



The effect of drama therapy on working memory and its components in primary school children with ADHD

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Abstract

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders among children and is correlated with several consequences such as working memory impairment. The present study aimed to determine the effect of drama therapy on working memory and its components in primary school children with ADHD. This study was quasi-experimental with pre-test, post-test, and control group design. The statistical population of this study was primary school students diagnosed with ADHD in Isfahan, Iran, during the academic year of 2017–2018. For the purpose of the present study, 45 students were randomly selected and assigned to experimental ($n = 21$) and control ($n = 24$) groups. It should be mentioned that the total number of the experimental group was 24 at the outset of the study; however, the number reduced to 21 due to attrition. The working memory was measured in pre- and post-intervention phases by the working memory subscales of the Wechsler Intelligence Scale for Children-Fourth Edition. The experimental group participated in a 12 session intervention (each 90 min) during 6 weeks, while the control group received no intervention and the collected data were analyzed using MANCOVA. The results revealed a significant difference between the working memory performance of students in the experimental and control groups ($p \leq .05$). The experimental group showed significant changes in their working memory, compared with the control group. In fact, the findings confirm that drama therapy can be effective in improving working memory whose deficit is one of the outcomes of ADHD.

Keywords Drama therapy · Working memory · ADHD · Primary school children

Introduction

Attention-Deficit/ Hyperactivity Disorder (ADHD), classified in the Diagnostic and Statistical Manual of Mental Disorders as one of the neurodevelopmental disorders (Ganji 2016), is a neuro-behavioral syndrome that starts in childhood and includes attention deficit, hyperactivity, and reactivity incompatible with the developmental level of the individual (Miller and Hinshaw 2014). According to the American Psychiatric Association (2013), in most societies and cultures, approximately 5% of children and 2.5% of adults suffer from ADHD. This percent is much higher in males than females so that in children, the male

to female ratio is 2:1, and in adults, this ratio is 6:1. Meanwhile, it is estimated that in half of the children with ADHD, the symptoms continue through adolescence and into adulthood, and about 30% of them will not be able to complete their high school (Barkley 1994; Hermens et al. 2004).

This debilitating disorder correlates with several negative consequences. Oftentimes, these negative consequences have been repeatedly experienced by these children, and the harmful effect of hyperactivity in shaping these outcomes is proven in children with ADHD diagnosis (Patros et al. 2017). ADHD obviously results in multiple heterogeneous neurocognitive impairments including a malfunction in executive performance. The strongest evidence of deficits exists for response inhibition, three-dimensional working memory, and attention deficit; besides, there are deficits in non-executive functions including three-dimensional short-term memory, visual memory, and hypervigilance. It has also been proved that ADHD is associated with cognitive impairment and energy dysregulation which can lead to slow movement processes and low hypervigilance, resulting in poor executive functions performance (Lin and Gau 2017). Evidence confirmed that working

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memory deficit is one of the main deficits in ADHD (Rapport et al. 2001) and the specific neural network and functional anatomy of working memory processes in ADHD can be attributed to the pathophysiology of attention-deficit/hyperactivity (Massat et al. 2012).

Working Memory and ADHD

Working memory temporarily keeps the information and work on it, even in the absence of the main stimulus (Khademi et al. 2013). The working memory potentials in children account directly and indirectly for various academic, occupational and functional outcomes manifested by impulse control, and strategic games' skills (Wells et al. 2018). The child needs to recall the past to estimate the future. Such a process requires some kind of "online memory", i.e., working memory. Therefore, the defective process of working memory will exert a profound effect on the persistence of academic failures and some behavioral problems (Barkley 1998).

The working memory model of attention-deficit/hyperactivity proposed by Rapport et al. (2008) suggest that deficit in working memory is among the major causes of ADHD. Therefore, it can be stated that wherever working memory is required more, hyperactivity increases in children with ADHD, and this coincides with an increase in behavioral problems (Patros et al. 2017).

