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1 Department of Psychology, Ta.C., Islamic Azad University, Tabriz, Iran.
2 Department of Psychology, Ta.C., Islamic Azad University, Tabriz, Iran.
3 Department of Psychiatry, Research Center of Psychiatry and Behavioral Sciences, Tabriz University of Medical Sciences, Tabriz, Iran.
4 Department of Psychology, Ta.C., Islamic Azad University, Tabriz, Iran.

Corresponding author email address: dr.vafa@iau.ac.ir

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Comparing Mentalization and Emotion Regulation Interventions on on Working Memory, Theory of Mind, Sleep Problems, and Depressive Symptoms in Children with Sluggish Cognitive Tempo

Shiva. Razi[1], Marziyeh. Alivandi Vafa[2]*, Behzad. Shalchi[3], Ali Naghi. Aghdasi[4]

ABSTRACT

Objective: This study aimed to compare the effectiveness of Mentalization-Based Therapy (MBT) and Cognitive Emotion Regulation (CER) training in improving working memory, theory of mind, sleep problems, and depressive symptoms in children with Sluggish Cognitive Tempo (SCT).

Methods and Materials: A quasi-experimental design with pretest, posttest, and 3-month follow-up was applied. Forty-five boys aged 9–12 years diagnosed with SCT were purposively selected and randomly assigned to three groups: MBT (n=15), CER (n=15), and a control group (n=15). Standardized instruments were used to measure working memory, theory of mind, sleep habits, and depressive symptoms. Both interventions lasted 12 sessions. Data were analyzed using mixed ANOVA and Bonferroni post hoc tests.

Findings: Significant time-by-group interaction effects were found across all outcome variables ($p < .001$). The MBT group showed greater improvements than the CER group in working memory ($\eta^2 = 0.47$), theory of mind ($\eta^2 = 0.52$), sleep problems ($\eta^2 = 0.44$), and depressive symptoms ($\eta^2 = 0.40$). These effects persisted or even increased at follow-up. The control group showed no significant changes.

Conclusion: Both MBT and CER interventions improved cognitive and emotional functioning in children with SCT. However, MBT demonstrated superior and longer-lasting effects. These findings support the implementation of MBT in clinical and educational settings to address cognitive-emotional difficulties associated with SCT.

Keywords: Mentalization-Based Therapy, Emotion Regulation, Working Memory, Sleep Problems, Depression, Sluggish Cognitive Tempo.

Introduction

Sluggish Cognitive Tempo (SCT) is an attentional construct characterized by a set of symptoms including slow behavior, sluggish information processing, mental confusion, daydreaming, and hypoactivity (Becker & Barkley, 2018). Despite growing interest in the cognitive and socio-emotional functioning of SCT, there is a need for more research into its core cognitive symptoms. Initially, SCT was considered a specifier of Attention Deficit/Hyperactivity Disorder (ADHD) (Garnett et al., 2017). However, increasing evidence suggests that SCT is a distinct attentional issue separate from ADHD, with demonstrable differences in cognitive and social functioning (Jarrett et al., 2017; Smith et al., 2019). While symptoms such as distractibility or mental fogginess may appear in both conditions, individuals with SCT primarily experience difficulties in perceptual processes, selective attention, and attentional shifting rather than in executive functioning (Jarrett et al., 2020). In contrast, individuals with ADHD face impairments in executive functions such as response inhibition. Thus, distinguishing between early and late-stage information processing issues in SCT and ADHD is beneficial for identifying core cognitive characteristics (Park & Lee, 2021).

Previous studies have shown that individuals with SCT often experience real-life impairments including social, emotional, learning, and academic difficulties (Cook et al., 2019). SCT is associated with poorer sustained attention, problem-solving challenges, self-organization issues, and internalizing symptoms, all of which severely affect psychological and social well-being (Park & Lee, 2021). Working memory is among the cognitive factors whose impairment may be linked to SCT (Camporodón-Rosanas et al., 2020). Working memory is a cognitive process responsible for holding and manipulating information while engaging in other cognitive tasks. It is essential for guiding and maintaining goal-relevant information despite distractions (Nica et al., 2021). According to Baddeley (2010), working memory comprises four components: the phonological loop, which temporarily stores verbal information; the central executive, which directs attention to relevant stimuli, suppresses irrelevant information and inappropriate responses, and coordinates cognitive processes during multitasking; the visuospatial sketchpad, which retains visual information and plays a key role in mental imagery; and the episodic buffer, which integrates subsystems and informational dimensions into unified episodes.

