THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 13 Issue 2

RESEARCH ARTICLE

The Effect of Mind Simulation Method on Stuttering and Communication Attitude

Hamid Kamarzarin, PhD [1]; Mojtaba Bigdeli Shamloo, MA [2]; Zahra Fallahi, MA [2]

[1] Clinical psychology, Assistant Professor of Psychology, Tehran Payame-Noor University, Iran
[2] Psychology, Karaj Payame-Noor University, Iran.

OPEN ACCESS

PUBLISHED
28 February 2025

CITATION
Kamarzarin, H., Shamloo, MB., et al., 2025. The Effect of Mind Simulation Method on Stuttering and Communication Attitude. Medical Research Archives, [online] 13(2). https://doi.org/10.18103/mra.v13i2.6280

DOI
https://doi.org/10.18103/mra.v13i2.6280

ISSN
2375-1924

ABSTRACT

Background and Aims : Fluency disorder or stuttering is a disorder in the human speech system whose prevalence is higher at the age range before puberty. Mind simulation is one of the methods that may be effective in reducing the severity of stuttering and some associated problems such as negative attitude towards communication. This study aimed to investigate the effect of Mind Simulation method on reducing stuttering and improving the rate of communication attitude.

Materials and Methods: The method of the present study was quasi-experimental with a pre-test-post-test design. The sample of the study was a group of 30 children and adolescents with stuttering who were referred to the Mental Psychology Services Center in 2024. A total of 30 Ss' (age=7 to16 yrs., gender=M/F), including 9 females and 21 males responded to CAT-R DeNil and Brutten questionnaire, and their stuttering severity was measured by SSI-4 Railey in the pre-test stage. Clinical interviews were performed to determine if they were not affected by a particular disease. The subjects have been under treatment of the Mind Simulation method for 3 months. Then, they responded to the CAT-R questionnaire again and were measured in the post-test and one month later in the follow up stages. One-way Repeated Measure Analysis of Variance and Friedman Test statistical methods were used to analyze data.

Results: The data analysis results showed a significant difference between pre-test, post-test and follow up in stuttering severity (p=0.0001) and pre-test and post-test in communication attitude (p=0.0001). Statistical data did not report a significant difference in the control group before and after treatment in the amount of stuttering. Statistical data reported a significant difference in the post-test between the control group and the control group.

Conclusion: According to these results, the mind simulation method helps improve stuttering and communications attitude.

Keywords: Mind simulation, stuttering, communication attitude.

Introduction

Speech and language are two related components of communication. Any problem in each of them can significantly influence the individual's life. Language formation is an innate and environmental process that begins at birth and develops until the age of ten. Various factors may interfere with the natural formation and development of the tongue. One of these cases is speech disorder or stuttering, which is more common in the age range under puberty. According to the Diagnostic and Statistical Manual Disorders DSMVtr (2022), stuttering is a type of disorder in normal fluency and speech time pattern that is disproportionate to an individual's age.

According to Science Daily,[1] stuttering affects more than 70 million individuals worldwide, representing approximately 1% of the global population.[2] Stuttering is classified as a neurobiological speech disorder,[3] characterized by disruptions in speech fluency. These disruptions manifest as atypical interruptions in the smooth flow of speech.[4] The underlying causes of stuttering are multifactorial, including genetic predisposition,[3] neurophysiological differences,[5,6] variations in emotional reactivity and regulation,[7,8] and differences in speech motor control.[9,19,11] Stuttering is increasingly recognized as a complex disorder in communication, and its clinical and linguistic manifestations have garnered significant attention in both research and clinical settings worldwide.[12, 13, 14]

The way an individual reacts to a person who stutters can have a considerable impact on the person who stutters.[15] Stuttering refers to the physical difficulty of producing speech in a fluent manner, and to the emotions, thoughts and secondary behavior that are associated with it.[16] Given that about 0.72 % of the population stutters.[17] it is likely for an individual to come across someone who stutters at one point in the individual's lifetime. Apparently, it is not straightforward to have a conversation with a person who stutters. About 50 % of the 310 adults who did not stutter in the study of Boyle (2017) found it uncomfortable to talk with a person who stutters. More than 50 % of adolescents who stutter seem to experience a low communicative competency and an increased communication anxiety.[18]

It is plausible to assume that the way an individual reacts to a person who stutters is partially associated with an individual's amount of knowledge about stuttering and the individual's attitude toward people who stutter. For this reason, a significant amount of attention has been given to this topic.