Although a relatively small number of studies have investigated the relationship between ADHD and working memory as well as self-control processes, findings indicated that ADHD is highly correlated with working memory impairment in children (Wells et al. 2018). Porrino et al. (1983) assessed the rate of motor activity (by accelerometer) and compared a group of hyperactive boys with a healthy control group in different natural settings (such as home and school). It was predictable that the activity rate of hyperactive boys was significantly higher than that of normal boys in all settings. Furthermore, the comparison between healthy children and those with ADHD showed that the activity level of children with hyperactivity is disproportionately much more in math and English classes than lunchtime, break time and sports class, which might be due to the fact that math, reading and writing assignments require the use of working memory processes, such as the need to preserve, manipulate and accurately process information.

The results of a study by Stevens et al. (2002) revealed that children with ADHD had deficits in inhibitory control, working memory, and short-term memory, compared with the normal children. However, the groups did not differ in their responsiveness to external reinforcement. Holmes et al. (2010) compared the effect of a training program and stimulant medication on the working memory of children with ADHD. The results revealed that "While medication significantly improved visuospatial

memory performance, training led to substantial gains in all components of WM across untrained tasks" (p. 1). Kofler et al. (2018) compared the effect of Central Executive Training (CET) and Behavioral Parent Training (BPT) on working memory of children with ADHD. The results revealed a greater improvement in the CET group.

In general, working memory deficit is directly related to hyperactive behavior, attention deficit, and distraction, and might lead to the behavioral problems for those with ADHD (Wells et al. 2018). Therefore, the lack of proper and timely treatment can lead to problems and academic failures for these children (Mikami 2010).

ADHD Treatment

Although drug therapy for this disorder has always been a priority owing to its high effectiveness, it should be noted that drugs, especially stimulant drugs, have adrenergic and side effects such as increased blood pressure and heart rate. Moreover, despite the effect of the drugs on reducing hyperactivity, distraction, impulsivity and irritability in most patients, there is no evidence that they directly reduce memory impairment and improve children's learning problems (Sadock 2015) and also there are still some questions about the role of these drugs in the treatment of special groups, such as young adults. The concerns of many parents about the long-term use of these drugs also reveal the need for non-pharmacological treatments (Emadian et al. 2015; Sadock 2015). In the meantime, the results of previous studies show the positive effects of group therapy on different dimensions of the lives of children with ADHD, especially on the boys with this disorder (Sadock 2015).

Drama Therapy

Drama therapy, which is a type of art therapy and is a form of group treatment, uses the application of drama in the therapy. This is a new therapeutic theory with ancient roots linking back to ancient Egypt, Rome, and Greece (Weber and Haen 2005). As its name suggests, drama therapy means treating by drama, in which the patients gain the proper inner insights with the help of the drama structures. Besides, through social exposure, they can perceive emotions related to a particular place or a specific time as real and subjective (Jennings et al. 2005).

The drama approach, which is built on group dynamics and experiential learning, uses the improvisational role-playing of the themes which are often indirectly related to the students' real-life problems. Furthermore, the drama focuses on collective creation which is commonly appealing to children (Walsh-Bowers 1992). As stated by Kivnick and Erikson (1983), participating in drama requires a balance of spontaneity and

concentration. It also necessitates not only the controlled emotional expression but also concentration and undivided attention to the quality of performance, as the lack of concentration hinders creativity. Furthermore, the rationale behind such therapies is that a similar group experience in the creative arts might help referred students to better handle their developmental stresses because participating in artistic activities is by its very nature therapeutic (Kivnick and Erikson 1983).

Drama therapy employs various techniques, such as shows, pantomime, puppet shows, masks, improvisations, and performances, in order to achieve its goals. Here, the therapist is not just an analyst. In addition to expertise in psychology and counseling, he must certainly be trained in many theatrical techniques such as acting, theater directing, and even playwriting. Drama therapy techniques are used for all people with various kind of needs; therefore, this is the therapist that chooses the most appropriate techniques, depending on the degree of the problem and the needs of the patient (Morstad 2003).

