The Effectiveness of Mind Simulation on Psychological Symptoms and Mental Capabilities of Adults Suffering from Stuttering

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Abstract

Introduction: Cognitive factors are considered extremely important in stuttering. This study aims at examining the effectiveness of mind simulation on psychological symptoms and mental capabilities in adults who stutter.
Method: This study was a quasi-experimental research, with two groups (experimental and control group), and it consisted of two pre-test and post-test stages. The research population was all 33 females from stuttering disorder that were clients of speech-therapy centers including in 2019. The final number of samples reached 30 individuals, who were selected by simple random sampling method and were divided into two control and experimental groups. The package of Stuttering Anxiety Questionnaire, Self-esteem Measurement, Self-concept Measurement and Social Communication Measurement were used. Multivariate covariance analysis and SPSS software were used to analyze the data.
Results: In general, the findings indicated a significant difference between the data obtained from pre- and post-test average score of the two groups in terms of self-concept, self-esteem, social interactions and anxiety involved in the mind simulation process.
Conclusion: The current mind simulation methods have a considerable impact on the psychological symptoms and mental capabilities of adults suffering from stuttering, which can be used as an effective method to improve stuttering.

Keywords: Mind Simulation Method, Psychological Symptoms, Mental Capabilities, Stuttering Adults

Introduction

Stuttering often begins between the first two and three years in one's life. This is when a rapid growth in long and complicated speech structures is viewed [1]. Orton [2] posed that developmental stuttering was accompanied by aberrant functional lateralization of cortical networks and psychological symptoms. These cortical disruptions result in inefficient activation of some regions involved in motor control, which produce repetitions, and are responsible for blocking speech [3]. We tune out disfluency, but what we never tune out is anxiety. The negative reaction of the listener to the speaker actually shows the level of speaker's discomfort. The reason is that we often notice disfluency because it is accompanied by a sense of anxiety or prohibitive behavior. It is, in fact, not so much about stuttering but the speaker's reaction to it [4]. Stuttering is found in all parts of the world. That is, all cultures experience this special physical situation and witness stutterers regardless of the occupation, income rate, and the individual intelligence [5]. Stuttering, on the other hand, prevents the person from behaving in the social environment as he or she wishes to [6], so over time, in addition to reducing social communication [7], reduces self-confidence, self-concept [8], and increased anxiety [9]. However, its cause is still unknown to scientists and there have been many clues which partially help discover the reason [10]. First of all, it is strongly believed that stuttering is genetically inheritable. Second, it often

begins between ages 2 and 5. Stuttering may disappear within a couple of months or it can be gradually worse and turn to be chronic [11].

Despite the recent progress in understanding the basic mechanism, it is not yet possible to introduce an all-inclusive mechanism for stuttering treatment [12]. So far, many techniques have been used to treat, modify, or rehabilitate stuttering people [13], for example, to name a few, modifying phonation intervals [14], psychological counseling [15], hypnosis [16], and webcam preschool plan [17]. In the present study, mind simulation has been selected as a treatment, which has been worked on before by other researchers [18] from aspects different from ours.

Using virtual world offers exciting new lines of dealing with communication disorders and supporting clients [19]. In this rapidly-growing space of technological advances, some virtual systems could be used in order for speech pathologists to complement current methods and therapies [20]. Brundage and Hancock [21] found that there is a significantly positive relationship between virtual and real life conditions in terms of stuttering frequencies. Hence, these virtual worlds can provide supervised and controlled space for assessing and finding a treatment for stuttering. In another work by Arnold [22], it was suggested that stuttering does not result from relying too much on sensory feedback in order to move speech forward. Rather, it can only result in subtle anomalies in psychological symptoms and mental capabilities. Jones et al. [23] reached this conclusion that stuttering children have lower executive functioning. They proved that stuttering has a great impact on performance, behaviors, and characteristics all of which are related to psychological symptoms (social communication and anxiety), as well as mental capabilities (self-confidence and self-concept).

In general, people with stuttering tend to have low social interactions due to their negative self-esteem in social situations. They always blame themselves that this leads to lower self-confidence and self-concept. These people are susceptible to many other mental disorders. In the present study, mind simulation has been selected as a treatment which has been worked on before by other researchers from different aspects. The present study seeks to test this hypothesis that, mind simulation has a significant impact on psychological symptoms and mental capabilities in adults suffering from stuttering. To this end, the following question has been raised: Does mind simulation effect psychological symptoms and mental capabilities of stuttering adults?