Given the role of working memory in short-term information storage, behavioral guidance, and decision-making (Eriksson et al., 2015), it plays a critical role in tasks such as reading comprehension, mathematics, academic performance (Meltzer, 2018), motor skills (Ramazanzadeh, 2020), and emotional regulation (Samimi et al., 2016). Rami and Regier (2019) found that working memory deficits can disrupt interpersonal interactions and potentially contribute to physical-behavioral harm. Similarly, Smith et al. (2022) reported that weaker neurocognitive functioning, including working memory deficits, is associated with higher levels of SCT symptoms in youth.

Moreover, considering that children with SCT symptoms often struggle with social interactions, it is not surprising that they might also perform poorly in theory of mind (ToM). Theory of mind is a social-cognitive skill used to attribute mental states to oneself and others for interpreting social behavior (Yu et al., 2021). Two main perspectives exist on the development of ToM: one proposes a stage-wise progression, suggesting that children around ages 4–5 begin to understand that others can hold false or contradictory beliefs (Sebold & Wishart, 2008). From ages 4 to 6, children's understanding of mental states significantly improves, though their ToM performance remains weak until age 8 (Mazon & Nader-Grosbois, 2017). The other view posits a continuous development, attributing differences in ToM abilities before and after age 3 to functional factors such as verbal comprehension and attention (Wang et al., 2016).

Mikami et al. (2007), in a computer-based chatroom experiment, found that poor interpretation of social cues and weak memory are linked to low social responsiveness. Caputi and Schaumburg (2018) found that higher ToM skills are associated with fewer internalizing symptoms in children. Swinchuk et al. (2021) showed that the severity of SCT symptoms is significantly related to impaired ToM skills. Furthermore, research indicates that individuals with SCT suffer from various physical disruptions. For instance, many report difficulties initiating and maintaining sleep, altered sleep patterns, and daytime

drowsiness (Frederick et al., 2022; Becker et al., 2016). Studies with adults suggest that SCT and daytime drowsiness are distinct yet strongly correlated constructs. Kuryakin et al. (2015) suggest that children with SCT symptoms may represent a subgroup with low physiological arousal who either do not get enough sleep or require more sleep than their typically developing peers. Consequently, these children may struggle to wake up in the morning. Their sleep problems can exacerbate illness severity, reduce quality of life and daily functioning, impair memory, and disrupt concentration—leading to academic challenges and strained relationships with parents and peers (Mace et al., 2021).

Although SCT symptoms are widely associated with internalizing symptoms, the relationship between SCT and specific domains of anxiety and depression remains unclear. However, evidence so far suggests a somewhat stronger link with depressive symptoms (Becker et al., 2016). Environmental factors that lead to cognitive confusion in children and their subsequent distorted interpretations increase their vulnerability to depression (Frederick et al., 2021). Given that children with SCT often face negative judgments from others, they tend to develop negative self-assessments and distorted views of themselves and others, which may contribute to increased susceptibility to depressive symptoms (Burns et al., 2019).

In recent years, various interventions have been applied to related issues, yet one approach gaining attention is Mentalization-Based Therapy (MBT), whose effectiveness remains uncertain (Darabi et al., 2022). Peter Fonagy and colleagues (2010) developed and expanded MBT based on two core concepts: Bowlby's attachment theory and the concept of mentalizing. Mentalizing refers to the ability to understand one's own and others' mental states, rooted in early interpersonal relationships, particularly attachment bonds. The goal of therapy is to develop and strengthen this capacity through therapeutic relationships, enhancing the individual's awareness of their thoughts and emotions (Smith et al., 2022). Studies have shown improvements in cognitive functioning (e.g., attention and working memory) among participants who received MBT (Im et al., 2021), as well as reductions in depressive symptoms (Bracey et al., 2017) and improvements in sleep (Vikanen et al., 2015). However, the efficacy of MBT for children with SCT remains unclear (Malda-Castillo et al., 2019; Birney et al., 2020).