Since drama therapy can objectively represent many mental activities, and also because of the attractiveness, indirectness of the training and the improvement of attention through the enjoyable drama, learning is accelerated (Moneta and Rousseau 2008). In addition, many education professionals regard drama therapy as an appropriate tool that helps to adapt with school curricula, and it is a therapy that helps to prevent the occurrence of problems in children entering adolescence (Walsh-Bowers 1992). Walsh-Bowers (1992) conducted a non-randomized, controlled trial including 84 grade-six students in the intervention group and 20 grade-six students from another school in the control group. This study aimed to ease adolescents' adjustment to school transition. For this purpose, 14 drama in-class sessions (in three small groups) were implemented by an academic social worker, a counselor, and the school teachers. The intervention group students, as claimed by teachers, deteriorated less than the control group students with regard to school performance following transition and the parents' ratings revealed greater social strength in the intervention group. The author stated that drama therapy led to improvement in social skills owing to the students' development through experiential learning, the development of peer relations' skills and the social-emotional skills and potentials which is in line with the cognitive social problem-solving model (Hepler and Rose 1988). In general, when a child takes on a role, he takes on his character in that role and shows a part of his character in the role he takes. Also, when he uses clothes, masks, and dolls, his objective experience and understanding increase as well (Morstad 2003).

Drama Therapy and Working Memory

Working memory function might be directly related to the role theory through stimuli development and modeling. In

discussing the relationship with the counter role, in playing a role, Landy (2008) defines the process of creative pairs who are intrinsically dynamic in terms of distancing and approaching each other in accordance with the situational needs. The counter role plays an important part in determining and selecting a role. Since the counter role is not objective, its creation is the result of the individual's mental experience. Such decision making is guided by various options such as schematic data or the system of the counter role (Frydman 2016). In addition to the concept of role, role play (the imposition of a specific role) can be explained through working memory processes (Hofmann et al. 2012).

However, studies that specifically investigated the effect of drama therapy on working memory are still scanty. Frydman (2016) investigated and proved the relationship between role theory and executive functions. Frydman (2017) investigated the interactive effect of drama-based therapeutic approaches and developmental transformations in a wider cognitive context and succeeded in developing a cognitive model for developmental transformations. O'Rourke (2016) investigated the role of drama therapy in the prevention of Alzheimer's disease and Dementia in at-risk individuals. The results revealed the beneficial effect of this therapy owing to the incorporation of physical movement and cognitive stimulations in this approach. Sepanta et al. (2016) investigated the efficacy of drama therapy in reducing the behavioral problems of children with ADHD. The results revealed a significant reduction in such problems.

In general, drama therapy, which is the systematic use of theater and plays in a therapeutic process, is highly valued because of its educational and therapeutic merits since it is a systematic and cooperative rather than a competitive treatment; therefore, there is no fear of failure and pressure to win and it can enhance the strengths of the child and support him. Besides, the visual nature of drama improves recognition and attention in children (Roy and Dock 2014). However, despite the congruity between drama therapy and the nature of the children, such treatment has been less frequently used in Iran, compared with other methods (Bayati et al. 2011); therefore, the present study aimed to investigate the effectiveness of drama therapy in the working memory and its components in the primary school children with ADHD.