Method

This study was a quasi-experimental research, and the research plan included two groups (experimental group and control group), and it consisted of two pre-test and post-test stages. The research population was all 33 females suffering from stuttering disorder that were not treated in the past, which were clients of speech-therapy centers including Aftab Institute and Empowerment Mind Center in Tehran during 2019. The final number of samples reached 30 individuals, who were selected by

simple random sampling method and were divided into two control and experimental groups each containing 15 individuals according to the Cochran formula (using 5% error and 95% confidence).

The inclusion criteria for this study included: individuals suffering from stuttering disorder, female gender, age range of 20 to 30 years, not having received any other treatment in the past, not receiving any treatment at the same time, a maximum of one month passed since the diagnosis of the disease by a clinic.

The medium severity of stuttering disorder was matched by the test of Stuttering Severity Instrument Fourth Edition [SSI-4]. People were single, not using psychotropic drugs, and were satisfied and had agreed to cooperate

The exclusion criteria included absence from trial and intervention for more than two sessions, unwillingness to continue the trial and intervention, severe psychiatric disorder requiring urgent medication, using psychotropic drugs or substances, exiting whenever she was willing to leave the study.

The ethical consideration in this research was as follows: before starting and participating in the project, they became familiar with the layout specifications. The attitudes and beliefs of the individuals were respected. The members of the test and control groups were allowed to leave the research project at any stage. In addition, the group members were free to repeat the treatment sessions of the intervention group if they were interested in entering the intervention group only at the end of the treatment. Control group members received treatment after the treatment sessions. All documents, questionnaires and confidential records were only available to the administrators. A written and informed consent of the parents or legal guardians of all the candidates was taken. According to the ethical principles regarding human experimentation stipulated in Helsinki declaration, the participants were allowed to quit participation in case of experiencing any discomfort or pain increase.

The psychological symptoms included social communication and anxiety. Also, the mental capabilities included confidence and self-concept.

Social communication, anxiety, self-confidence, and self-concept were the dependent variables, and stuttering status was considered as the independent variable. In this regard, several measurements were used including Monjemi zadeh's Social Communication, Kettle's Anxiety Questionnaire, Coopersmith's Self-esteem Inventory, and Rogers' Self-concept.

At first, the research license was obtained from Aftab Institute and Empowerment Mind Center in Tehran. Before starting the sampling in the implementation process, some explanations were made about the purpose of the study and maintaining the materials confidentiality to the subjects and concurrently. An informed consent about the samples participation in the research was received from individuals and then the questionnaires were gathered from both groups. The experimental group received the package of Taghizadeh and Bigdeli Shamloo [18] in 15 intervention sessions, each lasting for 60

minutes, two sessions per week during the time interval of May to July 2019 and the post-test was received from both groups after the sessions' completion. The control group received no interventions. Multivariate covariance analysis and SPSS software were used to analyze the data.

<div align="center">Table 1. Mental Simulation Intervention Process</div>

Session	Target	Content sessions
1	Introduction and Evaluation	Getting to know each other and expressing the goals of the sessions
2	Coding	Encoding important words in expression
3	Mental Imagination	Imagination on correct expression of important words
4	Speech Linearity	Focusing on the words that are spoken correctly
5	Half-opened Speech-mental Technique	Repetition and mental training in problematic letters
6	Speaking Excitement Control	Controlling negative emotions with your relaxation technique and focusing on proper performance
7	Stress Management	Managing stress by training for the best way to properly evaluate situations
8	Facial Tics	Preventing facial tick formation with relaxation and mental visualization
9	Speech/Mental Obsession	Cognitive training neglecting negative thoughts to prevent obsessive-compulsive expression of words and letters
10	Self-confidence Enhancement	Improving the spirit of individual empowerment to increase self-esteem
11	Mind Cleansing	Teaching the cognitive technique disregarding negative environmental factors
12	Power Emphasis Technique	This technique focuses on enhancing one's ability to empower
13	Cooperation between Body and Mind	Assessing the state of mental and behavioral states and providing exercises to maintain the interaction between the both
14	Removing Physical Pressures when Talking	Training by disregarding environmental factors that cause stress
15	Unity in the Speech and Summary of Sessions	Unity in the speech and summary of sessions

The tools used in this study were as follows:

Monjemizadeh's Social Communication Questionnaire: This questionnaire has been developed by Monjemizadeh in 2013 and contains 19 Likert-scale questions [24]. The questionnaire was developed based on a 5-option Likert scale from strongly disagree to strongly agree. The range of scores for social communication was 19 to 95. The construct and concurrent validity were confirmed by the developers and the reliability was obtained by Cronbach's alpha 0.73. In the present research, the reliability by Cronbach's alpha was 0.82.