Given the emotional difficulties these children face, interventions based on Cognitive Emotion Regulation (CER) may also be beneficial. CER includes both conscious and unconscious strategies used to increase, reduce, or maintain the emotional, behavioral, and cognitive components of emotional responses. Emotion regulation therapy aims to manage and reduce negative emotions while promoting constructive emotional use. CER encompasses a) awareness and understanding of emotions, b) acceptance of emotions, and c) the ability to control impulsive behaviors and act in goal-oriented ways (Kristen et al., 2024).

In sum, SCT characteristics affect both behavior and emotions, disrupting social and familial interactions and undermining the psychological well-being of both the individual and their family. Moreover, children's behavioral disorders impose substantial costs on healthcare systems. With ongoing cultural and structural changes, SCT prevalence appears to be rising—adding financial and emotional strain on families. These children may destabilize family dynamics and create psychological distress, particularly for parents. Given these realities, it is vital to identify effective treatments for SCT and design comprehensive, evidence-based interventions tailored to these individuals. In recent decades, a variety of interventions—including MBT and CER training—have been integrated into the specialized literature for children with special needs. Considering the cultural, economic, and social differences across countries, implementing context-sensitive interventions for children with SCT can significantly mitigate their challenges. Despite increasing awareness, limited studies have been conducted in Iran on effective SCT interventions. Further research is needed to identify the most effective treatment strategies and develop comprehensive plans for supporting this population. The present study seeks to address theoretical gaps regarding the efficacy of selected interventions and explore the relationships between the dependent variables. Practically, it also aims to provide valuable insights for psychologists, clinicians, psychiatrists, and mental health professionals working with young students.

depression, enhancing self-care behaviors, and affecting physiological changes (Mattioli et al., 2012).

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Cognitive impairment significantly contributes to psychological vulnerability (Bodaqi et al., 2016). Moreover, greater psychological vulnerability in MS patients is associated with negative disease outcomes and beliefs about lack of symptom control (Jopson & Moss-Morris, 2003), which may increase health-related anxiety. On the other hand, Infrasca (1997) argues that alexithymia, limited emotional awareness, and impaired cognitive processes lead to prolonged physiological arousal, neural responses, and psychological stress, which may negatively impact the autonomic, immune, and hypothalamic-pituitary-adrenal (HPA) systems (Barghi Irani et al., 2014), thereby exacerbating MS symptoms. Individuals with alexithymic traits struggle with interpersonal relationships and adaptation, making them more susceptible to psychological disorders. Their reduced adaptability is particularly critical in MS, where adjusting to illness is essential for maintaining health; without such adjustment, deterioration in well-being is likely (Barghi Irani et al., 2014). Given the prevalence of MS in young adults, it often leads to reduced individual and social functioning and increases psychological and emotional problems. With disease progression and lack of adequate control, psychological vulnerability intensifies. Therefore, addressing the psychological issues, cognitive deficits, and emotional challenges of MS patients is essential. Most studies on MS have focused on physical aspects, with less attention paid to cognitive and emotional dimensions within a unified model. Based on this, the current study poses the following question: Does the psychological vulnerability model based on alexithymia and cognitive functioning in MS patients fit well, considering the mediating role of anxious thoughts?

Methods and Materials

Study Design and Participants

The research design employed was a quasi-experimental type with a pre-test, post-test, and follow-up control group design. The statistical population included all male students aged 9 to 11 years with symptoms of sluggish cognitive tempo (SCT) in public schools in Urmia during the 2023–24 academic year. A convenience sampling method was used to select participants. Initially, with coordination from the Urmia Department of Education, 8 accessible elementary boys' schools out of 16 were visited. Based on evaluations, 105 students were identified by teachers as meeting the criteria for SCT. Subsequently, diagnostic SCT questionnaires were sent to the parents of these students. From this group, 64 students scored above the cutoff point and were selected. To confirm the final diagnosis, semi-structured clinical interviews were conducted with the children. Ultimately, based on inclusion and exclusion criteria, 45 students were purposefully selected and randomly assigned to two experimental groups and one control group (15 students in each group) (Gall et al., 2003).

