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The Effectiveness of Dialectical Behavior Therapy on Cognitive Flexibility and Alexithymia in Aggressive Adolescents

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A B S T R A C T

Objective: Intense emotions following physical, psychological, and cognitive changes in adolescents may lead to aggression. Aggressive adolescents, due to negative experiences in relationships, are at risk for multiple psychological problems. Therefore, the present study aimed to investigate the effectiveness of dialectical behavior therapy on cognitive flexibility and alexithymia in aggressive adolescents.

Methods and Materials: This quasi-experimental study employed a pre-test, post-test design with a control group. The statistical population included all high school students (grades 1 and 2) in Shahdad County during the 2021-2022 academic year. Thirty students were selected using convenience sampling from these schools, having scored higher than 78 on the Buss-Perry Aggression Questionnaire. Out of these, 30 students were randomly assigned to experimental (n=15) and control (n=15) groups. The research instruments included the Cognitive Flexibility Inventory (Dennis & Vander Wal, 2010), the Toronto Alexithymia Scale (1994), and the Buss-Perry Aggression Questionnaire. Multivariate analysis of covariance (MANCOVA) was used to analyze the data using SPSS-26 software.

Findings: The findings indicated that dialectical behavior therapy had a significant effect on cognitive flexibility and alexithymia in aggressive adolescents ($p<0.005$).

Conclusion: Considering the effectiveness of dialectical behavior therapy on cognitive flexibility and alexithymia in aggressive adolescents, the implementation of intervention methods based on dialectical behavior therapy, particularly for emotional regulation and increasing cognitive flexibility, is recommended in schools and for high school students.

Keywords: *Dialectical Behavior Therapy, Cognitive Flexibility, Alexithymia, Adolescents, Aggressive.*

1. Introduction

Aggression is one of the most common problems among adolescents and a significant reason for their referral to counseling and psychotherapy centers (Healy et al., 2020). Aggression refers to intentional behavior (verbal or non-verbal) that leads to personal, psychological, or physical harm to oneself and others for the purpose of achieving a goal or emotional discharge (Hills, 2018). This behavior is more prevalent in frustrating environments (DiSciullo et al., 2023). Researchers emphasize aggression due to its consequences for adolescents, such as creating negative images and peer rejection, academic decline, substance abuse, and delinquency (Ghaffari Cherati et al., 2023; Gholipoor-bazkiaghurab et al., 2020). Aggressive adolescents often lack self-control and violate societal norms and ethics (DiSciullo et al., 2023). Additionally, due to the high prevalence of aggression and its impact on academic skills, including reduced organization and planning, weakened working memory, and attention deficits, many daily skills, including academic skills, are also affected (Hemming et al., 2019).

One of the related and effective constructs in aggression is cognitive flexibility, which is a core component of executive functions (Dennis & Vander Wal, 2010). Cognitive flexibility is the ability to appropriately adjust one's behavior in response to a changing environment, enabling the individual to be efficient and disengage from previous ineffective paths, reconfiguring and implementing a new set of responses in their life. It allows individuals to change rules or strategies, thereby improving the quality of daily life (Grospe et al., 2018) and increasing their tolerance for conflict and social acceptance (Stepanyan et al., 2020).

According to Hills (2018), aggression is aimed at emotional discharge (Hills, 2018). Kealy et al. (2018) confirmed the relationship between alexithymia and aggression in their studies (Kealy et al., 2018). Studies have also confirmed that aggression is due to various individual and social factors (Dehghani & Falahi, 2021), with one such individual factor being alexithymia. This component plays a significant role in aggressive behaviors (Hemming et al., 2019). Alexithymia is a type of affective deficiency that results in an inability to cognitively process emotional information and regulate emotions (Hemming et al., 2019; Kealy et al., 2018). This component is a multifaceted construct comprising difficulty identifying and distinguishing between feelings, bodily excitations related to emotional arousal, difficulty describing feelings to others, limited imagination due to a lack of fantasies, and an objective (non-imaginative) cognitive style (Hemming et al., 2019).

