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## Review article

# Overview of research over the efficiency of therapies of stuttering

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## ARTICLE INFO

## Article history:

Received 21 March 2016

Accepted 14 November 2016

Available online 7 December 2016

## Keywords:

Stuttering

Therapy of stuttering

Efficiency of therapy of stuttering

## ABSTRACT

**Introduction:** A number of methods of therapy of stuttering have been developed, which can be grouped as direct, indirect and compound methods. Direct methods are aimed at the very speech act and lead to improving speech fluency. Indirect methods are supposed to influence the person and his/her organism. Compound methods are a combination of direct and indirect methods in the form of a therapeutic program.

**Aim:** The aim of the overview was to analyze 17 articles that presented studies over the efficiency of direct, indirect and compound therapies of stuttering, as published in PubMed database between 2008 and 2015.

**Discussion:** As far as direct methods of stuttering are concerned, devices like SpeechEasy, DAF and FAF (i.e. the one which alter the patient's perception of his/her own speech), as well as a metronome turn out to be really efficient. Indirect methods which use biofeedback, tactile and visual transmission of feedback as well as hypnotherapy combined with diaphragm exercise are equally effective. Laser acupuncture and cognitive therapy seem to improve the positive results achieved by means of other methods. Among the compound methods, Lidcombe Program in its different variants proves to be highly efficient among children, whereas Camperdown Program works well among teenagers and adults. One may have certain hopes with regard to an innovative program referred to as Acceptance and Commitment Therapy.

**Conclusions:** Studies on efficiency of therapies of stuttering are scattered, do not cover the whole structure of the disorder and are focused on the symptom i.e. on assessing the severity of speech disfluency. Considering the research done so far, one cannot conclude that some methods are better than others since neither of them were compared in an experimental way.

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## 1. Introduction

### 1.1. *The nature of stuttering, the aims of its therapy and key indicators of its efficiency*

Views on the nature of this disorder influence both the aims of its therapy and key indicators of efficiency of the therapy. Stuttering is most often regarded as pathological speech disfluency, thus the primary aim of its therapy is to reduce the frequency of such symptoms of fluency disorder as sound, syllable and word repetitions as well as combinations of the three, utterance blocking, redundant pauses, sound ('yyy,' 'aaa') and word (Polish 'tego,' 'no') interjections, and revisions. If we include psychosocial factors into the definition, then stuttering can be understood as a function of speech disfluency as well as individual and social reactions to it. In that case, therapy is aimed not only at improvement of fluency, but also at change of negative reactions into positive ones e.g. by replacing logophobia with willingness to communicate. From the systemic perspective, stuttering has its own structure which consists of the following groups of factors: linguistic and paralinguistic (e.g. fluency and speech pace disorders), biological (e.g. excessive muscle tension, breathing, phonation and articulation disorders), psychological (e.g. logophobia, annoyance) and social (e.g. disturbed interpersonal communication). The therapy is aimed at improving performance against these factors and changing the relationships between them.<sup>1,2</sup>

### 1.2. *Methodological basis of research over the effectiveness of therapies of stuttering*

Efficiency of therapy is defined as the degree to which a given program or therapeutic method leads to positive results. However, measuring efficiency is troublesome as:

- (1) Examination should cover all the key elements of the structure of stuttering, making interdisciplinary approach necessary, which in fact hardly ever happens.
- (2) Reduced frequency of stuttering calculated on the basis of the percentage of disfluently pronounced syllables is perceived as the primary indicator of efficiency of a therapy. This may be debatable as speech sample of the same person may differ significantly and stuttering as a phenomenon is changeable as it occurs in some situations, while does not in others. Speech disfluency is most often measured in a laboratory or a doctor's surgery, and not during natural communication. At the same time, patients are aware that they are being examined, which may distort the results obtained. In a situation like this it is controlled fluency rather than spontaneous fluency that is observed as improving. Also, speech pace and naturalness are rarely measured simultaneously.
- (3) Measurement of efficiency of therapy of stuttering requires the examiner to assess physiological, psychological and social factors as well, and correlate them with severity of speech disfluency. Improved speech fluency which is not accompanied by reduced muscle tension and logophobia does not lead to permanent positive results of a therapy.