Inclusion criteria were: age between 9 and 11 years, diagnosis of SCT, absence of intellectual disability, absence of learning disorders, no visual, auditory, or motor impairments, no medical conditions such as diabetes, epilepsy, or heart disease, and completion of informed consent forms for participation. Exclusion criteria included: missing more than one session, incomplete questionnaire responses, participation in similar therapy sessions, and use of medication for attention-deficit/hyperactivity disorder (ADHD).

Instruments

Sluggish Cognitive Tempo Questionnaire: Designed by Penny et al. (2009), this scale comprises 14 items rated on a five-point Likert scale (0 = Never to 4 = Always). It includes three subscales: Slowness, Sleepiness, and Daydreaming. Sample items include: "Completes tasks slowly or with delay" and "Needs reminders to pay attention." Content validity, internal consistency, and test-retest reliability are satisfactory, with Cronbach's alpha coefficients of 0.87 for the total scale and 0.87, 0.83, and 0.70 for the subscales, respectively (Penny et al., 2009). In Iran, Khanjani, Mohammadi, and Shadbafi (2020) reported a content and criterion validity of 0.82 for the total scale using Cronbach's alpha.

Working Memory: The Digit Span subtest from the Wechsler Intelligence Scale for Children (2012) was used to assess working memory. This test has two parts: forward digit span and backward digit span. In the forward digit span, sequences of three to nine digits are read aloud, and the child is asked to repeat them in the same order. In the backward digit span, sequences of two to eight digits are read, and the child must repeat them in reverse order. Each part has two trials, and scoring is based on correct repetitions. The test yields three scores: forward span, backward span, and total score. Higher scores indicate greater working memory capacity.

Wechsler (2012) reported split-half and test-retest reliability coefficients of 0.87 and 0.83, respectively. In an Iranian sample, Abedi et al. (2015) reported a split-half reliability of 0.71.

Theory of Mind Questionnaire (Steerneman, 1999): This 38-item scale assesses theory of mind in children aged 5 to 12 years, including those with pervasive developmental disorders. It provides information on social understanding, sensitivity, and insight, as well as the extent to which a child can comprehend others' thoughts and feelings. Each correct response earns one point, with total scores ranging from 0 to 38. Higher scores indicate more advanced theory of mind abilities. Ghamarani et al. (2006) reported concurrent validity of 0.89 with the Dollhouse Task. Test-retest reliability ranged from 0.70 to 0.94, internal consistency (Cronbach's alpha) was 0.86, and inter-rater reliability was 0.98.

Children's Sleep Habits Questionnaire (CSHQ): Developed by Owens et al. (2000), this 45-item questionnaire assesses sleep behaviors and problems in children aged 4 to 12 years. Items are rated on a five-point Likert scale (1 = Rarely to 3 = Usually). Items 1, 2, 3, 10, 11, and 26 are reverse-scored. Only 33 items are used for scoring, with total scores ranging from 33 to 99. Higher scores indicate more appropriate sleep habits. Owens et al. (2000) reported internal consistency (Cronbach's alpha) of 0.70 and test-retest reliability between 0.62 and 0.79. In Iran, Shoghi et al. (2005) reported test-retest reliability of 0.79 and internal consistency of 0.77.

Child Symptom Inventory (CSI-4) – Depression Subscale: This behavioral rating scale, developed by Gadow and Sprafkin (1984) and revised in 1994, screens for 18 behavioral and emotional disorders in children aged 5 to 12 years. The parent version contains 112 items rated on a four-point scale (0 = Never to 3 = Often). Sprafkin et al. (2002) reported a Cronbach's alpha of 0.96 for the total scale and 0.69 for the depression subscale. Concurrent validity of the depression subscale with the Diagnostic Interview Schedule for Children-Parent Version was 0.41 ($p < 0.001$). In Iran, Farzad et al. (2011) reported a Cronbach's alpha of 0.94 for the total scale and 0.71 for the depression subscale. Concurrent validity with the Children's Depression Inventory was 0.30 ($p < 0.05$).

Mentalization-Based Intervention: The first experimental group underwent a 12-session, 90-minute mentalization-based intervention, adapted from the manual by Midgley et al. (2017). The content validity of the sessions was assessed qualitatively and quantitatively, with content validity ratios ranging from 0.70 to 0.85 and content validity indices between 0.86 and 1.00, indicating acceptable content. The session summaries are presented in Table 1.