These individuals cannot correctly process, perceive, and evaluate emotional information, making them emotionally and cognitively distressed, which disrupts the organization of emotions and cognitions. Thus, their lack of insight into psychological and emotional aspects enables them to use maladaptive methods such as aggression to solve their emotional disturbances. Deficiency in emotion regulation and management is a characteristic of individuals with alexithymia, leading to abnormal reactions in the expression of negative emotions like anger (Delaquis et al., 2022). Keonigs et al. (2007) suggested that deficits in emotional reactions and anger coping are related (Koenigs et al., 2007). Additionally, Liverant (2011) suggested that individuals with alexithymia try to suppress negative and unwanted thoughts and emotions, including anger, leading to increased preoccupation with those thoughts, resulting in greater feedback of anger (Dehghani & Falahi, 2021).

Various methods have been employed to improve the psychological components of students, one of which is dialectical behavior therapy (DBT), which has demonstrated efficacy in treating various psychological components (Robinson et al., 2018). DBT is a third-generation psychological treatment encompassing four skills: mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness, which include general acceptance and change skills (DeCou et al., 2019). This approach offers a new perspective in explaining the cognitive-behavioral therapy approach, requiring metacognitive learning and new behavioral strategies to focus on attention, prevent rumination, and reduce worrying responses, thereby expanding new thoughts and reducing unpleasant emotions (Hiller & Hughes, 2023).

Given that alexithymia involves the inability to cognitively process emotional information and regulate emotions, adolescents with alexithymia exhibit multiple problems in emotion regulation. Considering the deep relationship between alexithymia and emotion regulation strategies, it seems that modifying emotion regulation strategies through DBT can reduce alexithymia (Harned et al., 2021). Safari and Aftab (2021) demonstrated that DBT reduces emotion regulation difficulties and feelings of guilt (Safari & Aftab, 2021). Harned et al. (2022) and Delaquis et al. (2022) also reported that DBT improves alexithymia and psychological processing in patients (Delaquis et al., 2022; Harned et al., 2021). Finally, Harvey, Hunt, and White

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(2019) found in a systematic review that DBT reduces self-harming behavior and emotional regulation problems (Harvey et al., 2019). AliJanzadeh et al. (2014) examined the effectiveness of group DBT (skill-based training) on adolescent aggression, showing a significant impact on the emotional dimension of aggression due to the intervention.

Overall, various studies indicate that DBT presents a promising future for improving executive functions and reducing behavioral problems in adolescents. Notably, no study has examined the impact of DBT on cognitive flexibility and alexithymia in aggressive adolescents. Therefore, the research question is whether DBT affects cognitive flexibility and alexithymia in aggressive adolescents.

2. Methods and Materials

2.1. Study Design and Participants

The present study was applied in terms of its aim and employed a quasi-experimental design with pre-test and post-test with a control group. The statistical population included all high school students (grades 1 and 2) in Shahdad County during the 2021-2022 academic year. From this population, one school that was able to cooperate was selected using convenience sampling from four schools in the county. The Buss-Perry Aggression Questionnaire was administered to all high school students. Students scoring above the cutoff score of 78 were identified as aggressive adolescents. Thirty students were then randomly assigned to experimental (n=15) and control (n=15) groups.

Inclusion criteria included a high score on the Buss-Perry Aggression Questionnaire, no psychological or physical illness, no concurrent treatment during the intervention, an age range of 13 to 20 years, and consent from parents and adolescents to participate. Exclusion criteria included irregular attendance in educational sessions, non-compliance with group regulations, and incomplete questionnaires in the pre-test and post-test. As a pre-test, cognitive flexibility and alexithymia questionnaires were administered to both groups. DBT training sessions for the experimental group were conducted over eight 90-minute sessions, while the control group received no training. Finally, post-tests were administered to both groups.