Method

The present study was quasi-experimental with pre-test, post-test, and control group design. The statistical population included all primary school girls and boys with ADHD diagnosis in the academic year of 2017–2018 in the six educational regions of Isfahan, Iran. After obtaining the permission and getting the referral letter from the Education Directorate of Isfahan, two educational regions were randomly selected (regions 4 and 5) and then from these two regions, two

elementary schools for girls and two elementary schools for boys were randomly selected from the list of primary schools in these regions. From these schools, the students were evaluated for ADHD by a psychiatrist. As a result, a total of 94 boys and 68 girls were identified; however, following a clinical evaluation, 29 boys and 18 girls were excluded due to the use of psychiatric medications or the invalidity of the diagnosis. Then, 48 students were selected through convenience sampling and randomly divided into experimental and control groups (each including 24 students). Eventually, due to attrition, 21 students remained in the experimental group (10 boys and 11 girls), but the control group had no attrition (12 boys and 12 girls). The inclusion criteria were: the ADHD diagnosis based on DSM criteria and by a psychiatrist (to further ensure the correct diagnosis, the researchers interviewed the children's parents based on DSM 5 criteria, i.e., the parents were questioned about their children's behavior. Taking these two sources of information together, the researchers ensured a correct diagnosis.), lack of significant physical (such as chronic heart disease, pulmonary disease, cancers, etc.), sensory (blindness or deafness) or motor impairment (paralysis of each of the motor organs), age range of 6 to 12 years, attending regular schools (from the first to the sixth grade), having normal intelligence, parents and children's consent for participation in research and not using psychiatric medications over the last year. The exclusion criteria were children's unwillingness and parents' disagreement to participate in or continue the study, and the absence of more than two sessions.

As mentioned above, the number of participants in the experimental group was reduced to 21, that is, three students left the study. Of these three, one was a grade one boy who left the study since his family moved to another city. The second one was a grade six girl whose parents were no longer interested in her participation in the treatment sessions and the third one was a grade five boy who was excluded by the researchers due to severe seizures leading to recurrent hospitalization which were not mentioned by his parents at the outset of the study.

Instruments

Interview Interviews with children participating in the research and their parents were conducted to obtain information regarding their demographic characteristics.

Wechsler Intelligence Scale for Children – Fourth Edition Wechsler Intelligence Scale provides five primary index scores, namely Verbal Comprehension, Visual-Spatial, Fluid Reasoning, Working Memory, and Processing Speed index. Wechsler (2003) used the split-half method to estimate the reliability of the subscales and IQs and used the test-retest method for coding, symbol search, and cancellation subscales since they are speed tests.

The working memory subscale which was used in the present study includes digit span, letter-number sequencing and an optional subtest of arithmetic. This scale was translated and validated in Iran by Sadeghi et al. (2011) and the total scale validity was .97. The highest validity index was for verbal comprehension (.94) and the lowest was for processing speed (.88). Fathi Ashtiani et al. (2016) estimated the split-half reliability for the subtests which were: .72 for letter-number sequencing, .71 for digit span, and .74 for arithmetic. The reliability estimates of the subtests obtained by test-retest for the present study were: .72 for letter-number sequencing and .71 for digit span. It needs to be mentioned that the digit span test can be administered either forward or backward and each type includes 16 digit chains and the letter-number sequencing test includes 30 mixed chains of letters and numbers.

Procedure

Drama therapy was implemented by the first researcher of the study. She has been working as an actress and a playwright and has studied some books on drama therapy and completed a drama-therapy course. The experimental group received drama therapy intervention during 12 sessions of 90 min. The sessions' content, including the selection of exercises, games and play scripts was determined with the aim of strengthening the working memory of the participants. Eventually, at the end of the 12th session, the working memory test was taken from both experimental and control groups. It should be noted that throughout this period, the control group did not receive drama therapy intervention and only attended school. The content of the intervention sessions is as follows (Table 1).

The ethical issues considered in conducting this study were: obtaining parents and children consent to participate in the study and informing them about the research objectives, ensuring the confidentiality of the information obtained from the participants and anonymity, not imposing costs on families by holding a free intervention program, holding group meetings in accordance with the schooling hours and avoiding any educational losses, giving children freedom to participate in the intervention sessions, and commitment to provide intervention for the control group in the case of its effectiveness. In the end, the data were analyzed using analysis of covariance (MANCOVA).