There are many theories about stuttering that eventually falls into three categories: theories dealing with stuttering disorder, theories dealing with the causes of stuttering, and theories that seek for new frameworks to study this disorder. While there are theories that consider stuttering as a genetic, motor, linguistic, neuro-logical, psychological, auditory processing, and environmental phenomenon, there is still no single cause for stuttering.[19]

In evaluating early childhood stuttering interventions, a crucial factor to consider is the awareness of stuttering and its subsequent impact on an individual's life. The negative effects of stuttering have been well documented, particularly in relation to social, educational, and occupational challenges.[20, 21, 22] As individuals move into adolescence and adulthood, stuttering is often linked to clinically significant social anxiety, limited educational and professional achievements, and difficulties in social interactions.[22] Research suggests that these negative effects can begin as early as childhood.[23]

These disruptions in oral communication are frequently associated with physical tension and effort. Stuttering commonly affects the academic,[24] social,[25] and vocational.[26]

For the majority of people, speech occurs so fluently and automatically that the person is unconscious of it, but a number of people face challenges in this automatic phenomenon that affect their fluency and cause speech difficulties. These difficulties are often manifested in the emoticons on their faces. Over time, the person experiences a variety of emotions such as failure, hopelessness, and fear, which along with the initial symptoms, reduce the person's social participation in social contexts. These feelings and difficultis cause a negative attitude towards communication in these people. Communication attitude is very important in social interactions of stutterers and has a great impact on it. In a study conducted by Yadegari et al., the findings showed that the communication attitude of stutterers is more negative than normal people. The findings reported by Azimi et al., Rahimi et al., Valinejad et al., and DeNil and Brutten confirm these findings.[27, 28]

Mind simulation is knowledge used to access human mental information and convert it into physical, observable data. This process includes simulating the information present in the mind, retrieving important codes of learned behaviors, and teaching them to individuals who need them. With this knowledge, it is possible to access individuals' mental information and create mental changes more rapidly and accurately, which leads to the improvement of learned skills and behaviors.[29]

Mind Simulation turns invisible information into visible information, observes a person's skills and abilities, translates them into codes, and by simulating, i.e. imitating these codes of behavior in other people's minds, teaches skills, and transmits the desired or needed changes to the minds of eager or needy people in a short time.[29] Numerous studies show the effectiveness of mind simulation in improving the performance, learning, and skills of individuals.[30]

Various treatments such as speech therapy, behavioral therapy, hypnosis, cognitive-behavioral therapy, and the like are used to treat stuttering. One of the methods used to reduce the severity of stuttering, invented by Bigdeli Shamloo through his research, is the method based on mind simulation. Simulation is the re-creation or re-representation of an object, a situation, or a real subject. This technique, like a mirror, simulates facts. Moreover, there is no probable harm for the participants.[31] The aim of this study was to investigate the effect of mind simulation method on reducing stuttering intensity and negative communication attitude of children and adolescents with stuttering.

The findings of many studies, including Emami Meybodi et al., Tuzandeh Jani et al., Sadat Qureshi et al., Blood et al., and Davis et al., have provided evidence on the negative impact of stuttering on the quality of life of children and adults.[32] These studies have shown that children with stuttering experience high level of stress and anxiety. Children and adolescents with stuttering in the school-age period are worried about the attitudes of their classmates and others in their schools and living environment, and these concerns lead to their negative attitudes towards speech. Children and adolescents with stuttering gradually use avoidant behaviors due to their bad experiences with stuttering.[33, 34] Also, their anxiety about the reaction of their friends and peers and the fear of being ridiculed by them, ultimately, leads to their misconceptions, irrational beliefs in themselves, and the lack of flourishing their potential talents and academic abilities.[35] Given the role of stuttering on verbal communication of children and adolescents, it is necessary to study other effective methods in reducing the severity of stuttering and improving their attitude, and this study was conducted with this aim. To achieve this goal, the following research hypotheses have formed:

1. There is a significant difference between the scores of stuttering severity instrument test before holding mind simulation sessions and after performing this method.
2. There is a significant difference between the scores of communication attitude test before holding mind simulation sessions and after performing this method.