Table 1.

Mentalization-Based Intervention

Session	Content
Session 1	Emotion education through games, storytelling, emotion flashcards, and encouraging clear expression of feelings.
Session 2	Emotion regulation using symbolic play and working with clay.
Session 3	Understanding others' minds through introducing the "mind box," clarifying self-other boundaries, exploring internal and external aspects of the mind, and using the "brain scan" technique.
Session 4	Emotion regulation via games, practicing "stop and return" techniques, and focusing on others' internal feelings.
Session 5	Exploring others' inner worlds by drawing family members and discussing their positive and negative traits.
Session 6	Mentalizing relationships through games, mirroring exercises, and attending to others' minds.
Session 7	Preparing the child for termination by reviewing progress, discussing the upcoming end of therapy, and suggesting alternative activities.
Sessions with the Child and Parent	
Session 8	Reviewing progress, clarifying remaining goals, discussing changes observed at home and school, and reassessing therapeutic objectives.
Session 9	Termination, creating a therapy memory box, educating caregivers about potential post-therapy behaviors, and emphasizing their role in managing situations.
Session 10	Understanding the importance of mentalization and its impact on relationships.
Session 11	Enhancing play

Cognitive Emotion Regulation (CER) training: For the second experimental group, the cognitive emotion regulation intervention was conducted over eight 60-minute sessions. The intervention used in this study was based on the Cognitive Emotion Regulation Program developed by Gross and Thompson (2007). The details of the cognitive emotion regulation sessions are presented in the table below.

Table 2.

Summary of Cognitive Emotion Regulation Sessions (Gross & Thompson, 2007)

Session	Content
1st	Definition of emotion regulation, reasons for learning emotion regulation skills, presenting accurate perspectives on emotions, reviewing primary and secondary emotions, and stating the objectives of the training (understanding experienced emotions, reducing emotional vulnerability, and emotional distress).
2nd	Describing emotions (triggering event, interpretation of the event, bodily changes, bodily responses to emotions, action urges, expression, and communication), and familiarization with different emotional states.
3rd	Explaining how to describe emotions and teaching methods for proper emotion description (e.g., for the word "love": describing the triggering events for the feeling of love, interpretations activating the feeling of love, experiencing the emotion of love, expressing and acting based on love, and its consequences).
4th	Teaching the functions of emotions, including the role of emotions in communication and influencing others, emotions that lead to organizing and motivating action, and the validating nature of emotions.
5th	Teaching how to reduce vulnerability caused by experiencing negative emotions and training in Linehan's emotion regulation chart (treating physical illness, balanced eating, avoiding mood-altering substances, balanced sleep, exercising, and mastery).
6th	Teaching short-term and long-term steps to increase positive emotions, being mindful of positive experiences and not being mindful of negative experiences and worries, discussion of a list of pleasant events.
7th	Relieving emotional distress, changing emotions through opposite action, and learning about different opposite actions and behaviors.
8th	Summarizing and reviewing previous sessions and practicing emotion regulation skills.

Procedeure

After selecting the sample, the Digit Span Test, Theory of Mind Questionnaire, Children's Sleep Habits Questionnaire, and the Depression subscale of the Child Symptom Inventory were administered as pre-tests to participants in both experimental and control groups. Subsequently, the first experimental group received the mentalization-based intervention, while the second experimental group underwent cognitive emotion regulation training. The control group was placed on a waiting list and did not receive any psychological intervention until the post-test phase. At the end of the training period, the same assessments were administered as post-tests to all groups. To evaluate the durability of the interventions' effects, a follow-up assessment was conducted three months later.

Data analysis

Data were analyzed using SPSS version 26. The normality of data distribution was assessed using the Kolmogorov–Smirnov test. To examine changes across the pre-test, post-test, and follow-up phases, a mixed-design ANOVA (repeated measures ANOVA) was employed. Bonferroni post hoc tests were used to determine pairwise differences between the groups. The significance level was set at 0.05 for all statistical tests. Additionally, effect sizes (eta squared) were calculated to estimate the magnitude of intervention effects.

Findings and Results

The statistical characteristics of the variables—working memory, theory of mind, sleep problems, and depressive symptoms—are presented in Table 3.