Pre-test scores were the covariate and the study aimed to compare the experimental and control group scores on the two dimensions of working memory, namely digit span, letter-number sequencing (mentioned in the instrument section) following the end of the treatment.

Table 1 Drama therapy intervention based on the five-stage integrated pattern of Emunah (1994)

Sessions	Session content
1	The beginning of the meeting and introduction; Warm up (relaxing with music); expressive exercises (with lyrics); imagination exercises (imaginary journeys); memory and concentration exercise; reading the summary of plays by the researcher
2	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (rhythmic movements); expressive exercises (breathtaking and uttering sounds and phonemes); imagination exercise (performing a verb); memory and concentration exercise (game of moving objects); reading and analyzing roles; talking about dialogues; getting out of the role
3	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (imitating animals' movements); expressive exercises (repeating lyrics with different tones of voice); imagination exercise (painting on an imaginary canvas); memory exercise (game of continuing sentences); starting performance; talking about dialogues; getting out of the role
4	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (changing the direction by hearing a sound); expressive exercises (uttering sounds); imagination exercise (smelling imaginary smells); memory exercise (frequently repeated game); starting performance; talking about dialogues; getting out of the role
5	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (imitating the researcher movements); expressive exercises (correct breathing and repeating difficult sentences); imagination exercise (imaginary walking on a hot surface); memory and concentration exercise ("what is lost?" game); starting performance; talking about dialogues; getting out of the role
6	Starting the session and reviewing the previous week; class grouping (arranging the class collaboratively and preparing the scene); Warm up (performing the reverse movements); expressive exercises (group singing); imagination exercise (eating a worm bitten apple); memory and concentration exercise (drawing visible objects); starting performance and changing roles; talking about dialogues; getting out of the role
7	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (changing the direction by hearing a sound); expressive exercises (correct breathing and uttering words); imagination exercise (smelling different imaginary smells); memory and concentration exercise (naming foods and numbers every other turn); reading the summary of the play by the researcher
8	Starting the session and reviewing the previous week; class grouping (arranging the class collaboratively and preparing the scene); Warm up (hand movement with music rhythm); expressive exercises (correct breathing and uttering sounds); imagination exercise (eating something sour); memory and concentration exercise (exact description of an object); reading the play and role analysis
9	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (multi-step movements); expressive exercises (repeating the lyrics with different tones of voice); imagination exercise (purposeful painting on an imaginary canvas and guessing others' paintings); memory and concentration exercise (performing the details of a job); starting performance and talking about roles; getting out of the role
10	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (changing the way of walking by the change in music); expressive exercises (improvisation); imagination exercise (being in a cold weather); memory and concentration exercise ("to which city I want to go?" game); continuing performance; talking about roles; getting out of the role
11	Starting the session and reviewing the previous week; arranging class (arranging the class collaboratively and preparing the scene); Warm up (stretching exercises); expressive exercises (dubbing a clip); imagination exercise (penalty, jump rope workout); memory and concentration exercise ("which word is missed?" game); ending performance and changing roles; talking about roles; getting out of the role
12	Starting the session and reviewing the previous week; class grouping (arranging the class collaboratively and preparing the scene); Warm up (stretching exercises); playing a show for parents; talking about the work flow from beginning to end; appreciating participants and saying goodbye

Results

The results of the pre- and post-test scores of working memory are presented in the following table (Table 2).

As can be seen in Table 2, the mean of the experimental group increased around 24 points in the post-test while such an increase was about 4 points in the control group. Furthermore, the standard deviation of the experimental group decreased from pre-test (10.16) to post-test (6.84).

As stated before, analysis of covariance was used for data analysis. Prior to the analysis, the following assumptions were checked. The Kolmogorov-Smirnov test was used to check the normality of assumptions ($p = .20$); Levene's test was used to ensure the

homogeneity of variance ($p = .12$) and Box's M test was used to check the equality of multiple variance-covariance matrices ($p = .05$). The findings revealed that all the assumptions were met.

