gradually increased. Correlation analysis show that the cognitive age of the notes is linearly correlated with the SIR score ($r=0.608$, $P<0.01$), and is nonlinearly related to the MUSS score ($r=0.165$, $P>0.05$).

Table 3. Correlation between auditory ability assessment score and questionnaire score of children with different stages of musical cognition

Evaluation project	Correlation coefficient

	0 months	3 months	6 months	9 months	12 months
Note cognitive rate and CAP score	_	_	0.521**	0.547**	0.654**
Note cognitive rate and IT-MAIS score	_	_	0.360*	0.484**	0.578**
Note cognitive rate and LittleWARS score	_	_	0.602**	0.701**	0.722**
Note cognitive age and SIR score	_	_	0.390*	0.682**	0.688**
Note cognitive age and MUSS score	_	_	0.086	0.194	0.688**

IV Discussions

Studies have shown that the auditory speech system has plasticity, and functional recovery training can promote the rehabilitation of systemic functions, which plays an important role in the recovery process of patients with neurological dysfunction.

Bi Jingya's research shows that children with disabilities who use this method are trained to have high correct rate of sound and finals, and more accurately recognize the four tones of Chinese, while the use of spectral markers is easy to confuse the tone. Liu Qiaoyun found that the two methods are completely consistent in the phoneme recognition of the vowel. In the phonological phoneme recognition, the advantage of this method is that the compensation for the high frequency part is better. Sun Xibin's research shows that when the hearing thresholds of cochlear implants and hearing aids are in the appropriate range, the disabled children who are trained using this method are more selective.

In addition to the purely listening and speaking ability, advanced cognitive aspects such as ideology and intelligent development are covered by the questionnaire. The score of the questionnaire depends on the overall development of the nerve center. In this experiment, the disabled children are within 3 years old, and their nerve centers are still developing. Therefore, the quantitative assessment cannot be replaced.

V Conclusions

Traditional methods of note recognition neural training are used so that the accuracy of note recognition is low. In response to the problem, the method of interactive note recognition neural training based on the cognitive environmental science are proposed, which performs note recognition neural training by using the test of melody contours. The experiment proves that by using the method proposed in this paper, the recognition ability of the notes and timbres after hearing intervention is significantly improved, and their language comprehension and expression ability is also significantly enhanced, thereby effectively improving the quality of disabled children's life.

References

Adelman C, Cohen A, Regevcohen A (2015) Air conduction, bone conduction and soft tissue conduction audiograms in normal hearing and simulated hearing losses. Journal of the American Academy of Audiology 26 (1): 101-108.

Dekhtyar S, Wang H, Fratiglioni L, Herlitz A (2016) Childhood school performance, education and occupational complexity: a life-course study of dementia in the Kungsholmen Project. International Journal of Epidemiology 45 (4): 1207-1215.

Duvedi RK, Bedi S, Batish A (2015) Numeric implementation of drop and tilt method of 5-axis tool positioning for machining of triangulated surfaces. International Journal of Advanced Manufacturing Technology 78 (9-12): 1677-1690.

Maccà I, Scapellato ML, Carrieri M (2015) High-frequency hearing thresholds: effects of age, occupational ultrasound and noise exposure. International Archives of Occupational & Environmental Health 88 (2): 197-211.

Mcnulty JC, Silapie JL, Carnevali M (2015) Electron spin resonance of TOAC labeled peptides: folding transitions and high frequency spectroscopy. Peptide Science 55 (6): 479-485.

Tao J, Jiang X, Wang X, Liu H, Qian A, Yang C, Chen H, Li J, Ye Q, Wang J, Wang M (2017) Disrupted Control-Related Functional Brain Networks in Drug-Naive Children with Attention-Deficit/Hyperactivity Disorder. Frontiers in Psychiatry 8 (246)

Tunc S, Koprulu O, Ortac H, Nalbantoglu O, Dizdarer C, Demir K, Behzat O (2019) Long-term monitoring of Graves' disease in children and adolescents: a single-center experience. Turkish Journal of Medical Sciences 49 (2): 464-471.

Vielsmeier V, Lehner A, Strutz J (2015) The Relevance of the High Frequency Audiometry in Tinnitus Patients with Normal Hearing in Conventional Pure-Tone Audiometry. Biomed Research International 2015 (3): 1-5.