Method

Materials and Methods: The method of the present study was quasi- experimental with a pre-test-post-test design. The sample of the study was a group of 30 children and adolescents with stuttering who were referred to the Mental Psychology Services Center in 2020. A total of 30 Ss' (age=7 to16 yrs., gender=M/F), including 9 females and 21 males responded to CAT-R DeNil and Brutten questionnaire, and their stuttering severity was measured by SSI-4 Railey in the pre-test stage. Clinical interviews were performed to determine if they were not affected by a particular disease. The subjects have been under treatment of the Mind Simulation method for 3 months. Then, they responded to the CAT-R questionnaire again and were measured in the post-test and one month later in the follow up stages. Due to the existing conditions (Corona virus pandemic), all treatment sessions held online via video call.

To test the hypotheses, first the normality of the research variables was examined by Kolmogorov-Smirnov test and Shapiro-Wilk test. Then, statistical methods, One-way Repeated Measure Analysis of Variance for normal variables and Friedman Test for abnormal variables were used in SPSS software version 23 to analyze data.

Instruments

The instruments used to collect data were Stuttering Severity Instrument- 4 (SSI4) and Communication Attitude Test (CAT-R).

The Riley-4 stuttering intensity measuring instrument is one of the most well-known stuttering intensity measuring instruments and has a wide range of clinical and research uses. This tool measures the severity of stuttering in three age groups of preschool children (2-10 months to 11-5 months), school children (6 to 11-16 months), and adults (17 years and older), and measures stuttering in three dimensions of frequency, delay, and accompanying physical behaviors and assess the severity of stuttering based on the frequency of occurring stutter, the duration of verbal spasm's times, and the number of extra movements in other organs while speaking. These were included in the third version as well. In the fourth version, the new dimension adds self-reporting to the intensity measurement, which provides wider assessments of stuttering. Riley performed the instrument SSI4 on 72 preschool children with stuttering with 15 assessors in the United States.[36] The fourth edited version of this test has been translated into Persian[37] According to this instrument, a score of 6-10 refers to very mild stuttering, a score of 11-20 refers to mild stuttering, the score of 21-27 refers to moderate stuttering, 28-35 to severe stuttering, and above 36 refers to very severe stuttering.

Revised Communication Attitude Test (CAT-R): DeNil and Brutten developed the Communication Attitude Test in 1991, which was used for a 2- to 6-year follow-up. This assessment tool includes 35 items on speech-related attitudes. This test is the only measurement that is related to speech attitudes, and research has shown that this test has the power to distinguish stuttering and non-stuttering groups. The total score of this questionnaire is 35, which a score less than 11 shows completely negative attitudes, a score between 11 to 19 shows negative attitudes, scores between 20-24 indicate moderate attitudes, scores between 25-30 implies positive attitudes, and scores greater than 31 refers to completely positive attitudes.

Results

In order to provide a clear picture of the research findings and before entering the test hypotheses, descriptive statistics indicators, including mean and standard deviation, for all research variables are shown in Table 1.

Table 1: Mean and standard deviation of pre-test, post-test, and follow-up scores

Stages	Pre-test		Post-test		Follow- up	
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Communication attitude	14.36	7.77	20.46	8.07	21	6.92
Severity of stuttering	24.93	6.06	16.96	5.90	15.20	5.94
Number of stutters	11.93	3.69	7.83	4.23	7.16	4.09
Delay	6.06	1.92	4.40	1.61	3.80	1.51
Extra movements	7.06	2.24	4.93	1.70	4.40	1.35

Before examining research hypotheses, it is necessary to consider the normality of research variables. Table 2 shows the normality of the research variables (Kolmogorov-Smirnov and Shapiro WilkTests).

Table 2: Assessment of normality of research variables (Kolmogorov-Smirinov and Shapiro Wilk test) Kolmogorov-Smirinov test