Table 3 shows that after controlling for the pre-test effect on the dependent variable and considering the F value, a significant difference exists between the means of the working memory scores by group membership (experimental and control groups) in the post-test ($p < .005$). Eta squared indicates that 69% of the changes in the experimental group is due to the treatment effect, and the value of test power indicates the adequacy of the sample size. Therefore, it can be concluded that "drama therapy" significantly influenced the working memory of primary school children with ADHD.

Table 2 Mean and standard deviation of pre- and post-test scores of working memory

Group	N	Pre-test		Post-test	
		M	SD	M	SD
Experimental control	21	101.86	10.16	125.86	6.84
	24	93.25	12.16	97.25	13.01

The result of investigating the influence of drama therapy on the components of working memory are presented below (Table 4).

As can be seen in Table 4, a significant difference exists between the experimental and control groups in digit span and letter-number sequencing tests. The Eta squared value signifies that the intervention accounts for 69% of this difference; furthermore, the test power value confirms the adequacy of the sample size.

The results of Tables 5 and 6 further reveal the difference between the two groups in the components of working memory test. As can be seen in Table 5, the experimental group obtained higher means in the two working memory dimensions and the eta squared (Table 6) values of .66 for digit span test and .44 for letter-number sequencing test reveal the significant effect of drama therapy on the components of working memory test in children with ADHD.

Discussion

The findings of the study revealed the significant influence of drama therapy on both working memory and its components in primary school children with ADHD. Though research in this area is still scanty, the findings might be partially supported by the findings of Frydman (2016, 2017) and Sepanta et al. (2016).

Since working memory is a part of the cognitive pattern and thinking depends on it, psychologists attempt to improve it and also try to improve the linking between working memory with ADHD and also their interactions (Massat et al. 2018). As stated by Porrino et al. (1983), the increasing need for working memory and self-control processes increases motor activity in children with ADHD. The same finding was reported by Rapport et al. (2008). These findings firmly support the theory assuming a strong relationship between ADHD and the need for working memory. A child with ADHD is commonly born

with neurological constraints that cause his initial interactions with those around him difficult. Therefore, early and continuous interventions can greatly help to overcome these limitations (Sadock 2015). Furthermore, the function of working memory is directly related to the role theory which focuses on the development of the stimuli and pattern classification. Considering the concept of the counter role, since the counter role is not an objective reality, its creation is the result of an individual's mental experience (Frydman 2016).

When a role is developed, one has to consider the time required to activate it. This ability, commonly known as planning, gives an individual the goal-oriented information organization capability. When the right situation arises, the chosen role, which has already been well thought out and investigated, will be performed. The ability to regulate events and associate them with consciousness paves the way for reordering the events and ideas which, in turn, leads to self-consciousness (Smith 2002). The child is able to redefine his roles by reviewing his past actions and, as a result, fosters his awareness. With this awareness, he controls his flexibility and ultimately becomes more adaptive in behavior and action. As a result, the planning capacity of working memory actualizes (Frydman 2016). Furthermore, given that drama therapy is a systematic treatment based on collaboration, rather than competition, there is no fear of failure and pressure to win. Therefore, it can enhance the child's strengths and support him.

The intervention used in the present study was based on the Emunah (1994) therapeutic model and comprised of 1) Preparations: including sports exercises, preparation games, and phonemic and verbal exercises; 2) role play: including imagination exercises, pantomime and play performance, according to the script, and 3) role analysis. In line with the purpose of the study, in all of the above steps, we attempted to select the exercises that target the working memory of the students. Therefore, it might be possible to claim that the selection of sports exercises and activities, which do not create a competitive environment of winning or losing, and mainly target attention and concentration, such as coding and assigning each move to a code or reversing the movements under the careful consideration and consultation with physical education specialists, can directly or indirectly (through increased attention and concentration) enhance the working memory of the participants.