2.2. Measures

2.2.1. Aggression

This questionnaire comprises 29 items assessing four aspects of aggression: physical aggression, verbal aggression, anger, and hostility, as well as overall aggression. It is designed for adolescent and young adult groups. Scoring is on a five-point Likert scale from "very much like me" (5) to "not at all like me" (1), with scores ranging from 29 to 145 and a cutoff score of 78. Items 9 and 16 are reverse-scored. The reliability of this tool ranges from 0.72 to 0.80 in retests, with internal consistency for the four factors and total score ranging from 0.72 to 0.89 (Ganjeh et al., 2014). In Iran, Samani (2007) reported a test-retest reliability of 0.78 in a cross-sectional study of 492 students (248 males and 244 females) aged 18 to 22 years at Shiraz University, selected using cluster sampling. The obtained validity through convergent, concurrent validity indices, and factor analysis confirmed the tool's use in domestic research (Ghaffari Cherati et al., 2023).

2.2.2. Cognitive Flexibility

This tool, developed by Dennis and Vander Wal (2010), contains 20 items to evaluate individual progress in clinical and non-clinical work and assess progress in developing flexible thinking in cognitive-behavioral therapy for depression and other mental disorders. Scoring is on a seven-point Likert scale from "strongly agree" (7) to "strongly disagree" (1), with scores ranging from 20 to 140 (higher scores indicate greater cognitive flexibility). Dennis and Vander Wal (2010) reported concurrent validity with the Beck Depression Inventory of 0.39 and convergence with the Martin and Rubin Cognitive Flexibility Scale of 0.75. The reliability using Cronbach's alpha for the total scale, perceived controllability, and perceived alternatives were 0.91, 0.91, and 0.84, respectively, and test-retest reliability was 0.81, 0.75, and 0.77, respectively. In Iran, Shara (2013) reported test-retest reliability for the total scale of 0.71 and subscales of perceived controllability, perceived alternatives, and perceived justification of behavior at 0.55, 0.72, and 0.75, respectively. Cronbach's alpha coefficients for the total scale and subscales were 0.90, 0.87, 0.89, and 0.55, respectively. This tool has demonstrated satisfactory factor, convergent, and concurrent validity in Iran (Shareh et al., 2014).

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2.2.3. *Alexithymia*

This scale, developed by Bagby et al. (1994), comprises 20 items to measure alexithymia, with three components: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Scoring is on a five-point Likert scale from "completely disagree" (1) to "completely agree" (5), with scores ranging from 20 to 100. Scores between 20 and 40 indicate low alexithymia, 40 to 60 indicate moderate alexithymia, and above 60 indicate high alexithymia (Bagby et al., 1994). The psychometric properties of the Toronto Alexithymia Scale have been confirmed in numerous studies. Taylor, Bagby, and Parker (1997) reported an internal consistency of 0.81 and a suitable test-retest reliability of 0.77 over a three-week interval. In Iran, Basharat (2017) reported internal consistency for the total scale and three subscales (difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking) as 0.85, 0.82, 0.75, and 0.72, respectively (Dehghani & Falahi, 2021).

2.3. *Intervention*

2.3.1. *Dialectical Behavior Threapy*

The intervention protocol for dialectical behavior therapy (DBT) for aggressive adolescents consists of nine structured sessions. Each session includes a review of previous exercises, introduction of new concepts and skills, interactive discussions, and homework assignments to reinforce learning. The protocol aims to improve emotional regulation, cognitive flexibility, and reduce aggression by teaching practical coping strategies and emotional acceptance techniques (Arabzadeh et al., 2020; Asghari Sharabiani et al., 2023).

Session Details

Session 1:

This initial session focuses on reviewing the previous exercises and exploring thoughts and feelings. Participants are introduced to coping responses, both internal and external. The session concludes with assigning homework to apply these concepts in their daily lives.

Session 2:

Building on the previous session, students collaboratively examine thoughts and feelings leading to self-destructive or maladaptive behaviors. Participants are asked to note down all thoughts and feelings contributing to their maladaptive behaviors, enhancing their self-awareness and understanding of their triggers.