Kettle's Anxiety Questionnaire: This questionnaire has been developed by Kettle in 1962 [25] and contains 40 questions. The range of scores are: for incorrect 0, middle 1 and correct 2. The overall score is from 0 to 80. The construct and concurrent validity were confirmed by the developers and the reliability was obtained by Cronbach's alpha 0.84. In Iran, the content and construct validity were confirmed by Alirezaei Motlagh [26], and the reliability was obtained by Cronbach's alpha 0.81. In the present research, the reliability by Cronbach's alpha was 0.79.

Coopersmith's Self-esteem Questionnaire: This questionnaire was developed by Coopersmith in 1967 with 58 items [27]. The range of scores are: 0 for incorrect 0 and 1 for correct. The overall score is from 0 to 50. The construct and concurrent validity were confirmed by the developer and the reliability was obtained by Cronbach's

alpha 0.87. In Iran, the content and construct validity were confirmed by Sabzevari, et al. [28], and reliability was obtained by Cronbach's alpha 0.82. In the present research, the reliability by Cronbach's alpha was 0.80.

Rogers's Self-concept Questionnaire: This questionnaire was designed by Rogers in 1951 with 25 questions [29], with scores from 1 to 7. The overall score is from 25 to 175. The construct and concurrent validity were confirmed by the developer and the reliability was obtained by Cronbach's alpha 0.82. In Iran, the content and construct validity were confirmed by Bijari et al. [30], and the reliability was obtained by Cronbach's alpha 0.80. In the present research, the reliability by Cronbach's alpha was 0.78.

Riley's Stuttering Severity Questionnaire: This questionnaire was designed by Riley in 2009 [31]. It has 13 items, nine options in Likert-scale and scores range from 1 to 9. The Stuttering Severity Instrument–Fourth Edition (SSI-4) is a reliable and valid norm-referenced stuttering assessment that can be used for both clinical and research purposes. It is also used for adults. The construct and concurrent validity have been confirmed by the developer and the reliability was obtained by Cronbach's alpha 0.89. In Iran, the content and construct validity were confirmed by Tahmasebi Garmatani et al. [32], and the reliability was obtained by Cronbach's alpha 0.86. In the present research, the reliability by Cronbach's alpha was 0.82.

Results

Initially, the data normalization presumption was confirmed by the Shapiro-Wilks test, and then the presumptions of multivariate covariance analysis including homogeneity of Box and Levine were confirmed. Meanwhile, with respect to complying with other assumptions (slopes homogeneity and linear assumptions), a covariance analysis test was used to analyze the data.

As shown in table 2, we first reported the descriptive findings divided by measurement steps in pre-test and post-test in two control and experimental groups in this section. Accordingly, there was a considerable increase in the mean in the experimental group. Multivariate covariance was analyzed to test the research hypothesis.

As indicated in table 3, the values of F are significant in all four tests. Therefore, the independent variable impacts the dependent variables. The obtained values of F in the above table are the F values in covariance analysis. In fact, F value in covariance analysis is equal to the variance one obtained after manipulating the independent variable in terms of variance error.

As shown in table 4, with 99 percent certainty, the mind simulation has a significant impact on self-concept, self-esteem, social communication, anxiety and stuttering severity which is at significance level of 0.01.