Pre-test	Statistics	Sig.	Post-test	Statistics	Sig.	Follow-up	Statistics	Sig.
Communication attitude	0.15	0.07	Communication attitude	0.12	0.20	Communication attitude	0.11	**0.20**
Severity of stuttering	0.09	0.20	Severity of stuttering	0.09	0.20	Severity of stuttering	0.16	**0.05**
Number of stutters	0.14	0.10	Number of stutters	0.18	0.01	Number of stutters	0.15	**0.09**
Delay	0.21	0.002	Delay	0.23	0.0001	Delay	0.22	**0.001**
Extra movements	0.15	0.08	Extra movements	0.18	0.01	Extra movements	0.17	**0.02**
Shapiro Wilk test								
Communication attitude	0.92	0.02	Communication attitude	0.94	0.11	Communication attitude	0.95	**0.14**
Severity of stuttering	0.97	0.58	Severity of stuttering	0.95	0.20	Severity of stuttering	0.95	**0.22**
Number of stutters	0.95	0.15	Number of stutters	0.91	0.01	Number of stutters	0.94	**0.11**
Delay	0.89	0.004	Delay	0.86	0.001	Delay	0.81	**0.0001**
Extra movements	0.94	0.10	Extra movements	0.94	0.07	Extra movements	0.93	**0.07**

As Table 2 shows, most cases are abnormal in the Kolmogorov-Smirinov test, so it makes it impossible to use repeated measures analysis of variance. Therefore, the Shapirovik test is used to check the normality of the data. Among the research variables, the variables of stuttering intensity and extra movements in the pre-test, post-test, and follow-up are normal. Therefore, repeated measures analysis of variance test was used to test the hypotheses related to these variables, and Friedman test was used for other variables. Pillay effect was used to investigate the effect of the mind simulation method on stuttering intensity. The results are shown in table 3.

Table 3: Results of the Pillai effect test in repeated measures analysis of variance for the first hypothesis

Test	Measure	Pre-test (M)	Post-test (M)	Follow-up (M)	p-value	Effect Size (η^2)
Pillai's Trace (Repeated Measures ANOVA)	**Stuttering Severity**	**24.93**	**16.96**	**15.20**	**0.0001>**	**0.80**
Between-Group ANOVA	**Stuttering Severity**	**N/A**	**N/A**	**N/A**	**0.0001>**	**0.92**
Friedman Test	**Stuttering Frequency**	**2.20**	**1.73**	**1.28**	**0.0001>**	**N/A**
Friedman Test	**Stuttering Duration**	**2.82**	**1.77**	**1.42**	**0.0001>**	**N/A**

The statistical analysis results indicated that the mind simulation therapy had a significant impact on reducing the severity of stuttering. According to the Pillai's Trace test, there was a significant difference in the severity of stuttering across the three time points: pre-test, post-test, and follow-up ($p<0.0001$, $\eta^2=0.80$). Additionally, the repeated measures ANOVA showed that the mean stuttering severity scores decreased from the pre-test ($M=24.93$) to the post-test ($M=16.96$) and further to the follow-up ($M=15.20$), and these changes were statistically significant ($p<0.0001$). Moreover, the results of the between-group ANOVA confirmed the effectiveness of the treatment, showing a significant difference between the groups ($p<0.0001$, $\eta^2=0.92$).

The Friedman test results also indicated a reduction in both the frequency and duration of stuttering following the treatment. The mean frequency of stuttering in the pre-test ($M=2.20$) was higher than in the post-test ($M=1.73$) and follow-up ($M=1.28$), and these changes were statistically significant ($p<0.0001$). Furthermore, the duration of stuttering decreased from the pre-test ($M=2.82$) to the post-test ($M=1.77$) and follow-up ($M=1.42$), and the Friedman test results were significant ($p<0.0001$). These results demonstrate that the mind simulation therapy effectively reduced the severity, frequency, and duration of stuttering.

Table 4: Results of the Pillai effect test in repeated measures analysis of variance for the second hypothesis

Variable	Test	Mean (Post-test)	Mean (Follow-up)	Statistical Test	Significance (p-value)
Communication Attitude	Friedman	2.30(Post-test)	2.58(Follow-up)	Chi-Square = 38.91	0.0001 >
Stuttering Severity	Paired t-test	16.97(Post-test)	15.20(Follow-up)	t = 5.77	0.0001 >
Stuttering Frequency	Paired t-test	7.83(Post-test)	7.16(Follow-up)	t = 2.94	0.006
Stuttering Duration	Paired t-test	4.40(Post-test)	3.80(Follow-up)	t = 3.52	0.001
Accessory Movements (Stuttering)	Paired t-test	4.93(Post-test)	4.40(Follow-up)	t = 3.56	0.001
Communication Attitude (Post vs Follow-up)	Paired t-test	20.46 (Post-test)	21 (Follow-up)	t = -0.59	0.55

The analysis of the second hypothesis, which proposed a significant difference in communication attitude scores before and after the mind simulation therapy sessions, revealed crucial findings through the application of statistical tests.