- (4) Spontaneous subsidence of stuttering, observed particularly among young children, hinders the measurements of efficiency of therapy.
- (5) Effects of a therapy should be assessed several times, including assessment done at least one after the therapy ends as relapses of stuttering are frequent.
- (6) Selection, representativeness and size of the groups examined should be of special interest. The examined groups are often small and control groups are absent, which hinders reliable statistical analysis. Following the complete model of experimental research is difficult also because of other objective reasons (e.g. lack of volunteers).
- (7) Studies over efficiency of a therapy should offer convincing arguments that the method has been applied appropriately and its results are measured in a repeated way.<sup>3</sup> Also, it is advisable not only to make the results valuable from the academic perspective, but also to make them useful in a patient's everyday life in order to improve its quality. It is sometimes the case that the changes recorded are statistically significant, though clinically invaluable.<sup>4</sup>

## 2. Aim

The aim of this overview was to analyze 17 articles which presented studies over the effectiveness of direct, indirect and compound therapies of stuttering, as published in PubMed database between 2008 and 2015.

## 3. Discussion

The analysis of 17 articles does not cover studies over pharmacotherapy of people who stutter, which have been discussed in a separate publication,<sup>5</sup> as well as overviews developed earlier.<sup>6,7</sup> Although a number of methods of therapy of stuttering have been developed, they can be referred to as direct, indirect and compound.<sup>8</sup>

### 3.1. *Direct methods*

Direct methods are aimed at the very speech act and lead to improving speech fluency. They include the following techniques: the technique of slow, prolonged speech, rhythmization, the 'more fluent stuttering' method as well as influencing speech fluency by using devices.

A study which was based on choral speaking and made use of the SpeechEasy device has showed that all adult people who stuttered (18) that used the device for 13–59 months displayed a varied degree of improvement in speech fluency. When compared to the initial assessment, 7 subjects did not display any statistically significant improvements, while the other 11 – quite the opposite.<sup>9</sup>

Using a metronome (intervals of 0.75 s and 0.30 s) proved to be equally effective for 13 subjects aged 18–62, who were examined with a set of reading and monologue tests after their therapy. The disfluency reduced very significantly, and the reduction level was higher for the 0.75 s interval and

reading test. Only 2 subjects did not observe any positive effects.<sup>10</sup>

Thirty adults aged 18–85 who used delayed auditory feedback (DAF) or frequency-shifted auditory feedback (FAF) displayed significant improvement of speech pace and fluency, as well as articulation and duration of phrase.<sup>11</sup> DAF and FAF were used simultaneously in another research in which 9 adult people who stutter were assessed during phone conversations in the following scenarios: without any alteration of feedback, with feedback delayed by 50 ms and shifted upwards by half an octave (disfluency reduced by 65%), and with the delay of 200 ms and feedback shifted downwards by half an octave (disfluency reduced by 74%).<sup>12</sup>

### 3.2. Indirect methods

Indirect methods of therapy of stuttering are supposed to improve speech fluency by reacting to the person and his/her organism. They include pharmacotherapy, physiotherapy, herbal medicine, hypnotherapy, regulating voice and phonation, biofeedback, acupuncture and many others.

Laser acupuncture helped sustain long-term effects of logopedic therapy among 20 subjects aged 15–35. They were randomly divided into an experimental group (10 people), who were treated with a laser, and a control group (10 people) who were offered placebo. The percentage of disfluently pronounced syllables was calculated three times L before the therapy, straight after the therapy and 3 months later. Frequency of speech disfluency was considerably lower in the experimental group and the effect remained after 3 months as well. Although significant reduction of frequency of disfluently was also observed in the control group, the effect was only temporary.<sup>13</sup>

Results of the research involving biofeedback are equally promising as the method turned out to improve speech fluency among adult people who stutter by 71%–80%. The subjects' voice was recorded with a microphone or an accelerometer. Once processed, it returned to the speaker as a tactile stimulus. Patients using biofeedback were more fluent than individuals from the control group.<sup>14</sup>