Session 3:

This session introduces emotion regulation skills, starting with the definition of emotion and its components. Through discussions and practical examples, students begin to understand how emotions work and how they influence their behaviors. Homework is given to practice identifying and labeling emotions in various situations.

Session 4:

Continuing with emotion regulation, this session focuses on recognizing emotions and labeling them accurately. This skill helps increase the ability to control emotions. Students practice identifying different emotions and discussing their experiences, aiming to improve emotional clarity and management.

Session 5:

A review of previously learned skills is followed by teaching emotional acceptance, even of negative emotions. The session emphasizes the importance of acknowledging and accepting all emotions without judgment. Homework assignments reinforce these acceptance techniques in daily scenarios.

Session 6:

This session focuses on skills to reduce vulnerability to negative emotions. Techniques are discussed and practiced to help students build resilience against emotional distress. Homework involves applying these strategies in real-life situations to observe their effectiveness.

Session 7:

Participants review previous skills and are introduced to distress tolerance strategies, specifically crisis survival strategies. These include distraction techniques, enhancing the present moment, and using pros and cons. The session aims to equip students with tools to manage intense emotional episodes effectively.

Session 8:

The second part of distress tolerance skills focuses on reality acceptance skills, which include mindful breathing, half-smile, and awareness. These techniques help students accept reality as it is, reducing emotional resistance and enhancing coping capacity.

Session 9:

In the final session, participants review and practice all previously learned skills, particularly focusing on enhancing the present moment from crisis survival strategies. They also learn how to generalize these skills outside of therapy sessions. The session ends with summarizing key points, addressing any ambiguities, and conducting a post-test to evaluate the intervention's effectiveness.

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2.4. Data analysis

Multivariate analysis of covariance (MANCOVA) was used to analyze the data using SPSS-26 software.

3. Findings and Results

In the sample under study, 30 individuals were examined in two groups: control and experimental. In the examined group, 46% (14 individuals) were in the first stage of secondary education, and 54% (16 individuals) were in the second stage of secondary education. In the examined group, 33% were the first child, 50% the second child, and 17% the third child. Table 1 presents the descriptive statistics of the study variables.

Table 1

Descriptive Statistics of the Study Variables

Variable	Group	Stage	Frequency	Minimum	Maximum	Mean	Standard Deviation
Cognitive Flexibility	Experimental	Pre-test	15	74	126	99.80	15.77
		Post-test	15	61	97	78.66	10.47
	Control	Pre-test	15	62	87	75.20	6.95
		Post-test	15	65	94	76.13	8.21
Alexithymia	Experimental	Pre-test	15	37	54	44.86	9.44
		Post-test	15	39	75	62.20	9.23
	Control	Pre-test	15	53	79	63.80	6.61
		Post-test	15	52	81	63.26	7.99

To examine the effectiveness of dialectical behavior therapy on cognitive flexibility and alexithymia in aggressive adolescents, multivariate analysis of covariance (MANCOVA) was used. Before performing this test, several statistical assumptions must be checked. One of the assumptions for conducting multivariate analysis of covariance is the homogeneity of covariance matrices, which was checked using Box's test. The significance level of Box's test was 0.36. Since this value is greater than the required significance level (0.05) for rejecting the null hypothesis, the assumption of homogeneity of covariance matrices, as one of the assumptions of multivariate analysis of covariance, is met. Additionally, Levene's test and the Kolmogorov–Smirnov test were used to examine the homogeneity of variance of the dependent variables among the groups, and the results indicated that the assumption of normal distribution of scores is met.

Next, multivariate analysis of covariance was used to compare cognitive flexibility and alexithymia in the experimental and control groups. As shown in Table 4, the significance level of all four related multivariate statistics, namely Pillai's trace, Wilks' lambda, Hotelling's trace, and Roy's largest root, is less than 0.05 ($p < .05$). Therefore, the null hypothesis is rejected, and it is determined that there is a significant difference in at least one of the dependent variables between the experimental and control groups in the post-test.