Using the Friedman test, the results demonstrated a significant improvement in communication attitude after the intervention. The mean rank for communication attitude increased from 2.30 at the post-test to 2.58 at the follow-up, with a chi-square value of 38.91 and a significance level of $p < 0.0001$. This substantial improvement indicates that the mind simulation therapy was effective in enhancing communication attitudes over time, suggesting a positive and lasting impact on how individuals perceive and manage their interpersonal communication.

Further analysis using paired t-tests to assess different aspects of stuttering (such as severity, frequency, duration, and accessory movements) showed consistent and significant improvements from post-test to follow-up. The mean severity score decreased from 16.97 at post-test to 15.20 at follow-up ($t = 5.77$, $p < 0.0001$), indicating a meaningful reduction in overall stuttering severity. Similarly, stuttering frequency dropped from 7.83 at post-test to 7.16 at follow-up ($t = 2.94$, $p = 0.006$), stuttering duration decreased from 4.40 to 3.80 ($t = 3.52$, $p = 0.001$), and accessory movements associated with stuttering were reduced from 4.93 to 4.40 ($t = 3.56$, $p = 0.001$). These findings suggest that the mind simulation therapy contributed not only to short-term improvement but also to long-term maintenance of progress in stuttering control.

However, when comparing communication attitude scores between the post-test ($M = 20.46$) and the follow-up ($M = 21$) using a paired t-test, no statistically significant difference was found ($t = -0.59$, $p = 0.55$). While there was a slight increase in the mean score, the result was not significant, implying that after the initial improvement in communication attitude immediately following the intervention, further changes were not observed over the follow-up period. This suggests that while the intervention had an immediate positive impact, the additional follow-up phase did not show further progression in communication attitudes, although no regression was noted.

Overall, these results support the effectiveness of mind simulation therapy in improving both stuttering symptoms and communication attitudes, with sustained benefits over time, especially in reducing stuttering severity and frequency.

Discussion

The data analysis results showed a significant difference between pre-test, post-test and follow up in stuttering severity ($p=0.0001$) and pre-test and post-test in communication attitude ($p=0.0001$). Based on the obtained means, there is a significant difference between the scores of pre-test, post-test and follow-up in all subscales of stuttering severity) delay, frequency and extra movements (at the level ($p = 0.0001$). The severity of stuttering in the research samples in post-test and follow up has decreased compared to the pre-test, and also communication attitude increased in post- test compared to the pre-test.

These findings are consistent with kamarzarin et al (2021) research which showed that the implementation of the mind simulation technique is effective in reducing stuttering and associated problems such as stress, anxiety, and depression. These findings are also in line with some studies that showed a significant reduction in the severity of stuttering as a result of some interventions regardless of the type of intervention, including the research of Shafie et al., Jones et al., and Haris et al. In terms of rhythmic and singing techniques, it is in line with the research of Azami (2018), Abbasnejad (2016), and Jalali and Duffy and Tampline (2005). As Azami showed in a study, teaching rhythmic poems improved working memory function and reduced the severity of stuttering in children with stuttering. Abbas Nejad and Jalali also showed that singing can be effective in reducing stuttering and anxiety in school children. Duffy and Tampline showed that music therapy affects rhythm, speed, stress, and speech timing, thereby reducing the severity of stuttering. Thus, the effect of rhythm therapy, which is included in some simulation techniques, is manifested. The mind simulation method sees the human speech consists of three elements of rhythm, stretch, and continuity, and stuttering is a disorder in these elements that have caused a wrong speech pattern in the brain

and the lack of formation and development of speech skills. In the mind simulation method, a learning context is created for the mind and brain.