Application of visual feedback also led to considerable reduction of speech disfluency. People who stutter (8) aged 18–42 were saying phrases they remembered with attention focused on the image of their lip, tongue and jaw movement. In one trial the subjects were observing themselves in a mirror (synchronous feedback), in the other the feedback came from a video and was delayed (asynchronous feedback). Although severity of speech disfluency decreased in both cases, no statistically significant differences were observed between synchronous and asynchronous manner of providing feedback.<sup>15</sup> Intensive hypnotherapy combined with diaphragm exercise (lifting weights of 2–4 kg for 2 h a day for 8 consecutive days) led to statistically significant improvement in speech fluency as well as reduction of anxiety and strengthening self-esteem and motivation to therapy.<sup>16</sup> Social anxiety and stuttering-related negative thoughts were significantly reduced and life quality was improved among 14 individuals who had completed a 5-month online course in cognitive therapy.<sup>17</sup>

### 3.3. Compound methods

Compound methods are a combination of direct and indirect methods in the form of a therapeutic program and Lidcombe Programme is one of their best known examples. It is aimed at disfluently speaking children in preschool and its efficacy has been tested a number of times. After 9 months of therapy 57 children who stuttered observed disfluency severity going down to 1.7%.<sup>18</sup> After 2 years of therapy most of the 14 preschoolers reached complete fluency, while others displayed significant improvement.<sup>19</sup> Finally, 5 years after completing the Lidcombe Programme vast majority of subjects displayed no stuttering at all.<sup>20</sup> Metaanalysis has proved that children who benefit from early intervention are 7.7 times more likely to fight stuttering in preschool than later on.<sup>21</sup> Parents recorded their children with a camera and then handed the recordings to the therapist, which proved to be a very convenient and practical solution. The therapy as such was conducted at home and permanent contact with the clinic was unnecessary. Severity of speech disfluency reached 1.0% among all the children.<sup>22</sup>

Modern forms of communication combined with speech therapy worked well in the case of two 11-year-olds. At first, a direct method of speech therapy was applied during 50-min sessions twice a week. Particular methods were selected according to subjects' individual needs. A hybrid method – meeting in a clinic once a week and a 45–50-min session of teletherapy – was used in second phase. The third phase involved teletherapy only – three 30-min sessions per week. In total, the therapy lasted for 10 weeks. Severity of stuttering was tested after each phase and two months after the end of the therapy. Examination included weekly speech sample analysis (percentage of disfluent syllables in a monologue), attitude toward communication (CAT-R) as well as children's and parents' opinion on the therapy. Biggest improvement was recorded after first phase. Although the changes which happened later were marginal, improvement and maintaining the good results was constantly observed.<sup>23</sup>

Efficacy of the Camperdown Programme was also tested among 16-year-olds who stutter. During the therapy conducted in 25 sessions (15.5 h) the researchers monitored percentage of disfluent syllables, subjects' own assessment of stuttering, their satisfaction with communication, natural character of speech, communicative fear, quality of their life as well as satisfaction with the therapy. The percentage of disfluent syllables as observed straight after the therapy was 6.1%, while it was 2.8% 12 months later. Still, the level of communicative fear remained the same before and after the therapy.<sup>24</sup>

Efficacy of Camperdown Programme was also measured among 12 adult people who stutter. Disfluent syllables constituted 5.7% of a whole utterance before the therapy, 1.0% straight after the therapy and 2.4% a year later. After the therapy subjects' speech became more natural and did not change over a year.<sup>25</sup>

The aim of Acceptance and Commitment Therapy Programme is to improve not only speech fluency, but also the psycho-social functioning of people who stutter. Twenty adult individuals who participated in the programme displayed improvement in each of the parameters tested and the effects were still visible 3 months after the therapy.<sup>26</sup>