Furthermore, it might be claimed that choosing games such as passing sentences to the next individual, or identifying friends while eyes are closed and guessing the changes in

Table 3 Results of analysis of covariance of working memory in experimental and control groups in post-test

Source	Sum of squares	df	Mean square	F	Sig.	Eta squared	Test power
Pre-test	2613.10	1	2613.10	49.43	.00	.54	1
Group membership	4993.04	1	4993.04	94.46	.00	.69	1

Table 4 Multivariate Analysis of Covariance (MANCOVA) results

Effect	Value	F	Hypothesis df	Error df	Sig.	Eta squared	Test power
Wilks' Lambda	.30	45.59	2	40	.00	.69	1

the class, has enabled the participants to willfully and calmly engage in working memory exercises. However, we might not ignore the direct and indirect role of exercises, such as repeating sentences in alphabetical order used in verbal exercises, in the actualization of the therapeutic goals. However, the researchers of the present study believe that role-playing was the turning point of the intervention efficacy. For example, when children were asked to perform the details of a job, they were required to retrieve the details of that job from their memory and keep them in their working memory during this exercise.

However, a more important factor might be the drama script, as stated by Crimmens (2006). As it was the case with the present study, the scripts were written with the objectives of the intervention (working memory and its components) in mind. It can be said that the use of lyrics, rhythmic expressions, and proverbs in the scripts of the plays affected the ability and capacity of the students' working memory. As an example, somewhere the students were asked to put together short, common, and concise phrases and utter them one after another. Such performance requires not only the memorization of all of these phrases, but they also had to be aware of their turn to avoid repeating the phrase already uttered by another actor. Therefore, it is likely that the factors such as rhythm, awareness of the order of phrases, and focusing on memorizing the role and not uttering repetitive phrases, in a fun game (drama) and an atmosphere free from anxiety and fear of a negative outcome lead to greater motivation for students to get prepared to carry out exercises designed to strengthen their working memory.

Furthermore, in certain situations, the proverbs that matched that situation were used and immediately after the introduction of that proverb, the scene of the show was changed and the story related to that proverb was performed, as an interlude at the heart of the original drama. Therefore, each participant should not only be prepared for a variety of roles and names, but must also be careful about memorizing

the roles and names of the other individuals, and this is perhaps the place where the factor of the interaction between working memory and drama is added. Finding the frequency of the use of the selected proverbs in the real-world situations by students might be the evidence of the success and the effect of the drama intervention on their working memory and finally, reviewing the previous week (conducted at the beginning of each session) and discussing the role and drama (conducted at the end of each session) can further increase the efficacy of such intervention since the participants are required to concentrate and involve their working memory, in a non-competitive and anxiety-free setting.

With regard to the implications of the study, the findings of the present study indicated that drama therapy was effective in working memory which plays an important role in the learning process and increases academic performance. Furthermore, as it was mentioned in the paper, working memory impairment is closely related to the behavioral problems such as hyperactive behavior; therefore, drama therapy can be used as a supplementary activity in kindergartens, summer classes and even during the school year, with the goal of increasing the level of working memory performance and thus improving academic performance and reducing its associated problems. Drama therapy can be used as an effective group therapy which can reduce the ADHD treatment costs, especially with regard to improving working memory. It can also be used by teachers in various courses, especially those in which working memory plays a more significant role.