The second hypothesis of the study was: There is a significant difference between the scores of the communication attitude test before and after mind simulation sessions and its implementation. As the data showed, the mean scores of communication attitude in the pre-test were lower than the post-test. Therefore, after using the mind simulation method, the communication attitude has improved because the results of Friedman test have been significant and this has shown the effectiveness of the mind simulation method. Therefore, the second hypothesis of the study was confirmed, which means that the communication attitude of people after treatment with the mind simulation method has become more positive. These findings are not in line with the research of Rahimi et al. who showed that there is no significant relationship between the amount of communication attitude and treatment history because it is observed that with the treatment of stuttering and reducing its severity, communication attitude has improved and become more positive. The reason for the discrepancy between the findings of this study and Rahimi et al.'s research may be considered in the difference between the studied age group because Rahimi's research was done on adults over 18 years old. In contrast, these findings are consistent with the studies of Yadegari et al. who showed that there is a significant difference between the communication attitudes of stuttering and normal students and also with the research of Hosseinzadeh et al because, with the improvement of stuttering and more normal speech, the communication attitude of these children and adolescents has become more positive (Hossein Zadeh, 2010). This finding is also consistent with the findings reported by DeNil and Brutten, Hayhow et al., Guttormsen et al., Vanryckeghem et al., and Miller and Watson, who compared the attitudes of the normal and stuttering groups. Various studies have shown that the mind simulation technique, as an innovative therapeutic method, is effective in improving mental and speech disorders. In the study by Kamarzarin and colleagues (2021), the impact of mind simulation on reducing mental symptoms such as anxiety, stress, and depression in patients with stuttering was discussed. In a similar study conducted by Kamarzarin and colleagues (2023), this technique was also effective in treating specific phobias and helped reduce various phobias. Kamarzarin and colleagues (2024) demonstrated that mind simulation effectively reduces stuttering severity and improves overall adaptability, occupational adaptability, and emotional adjustment. Kamarzarin and colleagues (2023) examined the effect of this technique on reducing stuttering severity and improving communication attitudes in children and adolescents, and their results showed a significant reduction in stuttering severity and improvement in communication attitudes.

Communicative attitudes for individuals who stutter refer to their beliefs, emotions, and tendencies towards engaging in communication with others, and they can have a direct impact on the quality and effectiveness of their social interactions. Stuttering may lead to increased anxiety and decreased self-confidence in communication situations. However, research results show that cognitive methods, such as mental simulation, can play a significant role in improving the communicative attitudes of these individuals. On the one hand, mental simulation helps individuals with stuttering to analyze communicative situations before encountering them and to adjust their responses based on the possible reactions of others. This process can enhance empathy, improve mutual understanding, and reduce misunderstandings in daily interactions.

On the other hand, improving communicative attitudes through mental simulation can strengthen communication skills in individuals who stutter. Skills such as active listening, appropriate responsiveness, and creating effective two-way communication can be improved. These attitudinal changes not only strengthen interpersonal relationships but also play a key role in reducing social anxiety related to stuttering and increasing confidence in everyday interactions. From a scientific perspective, improving communicative attitudes for individuals with stuttering involves making changes in thought patterns, emotions, and behaviors, allowing them to perform better in social environments and get more out of their interactions. Therefore, it can be concluded that mental simulation, as an effective tool, can foster more positive communicative attitudes in individuals with stuttering and ultimately improve the quality of their interpersonal relationships.

In comparison with other methods for treatment and decreasing stuttering, the mind simulation method has some specific characteristics: other methods use techniques such as breathing, pausing, or talking like a robot, etc. These models are not natural, that is, these models are not spoken in society in a natural way and the person's speech in these models is very artificial. The mind simulation method analyzes ordinary speech models and breaks them down into elements. In order to learn each of these elements that are similar to normal speaking, there are some exercises and techniques, so that when a stutterer speaks with these techniques, his speech is not much different from a normal speech, so the person does not get stressed and his self-confidence and positive attitude towards speech increase.

The decrease in the number of participants and also not cooperating of some clients with the researcher regularly in the meetings can be mentioned as another limitation. Finally, some suggestions are provided for more and more in-depth research for interested researchers in the future: 1. Carrying out similar research on children with pre-school stuttering; since stuttering is more common among this age group, it makes it possible to conduct research with a larger sample size. 2. Carrying out a similar study among adults with stuttering, since this age group has well-formed personalities and attitudes that are less changeable; a study of this issue can fully determine the effect of the simulation method on improving communication attitudes. 3- It is recommended to do more research on the effect of the mind simulation method on other disorders associated with stuttering, including sleep problems, fear, etc.

Conclusion

The mind simulation method reduces stuttering by making

changes in the way a person speaks normally and regularly and creating a new speech pattern. Also, by using some of the common techniques and methods available and designing how to present them, the person has more control over his speech and thus the person's stuttering is reduced. At the same time, by creating self-confidence, self-steem and a positive feeling about speech, it creates a positive attitude towards communication. According to these results, the mind simulation method helps improve stuttering and communication attitude.