### 3.4. Opinions on the efficiency of therapies of stuttering

Members (200 people) of support groups in the National Stuttering Association (NSA) were questioned about therapy of stuttering. Most of them are convinced that in case of symptoms of stuttering, the primary contact should be an academic speech pathologist and a web portal. Fewer subjects mentioned psychological consultation or conversation with friends. Appointment at the GP's was least popular. Different opinions were observed regarding the question of using public or private health institutions. The respondents began their therapy at school (66%) or as adults (46%), while only 15% admitted that their therapy began in preschool. Most of the subjects had several attempts at the therapy. When asked about advice they would offer to parents of a stuttering child, as many as 20% said they would advise to wait until stuttering disappears. Vast majority concluded that compound therapies are more effective than approaches which are focused merely on speech disfluency, and stressed that emotions and attitudes of a person who stutters should be taken care of irrespective of changes in speech fluency.<sup>27</sup>

Research carried out among 40 adults who stutter shows that, contrary to scientific knowledge, they still believe there is a magical pill to cure stuttering. All of the respondents experienced participated in therapies which brought neither improvement, nor satisfaction.<sup>28</sup> Patients (231) assess direct methods higher than such indirect ones as breathing therapy or hypnotherapy.<sup>29</sup>

## 4. Conclusions

1. Research on efficiency of therapies of stuttering is rarely conducted and constitutes 5% of all studies published. It is much easier to obtain budget for diagnostic projects which discuss neuroimaging, despite the fact that its results do not lead to improvement of efficiency of therapies of stuttering.
2. Studies on efficiency of therapies of stuttering are scattered, do not cover the whole structure of the disorder and are focused on the symptom i.e. on assessing the severity of speech disfluency. The physiological and psychological reasons, which determine whether positive results will remain or disappear, are rarely monitored.
3. Considering the research done so far, one cannot conclude that some methods are better than others since neither of them were compared in an experimental way. Placebo effect and automatic disappearance of stuttering are beyond control.
4. Although different tools and devices improve efficiency of therapies, they are a sort of prosthesis which is not used very often in natural communication by people who stutter.
5. Indirect methods including biofeedback and laser acupuncture improve the prevalence of results achieved thanks to other methods.
6. Results of compound methods are most visible in preschool. Unfortunately, therapy is rarely adopted in this age because of a common belief that the disorder will automatically disappear.

7. Opinions of people who stutter on the efficiency of therapy differ, which may have been caused by their personal experience.

## Conflict of interest

None declared.

## REFERENCES

1. Humeniuk E. [Biological and Mental Aspects of Stuttering]. Lublin: Wydawnictwo Uniwersytetu Medycznego; 2012 [in Polish].
2. Tarkowski Z. [The Psychosomatics of Stuttering. Why Do People Who Stutter Speak Fluently?]. Lublin: Wydawnictwo Fundacji Orator; 2007 [in Polish].
3. Thomas C, Howell P. Assessing efficacy of stuttering treatments. *J Fluency Disord.* 2001;26(4):311-333.
4. Finn P. Evidence-based treatment of stuttering: II. Clinical significance of behavioral stuttering treatments. *J Fluency Disord.* 2003;28(3):209-217.
5. Pawlak D, Kamiński T. [Pharmacotherapy of speech disorders]. In: Tarkowski Z, ed. [Speech pathology]. Gdańsk: Harmonia Universalis; 2016 (in press).
6. Bothe AK, Davidow JH, Bramlett RE, Ingham RJ. Stuttering treatment research 1970-2005: I. Systematic review incorporating trial quality assessment of behavioral, cognitive, and related approaches. *Am J Speech Lang Pathol.* 2006;15(4):321-341.
7. Blomgren M. Stuttering treatment for adults: an update on contemporary approaches. *Semin Speech Lang.* 2010;31(4):272-282.
8. Tarkowski Z. [Stuttering]. Warszawa: PWN; 2001 [in Polish].
9. Gallop RF, Runyan CM. Long-term effectiveness of the SpeechEasy fluency-enhancement device. *J Fluency Disord.* 2012;37(4):334-343.
10. Davidow JH. Systematic studies of modified vocalization: the effect of speech rate on speech production measures during metronome-paced speech in persons who stutter. *Int J Lang Commun Disord.* 2014;49(1):100-112.
11. Unger JP, Glück CW, Cholewa J. Immediate effects of AAF devices on the characteristics of stuttering: a clinical analysis. *J Fluency Disord.* 2012;37(2):122-134.
12. Hudock D, Kalinowski J. Stuttering inhibition via altered auditory feedback during scripted telephone conversations. *Int J Lang Commun Disord.* 2014;49(1):139-147.
13. Shafiei B, Heshmatipou M, Tavakol S, Saghaei M, Ghayumi Z. Determining the effect of laser acupuncture in treating stutters in comparison with speech therapy. *Adv Biomed Res.* 2015;4:8.
14. Waddell DE, Goggans PM, Snyder GJ. Novel tactile feedback to reduce overt stuttering. *Neuroreport.* 2012;23(12):727-730.
15. Snyder GJ, Hough MS, Blanchet P, Ivy LJ, Waddell D. The effects of self-generated synchronous and asynchronous visual speech feedback on overt stuttering frequency. *J Commun Disord.* 2009;42(3):235-244.
16. Kaya Y, Alladin A. Hypnotically assisted diaphragmatic exercises in the treatment of stuttering: a preliminary investigation. *Int J Clin Exp Hypn.* 2012;60(2):175-205.
17. Helgadóttir FD, Menzies RG, Onslow M, Packman A, O'Brian S. A standalone Internet cognitive behavior therapy treatment for social anxiety in adults who stutter: CBTpsych. *J Fluency Disord.* 2014;41:47-54.