Table 2

Results of Multivariate Analysis of Covariance for Comparing Test Scores between Experimental and Control Groups

Effect	Test	Value	F	df effect	df error	p
Group	Pillai's Trace	0.782	44.754	2	25	0.000
	Wilks' Lambda	0.218	44.754	2	25	0.000
	Hotelling's Trace	3.580	44.754	2	25	0.000
	Roy's Largest Root	3.580	44.754	2	25	0.000

To further investigate the effectiveness of dialectical behavior therapy on the component of cognitive flexibility separately, univariate analysis of covariance (ANCOVA) was used (Table 2). The F-value indicates the effect of the covariate variable ($p = .000$). This F-value is significant ($p < .05$), confirming that the pre-assumption of the correlation between the covariate and independent variable is met. The fourth row of the ANCOVA output shows that the F-value for the effect of the independent variable is significant, meaning that after removing the effect of the pre-test, there

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is a significant difference in the mean scores of the two groups in the post-test. Therefore, the null hypothesis of no significant difference in mean scores between the two groups in the post-test, after accounting for the pre-test effect, is rejected. Thus, the mean difference between the two groups is significant. Comparison of the means indicates that cognitive flexibility in the experimental group increased significantly due to the dialectical behavior therapy intervention.

Table 3

Univariate Analysis of Covariance (ANCOVA) to Investigate the Effectiveness of the Intervention on Cognitive Flexibility

Variable	Source	Sum of Squares	df	Mean Square	F	p
Cognitive Flexibility	Adjusted Model	235293.919	3	78431.306	684.639	0.000
Pre-test Cognitive Flexibility	1067.719	1	1067.719	9.320	0.005	
Group	4098.799	2	2049.400	17.890	0.000	
Error	3093.081	27	114.559			
Total	238387.000	30				
Alexithymia	Adjusted Model	91342.517	3	30447.506	873.179	0.000
Pre-test Alexithymia	90.650	1	90.650	2.600	0.000	
Group	3324.034	2	1662.017	47.664	0.000	
Error	941.483	27	34.870			
Total	94284.000	30				

To further investigate the effectiveness of dialectical behavior therapy on the alexithymia component separately, univariate analysis of covariance (ANCOVA) was used (Table 3). The F-value indicates the effect of the covariate variable ($p = .000$). This F-value is significant ($p < .05$), confirming that the pre-assumption of the correlation between the covariate and independent variable is met. The fourth row of the ANCOVA output shows that the F-value for the effect of the independent variable is significant, meaning that after removing the effect of the pre-test, there is a significant difference in the mean scores of the two groups in the post-test. Therefore, the null hypothesis of no significant difference in mean scores between the two groups in the post-test, after accounting for the pre-test effect, is rejected. Thus, the mean difference between the two groups in terms of alexithymia is significant. Comparison of the means indicates that alexithymia in the experimental group significantly decreased due to the dialectical behavior therapy intervention, demonstrating the intervention's effectiveness in reducing alexithymia in aggressive adolescents.

4. Discussion and Conclusion

The analysis results indicated that dialectical behavior therapy significantly affects cognitive flexibility. These results are consistent with previous studies (Mohamadi et al., 2020; Rathus et al., 2015; Safari & Aftab, 2021). Cognitive flexibility is a high-level cognitive function developed and formed during childhood, enabling individuals to equip themselves with cognitive processing strategies and adapt well to new and unexpected situations. Cognitive flexibility is not a trait but a dynamic process. In this study, dialectical behavior therapy, one of the third-wave therapies offering a worldview or philosophical perspective guiding clinical specialists in formulating theoretical hypotheses and treating clients, was used (Shareh et al., 2014; Stepanyan et al., 2020). DBT begins by eliminating maladaptive behaviors and breaking reinforcement cycles, continuing with dialectical strategies. The therapy aims to balance acceptance and change, emphasizing accepting and validating behaviors as they occur. Therapeutic communication is considered essential for change (Ghaffari Cherati et al., 2023; Hancock-Johnson et al., 2020). Additionally, this study emphasized skill training (including effective interpersonal skills, emotional regulation, and distress tolerance), acceptance, and validation of emotions to help participants develop comprehensive awareness, wisdom, the ability to see what is right, act wisely, and engage fully and non-judgmentally in life experiences, applying these skills in their personal lives. Since inflexible individuals tend to be more closed off and prefer familiar experiences, learning how to approach issues more flexibly was an essential aspect of this therapy.