Acknowledgment

This article is derived from Ms. Zahra Fallahi's master's thesis in general psychology under the supervision of Dr. Kamerzarin. We would also like to thank Ms. Akbari, Dr. Shoushtari, Dr. Aliabadi, and Mr. Bigdeli Shamloo, who assisted us in conducting this study, as well as the honored clients who participated in the study for their sincere cooperation.

References

1. Science Daily. Stuttering: New insight on treatment, physiological basis. 2018. Available from: https://www.sciencedaily.com/releases/2015/02/150223154854.htm
2. Cai S, Beal DS, Ghosh SS, Tiede MK, Guenther FH, Perkell JS. Weak responses to auditory feedback perturbation during articulation in persons who stutter: Evidence for abnormal auditory-motor transformation. PLoS One. 2012;7(7):e41830. doi: 10.1371/journal.pone.0041830
3. Drayna D, Kang C. Genetic approaches to understanding the causes of stuttering. J Neurodev Disord. 2011;3:374–380. doi: 10.1007/s11689-011-9090-7
4. Smith A, Weber C. How stuttering develops: The multifactorial dynamic pathways theory. J Speech Lang Hear Res. 2017;60(9):2483–2505. doi: 10.1044/2017_JSLHR-S-16-0343
5. Giraud A, Neumann K, Bachoud-Levi A, Von Grudenberg AW, Euler HA, Lanfermann H, Preibisch C. The severity of dysfluency correlates with basal ganglia activity in persistent developmental stuttering. Brain Lang. 2008;104:190–199. doi: 10.1016/j.bandl.2007.04.005
6. Watkins KE, Smith SM, Davis S, Howell P. Structural and functional abnormalities of the motor system in developmental stuttering. Brain. 2008;131(1):50–59. doi: 10.1093/brain/awm241
7. Jones RM, Conture EG, Walden TA. Emotional reactivity and regulation associated with fluent and stuttered utterances of preschool-age children who stutter. J Commun Disord. 2014;48:38–51. doi: 10.1016/j.jcomdis.2014.02.001
8. Karrass J, Walden TA, Conture EG, Graham CG, Arnold HS, Hartfield KN, Schwenk KA. Relation of emotional reactivity and regulation to childhood stuttering. J Commun Disord. 2006;39(6):402–423. doi: 10.1016/j.jcomdis.2005.12.004
9. Alm PA. Stuttering and the basal ganglia circuits: A critical review of possible relations. J Commun Disord. 2004;37(4):325–369. doi: 10.1016/j.jcomdis.2004.03.001
10. Max L, Guenther F, Gracco V, Ghosh S, Wallace M. Unstable or insufficiently activated internal models and feedback-biased motor control as sources of dysfluency: A theoretical model of stuttering. Contemp Issues Commun Sci Disord. 2004;31:105–122. doi: 10.1044/cicsd_31_S_105
11. Namasivayam AK, Van Lieshout P. Investigating speech motor practice and learning in people who stutter. J Fluency Disord. 2008;33(1):32–51. doi: 10.1016/j.jfludis.2007.11.005
12. Brundage SB, Ratner NB. Linguistic aspects of stuttering: Research updates on the language-fluency interface. Top Lang Disord. 2022;42(1):5–23. doi: 10.1097/TLD.0000000000000269
13. Elsherif MM, Wheeldon LR, Frisson S. Do dyslexia and stuttering share a processing deficit? J Fluency Disord. 2021;67:105827. doi: 10.1016/j.jfludis.2020.105827
14. Gillam R, Marquardt T, Martin F. Communication sciences and disorders—From science to clinical practice. Singular Publishing Group; 2020.
15. Connery A, McCurtin A, Robinson K. The lived experience of stuttering: A synthesis of qualitative studies with implications for rehabilitation. Disabil Rehabil. 2020;42(16):2232–2242. doi: 10.1080/09638288.2018.1555623
16. World Health Organization. International Classification of Diseases. 2024. Available from: https://icd.who.int/browse/2024-01/mms/en#654956298
17. Yairi E, Ambrose N. Epidemiology of stuttering: 21st century advances. J Fluency Disord. 2013;38(2):66–87.
18. Erickson S, Block S. The social and communication impact of stuttering on adolescents and their families. J Fluency Disord. 2013;38(4):311–324.
19. Ward D. Stuttering and cluttering: Frameworks for understanding and treatment. 2nd ed. Hove and New York: Psychology Press; 2018.
20. Carter A, Breen L, Yaruss JS, Beilby J. Self-efficacy and quality of life in adults who stutter. J Fluency Disord. 2017;54:14-23. doi:10.1016/j.jfludis.2017.09.004.
21. Nang C, Hersh D, Milton K, Lau SR. The impact of stuttering on development of self-identity, relationships, and quality of life in women who stutter. Am J Speech Lang Pathol. 2018;27(3S):1244-1258. doi:10.1044/2018_AJSLP-ODC11-17-0201.
22. Norman A, Lowe R, Onslow M, O'Brian S, Packman A, Menzies R, Schroeder L. Cost of illness and health-related quality of life for stuttering: Two systematic reviews. J Speech Lang Hear Res. 2023;66(11):4414-4431. doi:10.1044/2023_JSLHR-23-00072.
23. Bernard R, Hofslundsengen H, Frazier Norbury C. Anxiety and depression symptoms in children and adolescents who stutter: A systematic review and meta-analysis. J Speech Lang Hear Res. 2022;65(2):624-644. doi:10.1044/2021_JSLHR-21-00236.
24. Werle D, Byrd CT. College professors' perceptions of students who stutter and the impact on comfort approaching professors. J Fluency Disord. 2021;67:105826. doi:10.1016/j.jfludis.2020.105826.
25. Zeigler-Hill V, Besser Y, Besser A. A negative halo effect for stuttering? The consequences of stuttering for romantic desirability are mediated by perceptions of personality traits, self-esteem, and intelligence. Self Identity. 2020;19:613-628. doi:10.1080/15298868.2019.1645729.
26. Gerlach H, Totty E, Subramanian A, Zebrowski P. Stuttering and labor market outcomes in the United States. J Speech Lang Hear Res. 2018;61:1649-1663. doi:10.1044/2018_JSLHR-S-17-0353.
27. Yadegari F, Daroui A, Farazi M, Alipour Heidari M. Communication attitude of stuttering students and non-stutters. J MEJDS. 2005;11(1):100–102.
28. DeNil LF, Brutten GJ. Speech-associated attitudes of stuttering and non-stuttering children. J Speech Lang Hear Res. 1991;34:60–66.
29. Kamarzarin H, Golestani A, Kordmirza A. Applied Specialized Glossary of Psychology. Tehran: Avaye Noor Publications; 2021.
30. Kamarzarin H, Beygi M, Bigdeli M. The Effectiveness of Mind Simulation on Soccer Skills Training in