18. O'Brian S, Iverach L, Jones M, Onslow M, Packman A, Menzies R. Effectiveness of the Lidcombe Program for early stuttering in Australian community clinics. *Int J Speech Lang Pathol*. 2013;15(6):593–603.
19. Guitar B, Kazenski D, Howard A, Cousins SF, Fader E, Haskell P. Predicting treatment time and long-term outcome of the Lidcombe. *Am J Speech Lang Pathol*. 2015;24(3):533–544.
20. Jones M, Onslow M, Packman A, et al. Extended follow-up of a randomized controlled trial of the Lidcombe Program of Early Stuttering Intervention. *Int J Lang Commun Disord*. 2008;43(6):649–661.
21. Onslow M, O'Brian S. Management of childhood stuttering. *J Paediatr Child Health*. 2013;49(2):E112–E115.
22. O'Brian S, Smith K, Onslow M. Webcam delivery of the Lidcombe program for early stuttering: a phase I clinical trial. *J Speech Lang Hear Res*. 2014;57(3):825–830.
23. Valentine DT. Stuttering intervention in three service delivery models (direct, hybrid, and telepractice): two case studies. *Int J Telerehabil*. 2015;6(2):51–63.
24. Carey B, O'Brian S, Lowe R, Onslow M. Webcam delivery of the Camperdown Program for adolescents who stutter: a phase II trial. *Lang Speech Hear Serv Sch*. 2014;45(4):314–324.
25. Cocomazzo N, Block S, Carey B, et al. Camperdown Program for adults who stutter: a student training clinic Phase I trial. *Int J Lang Commun Disord*. 2012;47(4):365–372.
26. Beilby JM, Byrnes ML, Yaruss JS. Acceptance and Commitment Therapy for adults who stutter: psychosocial adjustment and speech fluency. *J Fluency Disord*. 2012;37(4):289–299.
27. Yaruss JS, Quesal RW, Murphy B. National Stuttering Association members' opinions about stuttering treatment. *J Fluency Disord*. 2002;27(3):227–241.
28. Andrade CR, Cunha MC, Juste FS, Ritto AP, Almeida BP. Self-perception of people who stutter regarding their experiences and results of stuttering treatments. *Codas*. 2014;26(5):415–420.
29. Euler HA, Lange BP, Schroeder S, Neumann K. The effectiveness of stuttering treatments in Germany. *J Fluency Disord*. 2014;39:1–11.