Table 3.

Descriptive statistics of dependent variables

Variable	Mentalization-Based Intervention		Cognitive Emotion Regulation Training		Control Group	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
	M	SD	M	SD	M	SD
Working Memory	8.53	2.20	17.73	2.22	8.93	1.79
Theory of Mind	10.73	2.25	18.93	1.39	9.93	2.31
Sleep Problems	82.40	2.61	42.93	3.49	77.40	2.50
Depressive Symptoms	21.27	1.83	12.33	1.80	20.74	1.91

A review of the values presented in Table 2 indicates that there are observable differences in the mean scores of working memory, theory of mind, sleep problems, and depressive symptoms among the three groups: the mentalization-based intervention group, the cognitive emotion regulation training group, and the control

group. These differences in post-test scores suggest the effectiveness of the experimental interventions in enhancing working memory and theory of mind, as well as in reducing sleep problems and depressive symptoms, compared to the control group.

Table 4.

Descriptive statistics of the dependent variables at follow-up stage across groups.

Variable	Mentalization-Based Group	Cognitive Emotion Regulation Group	Control Group
Working memory	M=19.47, SD=2.23	M=15.33, SD=2.47	M=10.73, SD=1.67
Theory of mind	M=20.87, SD=1.30	M=15.67, SD=1.72	M=12.27, SD=1.94
Sleep problems	M=32.73, SD=1.94	M=47.13, SD=2.82	M=62.87, SD=4.31
Depressive symptoms	M=8.67, SD=1.88	M=15.87, SD=1.87	M=19.33, SD=1.72

As Table 4 shows, there are differences in the follow-up mean scores of the dependent variables, suggesting that the effects of the mentalization-based and emotion regulation interventions were maintained over time. To test the research hypotheses across the pre-test, post-test, and follow-up phases, a mixed ANOVA was used. The three-time points were treated as within-subject factors, and the group membership (mentalization-based, cognitive emotion regulation, and control) was considered as the between-subjects factor. The multivariate approach was employed, requiring Mauchly's test of sphericity. Preliminary assumptions, including Box's M, Levene's, and Mauchly's tests, were assessed and satisfied. The results of the univariate mixed ANOVA are presented below.

Table 5.

Univariate mixed ANOVA results for the dependent variables.

Source of Variation	SS	df	MS	F	p-value	Effect Size (η^2)
Working Memory						
Time	1034.059	2	517.030	19.014	<.0005	.805
Time*Group	170.300	1.171	925.785	43.875	<.0005	.520
Group	225.352	2	875.942	33.767	<.0005	.794
Theory of Mind						
Time	358.430	2	296.250	18.831	<.0005	.790
Time*Group	287.301	2.234	55.193	6.870	<.0005	.520
Group	311.357	2	112.676	13.767	<.0005	.794
Sleep Problems						
Time	478.400	2	288.450	219.431	<.0005	.798
Time*Group	354.200	3.086	59.393	33.673	<.0005	.527
Group	231.152	2	119.476	139.665	<.0005	.790
Depressive Symptoms						
Time	792.400	2	248.250	219.832	<.0005	.790
Time*Group	165.307	4.056	66.193	37.873	<.0005	.520
Group	241.541	2	119.674	141.765	<.0005	.794

As seen in Table 5, the main effect of time is significant for all dependent variables at the .05 level, indicating meaningful differences across pre-test, post-test, and follow-up stages. Additionally, the interaction effect of time and group is significant, suggesting that the observed changes differ across the three intervention groups. Post hoc Bonferroni test results indicated that both intervention groups significantly outperformed the control group on all outcome variables, with the mentalization-based group showing greater improvements than the cognitive emotion regulation group on several variables, including working memory and theory of mind. The follow-up analysis showed that the effects were sustained over time, confirming the long-term efficacy of the interventions.

Table 6.