For cognitive flexibility through DBT, the first step is the acceptance of personal responsibility for one's actions. This is followed by forming a therapeutic contract between the client and therapist, adhering to it, and using techniques such as mindfulness, interpersonal relationships, emotion regulation, and distress tolerance. The study also

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demonstrated that DBT significantly affects alexithymia, consistent with previous studies (Safari & Aftab, 2021), who showed that DBT reduces emotion regulation difficulties and guilt. Harned et al. (2022) and Delaquis et al. (2022) reported that DBT improves alexithymia and psychological processing in patients (Delaquis et al., 2022; Harned et al., 2021). Finally, Harvey et al. (2019) found in a systematic review that DBT reduces self-harming behavior and emotional regulation problems (Harvey et al., 2019). These findings align with prior research (Asghari Sharabiani et al., 2023; Ghaffari Cherati et al., 2023; Gholipoor-bazkiaghurab et al., 2020; Hancock-Johnson et al., 2020; Harned et al., 2021; Harvey et al., 2019; Mohamadi et al., 2020; Safari & Aftab, 2021; Stadler et al., 2016; Zalewski et al., 2018), confirming DBT's effectiveness on adolescent emotion regulation.

These findings indicate that dialectical behavior therapy effectively addresses multiple psychological disorders, targeting emotion regulation deficits characteristic of various conditions (Zalewski et al., 2018). Functional and cognitive deficits, such as aggression, result from inadequate emotional response regulation. Therefore, teaching emotion management and negative mood regulation skills through DBT, which includes identifying and accepting negative thoughts and feelings, provides a foundation for positive re-evaluation in adolescents and brings order to their emotions. DBT teaches principles and skills such as thinking, interpersonal skills, and emotion regulation to enhance positive interactions and reduce irritability and alexithymia (Rathus et al., 2015). This study aimed to familiarize participants with their emotions by teaching DBT, emotion regulation, and managing disturbed emotional states through direct attention to inner experiences, helping them distinguish emotions in various situations. Thus, managing emotional tendencies, especially aggression, is addressed.

5. Limitations & Suggestions

This study has several limitations that should be considered. First, the sample size was relatively small, which may limit the generalizability of the findings. Second, the study was conducted in a specific geographical location, which might not reflect the broader population. Third, the reliance on self-reported measures could introduce bias, as participants might not accurately report their thoughts and behaviors. Additionally, the short duration of the intervention might not capture long-term effects of dialectical behavior therapy (DBT) on cognitive flexibility and alexithymia. Finally, the absence of a follow-up period prevents assessment of the sustainability of the intervention effects.

Future research should aim to replicate this study with larger and more diverse samples to enhance the generalizability of the results. Longitudinal studies with extended follow-up periods are needed to evaluate the long-term effectiveness of DBT on cognitive flexibility and alexithymia in aggressive adolescents. Researchers should also consider using a mixed-methods approach, incorporating qualitative data to gain deeper insights into participants' experiences and perspectives. Additionally, exploring the impact of DBT on other psychological outcomes, such as self-esteem and interpersonal relationships, could provide a more comprehensive understanding of its benefits.

The findings of this study suggest several practical implications for mental health professionals working with aggressive adolescents. Implementing DBT in school-based mental health programs could help improve cognitive flexibility and emotional regulation skills, thereby reducing aggressive behaviors. Training educators and school counselors in DBT techniques can equip them with effective tools to support students facing emotional and behavioral challenges. Furthermore, integrating DBT with other therapeutic approaches might enhance its effectiveness and provide a more holistic treatment for adolescents struggling with aggression and emotional dysregulation.

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Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors contributed equally.

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