Adolescents. ACSTM, virtual conference Dubai 2021; Nov 20–21.
31. Bigdeli Shamloo, M. .Mind Simulation Knowledge, Mind Language, Programming Language of the Mind: A definitive treatment for stuttering and intelligent football. Ahvaz: Ayat(2017). Press. ISBN 978-964-6474-07-9.
32. Blood GW, Blood IM, Maloney K, Meyer C, Qualls CD. Anxiety levels in adolescents who stutter. J Commun Disord. 2007;40(6):452–469.
33. Saeidmanesh M, Nejad Akbai Ravari F. Effect of speech therapy in conjunction with stress management via cognitive behavioral therapy on adult stuttering. J MEJDS. 2016;7(13).
34. Merlo S, Briley PM. Sleep problems in children who stutter. J Commun Disord. 2019;82:105935. doi: 10.1016/j.jcomdis.2019.105935
35. Ghoreishi FS, Assarian F, Sepehrmanesh Z, Ahmadvand A, Etesam F. Comorbidity of mental disorders among the stuttering children referred to speech therapy department of Akhavan hospital in Kashan. Feyz J Kashan Univ Med Sci. 2012;16(2):182–187.
36. Railey G. Stuttering severity instrument for children and adults (SSI-4). 4th ed. Austin, TX: PRO-ED, Inc.; 2009.
37. Tahmasebi Garmatani N, Shafie B, Feizi A, Salehi A, Howell P. Determination of the reliability of the Stuttering Severity Instrument-fourth edition for specific adults who stutter. J Res Rehabil Sci. 2012;8(4):1–7.