Table 2. The Mean and SD of the Variables' Scores Obtained in Pre and Post-test

Variable	Step	Groups			
		Control		Experimental	
		Mean	SD	Mean	SD
Self-concept	Pre-test	79.26	6.2	87.2	7
	Post-test	80.62	7.14	101.2	5.04
Self-esteem	Pre-test	23.46	3.15	23.86	4.5
	Post-test	23.13	3.05	33.06	3.05
Social communication	Pre-test	41.86	5.23	44.2	6
	Post-test	42.21	5.5	54.93	6.9
Anxiety	Pre-test	41.13	4.67	40.44	3.6
	Post-test	40.86	4.31	32.80	3.27
Stuttering Severity	Pre-test	72.49	9.28	72.62	8.12
	Post-test	71.94	8.04	46.17	10.98

Table 3. The Results of Multivariate Analysis of Covariance (MANCOVA)

Tests	Value	F	Hypothesis df	Error df	Sig.	Partial Eta squared
Hotteling's trace	3.58		9	15	0.001	
Wilks' Lambda	0.364	5.86	9	15	0.001	0.857
Pillai's trace	0.874		9	15	0.001	
Roy's largest root	3.24		9	15	0.001	

Table 4. Variables Analysis in the Context of Multivariate Covariance Analysis

Variable	Sum of squares	Df	Mean of squares	F	Sig.	Effect size
Self-concept	1009.2	1	1009.2	23.36	0.01	0.485
Self-esteem	182.53	1	182.53	14.3	0.01	0.413
Social communication	770.13	1	770.13	19.6	0.01	0.412
Anxiety	480	1	480	36.6	0.01	0.567
Stuttering Severity	182.36	1	182.36	24.87	0.01	0.863

Discussion

The purpose of this study was to investigate the effectiveness of mind stimulation on psychological symptoms (social communication and anxiety), as well as mental capabilities (self-confidence and self-concept). The findings revealed that mind simulation was influential on treating stuttering, and the findings revealed that mind simulation was influential on treating stuttering. These results are consistent with some findings of researchers such as Taghizadeh et al. [33] who showed that the simulation mind model had an effect on the reduction of stress and the increase of cognitive flexibility in adults with stuttering disorder. Brundage and Hancock [21] showed that mind stimulation increased psychological symptoms and mental capabilities. In another work by Arnold [22], mind stimulation decreased the results of anomalies in psychological symptoms and mental capabilities. Jones et al. [23] study revealed that stuttering has a great impact on performance, behaviors, and characteristics all of which are related to psychological symptoms and mental capabilities. Different methods were used in the treatment procedure including mind cleansing, coding, and self-talking. In mind stimulation, self-talking is a means with interpretative and educational values, which increases social communication, self-confidence, and self-concept [34]. Talking to an imaginary friend or to one's self is not always psychotic [35]. Hardy et al. [36] defined self-talking as a conversation one makes with himself/herself in which the person interprets his/her understandings, he/she might change his/her evaluations and beliefs, and propose himself/ herself another instructions or even reinforce the existing structures. Bloodstein [37] admitted that stuttering people feel more comfortable when self-talking. That is, they speak fluently when talking to themselves. According to the researchers conducted over previous years, stuttering is regarded as

the least understood area, which language pathologists come across, and they often feel less comfort in treating such fluency disorder compared to any other speech-related disorder [38]. Based on this insight, mind simulation will be practical by considering concurrent educational demands in emotional and behavioral fields, as well as other complex cognitive tasks [18]. Mind simulation methods in stochastic situations have approximate responses. Mind simulation is referred to as a cognitive development and a basic self-regulating process which leads to cohesion and focuses on actions [33]. By using mind simulation and mind programing language, it becomes possible to train and treat the people with stuttering by designing and performing medical and educational programs through simulating and reconstructing the natural process of forming skills [34].

One of the limitations of this research was considering the type of gender in the target population. The other limitation of this research was the lack of controlling the socioeconomic status of the families associated with the target community. This research was limited to Aftab Institute and Empowerment Mind Center in 2019 of Tehran city. The impossibility of following up was a limitation for the present research. Also, the use of questionnaire tools was another limitation of this research.

Conclusion

Generally speaking, the effectiveness of mind simulation on increasing social communication, self-confidence, self-concept, and reducing anxiety in stuttering individuals has been confirmed in this study. On the other hand, it can be concluded that these plans provide a reliable solution for overcoming stuttering-derived anxiety, increasing social communication, self-confidence, self-concept, and strengthening the capability. The current mind simulation methods had a considerable impact on the psychological symptoms and mental capabilities of adults suffering from stuttering, which can be used as an effective approach to improve stuttering.

Conflict of interest

There are no conflicts of interest.

Ethical Approval

All ethical principles were considered in this article. The participants were informed about the purpose of the research and its implementation stages and signed the informed consent. They were also assured about the confidentiality of their information. Moreover, they were allowed to leave the study whenever they wish, and if desired, the results of the research would be available to them.

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