In addition, since the major clinical ADHD symptoms are attention deficit and hyperactivity (hyperactive behavior), it should be noted that the positive effect of drama therapy on attention deficit, as one of the dimensions of behavioral problems, was confirmed in this study. This finding is consistent with that of Wells et al. (2018). However, considering hyperactivity, Wells et al. (2018) and Patros et al. (2017) were the only researchers who investigated the relation between working memory and hyperactivity and concluded that hyperactive

Table 5 Descriptive statistics of the two working memory dimensions

Variable	Group	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Digit span	Experimental	19.38	.57	18.23	20.53
	Control	13.16	.53	12.09	14.24
Letter-number sequencing	Experimental	18.52	.91	16.67	20.37
	control	11.91	.85	10.18	13.64

Table 6 Multivariate Analysis of Covariance (MANCOVA) results for working memory dimensions

Source	Sum of squares	df	Mean square	F	Sig.	Eta squared	Test power
Digit span	275.92	1	275.92	82.51	.00	.66	1
Letter-number sequencing	219.58	1	219.58	32.99	.00	.44	1

behavior increases when working memory is more involved in doing a task and that improving the working memory performance in such cases results in less hyperactive behavior. It should be mentioned that the parents and teachers of the children participated in this study reported less hyperactive behavior; however, since hyperactivity was not an independent variable in this study, strong claims cannot be made in this regard.

Though no similar studies were found to support the finding of the present study regarding the increase in working memory capacity by drama therapy, researchers used other interventions to improve the working memory of different groups of children and adolescents. For instance, Hardy et al. (2011) reported that Computerized Cognitive Training (CCT) improved working memory and attention skills of children who survived cancer. Gray et al. (2012) investigated a group of 12- to 17-year olds with LD/ADHD divided into the two groups of computerized intervention programs: working memory training (Cogmed RM) and math training (Academy of Math). Adolescents in the WM training group made greater improvements in a subsets of WM, compared with the math-training group. Similarly, Chacko et al. (2014) used Cogmed Working Memory Training (CWMT) for 7- to 11-year old school-age children with ADHD whose result revealed greater improvements in verbal and nonverbal working memory storage of this group of children.

Considering limitations, the study was limited to students with ADHD aged between 6 and 12. Therefore, the findings might not be generalizable to other age groups, owing to the differences in developmental and cognitive characteristics and personality traits. In addition, this age range covers a major developmental spread and there might be developmental differences among the individuals participated in this study, yet age was not considered as an independent variable. Furthermore, this study was limited to children with ADHD; therefore, generalizing the findings to other children, either normal or with other disabilities, should be avoided. The play scripts used in the drama-therapy sessions were culturally localized, thus the findings might not be generalizable to other cultural groups and settings.

The participants of the present study were selected from the children attending regular schools. That being so, care should be exercised in generalizing the findings to the students who are studying in special schools (such as gifted students, mentally retarded students or students with sensory-motor disabilities). Besides, though the therapist who conducted the drama

therapy sessions completed a drama-therapy course, implementing drama therapy necessitates more extensive training and knowledge in this field, and the final limitation of the present study was that the treatment sessions ended before summer vacation and the researchers had no access to the participants during summer to conduct the follow-up stage of the study.

Future researchers are recommended to conduct a follow-up at least three months following the end of the intervention to measure the sustainability of the working memory improvements. Also, the same study should be repeated using a larger sample size.

Conclusion

Regarding the abovementioned points and considering the brain flexibility and the neuropsychological benefits and the positive affect implied in drama, it might be concluded that teaching cognitive and neuropsychological components included in drama therapy sessions not only improves and increases the level of working memory functioning, but it can also be considered as an early cognitive and neuropsychological intervention prior to the secondary school.

Drama is an appropriate therapeutic technique for children, because they can acquire the target stimuli, learn the controlling skills, including the skills to control visual and auditory stimuli, and get acquainted with body language since a child-centered drama therapy aims to enhance self-efficacy, self-actualization, and self-esteem; furthermore, the content is tailored to the working memory component, through the inclusion of games, role plays, imagination and visualization.

In conclusion, one of the major components of academic performance is having an age-appropriate working memory to make the child capable of following his teacher's instructions, copy content from the board and summarize the content. Therefore, drama therapy, among other therapeutic techniques, might help to improve the working memory performance of children, especially those with ADHD.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there are no conflicts of interest.

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