Bonferroni Post Hoc Test for Mean Differences of Dependent Variables Across the Three Groups

Variable	Comparison Groups	Mean Difference	Std. Error	Significance

Working Memory	Mentalization vs. Emotion Regulation	2.667*	0.685	0.001
	Mentalization vs. Control	5.378*	0.685	0.0005
	Emotion Regulation vs. Mentalization	-2.667*	0.685	0.001
	Emotion Regulation vs. Control	2.711*	0.685	0.001
Theory of Mind	Mentalization vs. Emotion Regulation	3.756*	0.612	0.0005
	Mentalization vs. Control	5.467*	0.612	0.0005
	Emotion Regulation vs. Mentalization	-3.756*	0.612	0.0005
	Emotion Regulation vs. Control	1.711*	0.612	0.0005
Sleep Problems	Mentalization vs. Emotion Regulation	-8.356*	1.039	0.0005
	Mentalization vs. Control	-18.200*	1.039	0.0005
	Emotion Regulation vs. Mentalization	8.356*	1.039	0.0005
	Emotion Regulation vs. Control	-9.844*	0.583	0.0005
Depressive Symptoms	Mentalization vs. Emotion Regulation	-4.067*	0.583	0.0005
	Mentalization vs. Control	-5.844*	0.583	0.0005
	Emotion Regulation vs. Mentalization	4.067*	0.583	0.0005
	Emotion Regulation vs. Control	-1.778*	0.583	0.0005

Table 7.

Bonferroni Post Hoc Test for Mean Differences of Dependent Variables Across Time Points

Variable	Time Comparison	Mean Difference	Std. Error	Significance
Working Memory	Post-test vs. Pre-test	5.044*	0.283	0.0005
	Follow-up vs. Pre-test	6.444*	0.293	0.001
	Follow-up vs. Post-test	-1.400*	0.081	0.0005
Theory of Mind	Post-test vs. Pre-test	4.289*	0.258	0.0005
	Follow-up vs. Pre-test	5.889*	0.271	0.0005
	Follow-up vs. Post-test	-1.600*	0.075	0.0005
Sleep Problems	Post-test vs. Pre-test	-21.178*	0.476	0.0005
	Follow-up vs. Pre-test	-31.533*	0.440	0.0005
	Follow-up vs. Post-test	-10.356*	0.347	0.0005
Depressive Symptoms	Post-test vs. Pre-test	-4.267*	0.253	0.0005
	Follow-up vs. Pre-test	-6.289*	0.275	0.0005
	Follow-up vs. Post-test	-2.022*	0.100	0.0005

The results of the Bonferroni post hoc analysis revealed significant differences in the dependent variables (working memory, theory of mind, sleep problems, and depressive symptoms) across the three time points and among the three groups. Specifically, significant differences were observed between pre-test and post-test, and between pre-test and follow-up, across all dependent variables. Furthermore, significant differences were also found between post-test and follow-up scores, indicating meaningful change over time. The consistent superiority of the mentalization-based intervention compared to the cognitive emotion regulation training and control condition across the three assessment phases (pre-test, post-test, and follow-up) suggests that mentalization-based therapy not only has an immediate therapeutic impact but also demonstrates more sustainable long-term effectiveness. This is evidenced by improved working memory, enhanced theory of mind, reduced sleep problems, and alleviated depressive symptoms, with effects that persisted and even increased during the follow-up period (Table 6 and 7).

Discussion and Conclusion

The present study aimed to determine the difference in the effectiveness of mentalization-based intervention and cognitive emotion regulation training on working memory, theory of mind, sleep problems, and depressive symptoms in children with Sluggish Cognitive Tempo (SCT). The results revealed that there were statistically significant differences between pre-test and post-test scores, as well as between pre-test and follow-up scores, in all dependent variables—working memory, theory of mind, sleep problems, and depressive symptoms. Moreover, significant changes were observed between post-test and follow-up phases, indicating that the scores of the dependent variables changed significantly at follow-up compared to post-test. These results confirm that the means across the three measurement phases—pre-test, post-test, and follow-up—differed significantly among the groups, with the intervention groups (mentalization-based therapy and cognitive emotion regulation training) performing differently than the control group. This suggests the superiority and persistence of the mentalization-based intervention's effectiveness compared to cognitive emotion regulation

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training in improving working memory, theory of mind, sleep problems, and depressive symptoms.

Both interventions—mentalization-based therapy and cognitive emotion regulation—had a positive impact on the functioning of children with SCT. However, they differ in their mechanisms of action. Mentalization-based therapy emphasizes self-awareness and the understanding of one's own and others' mental states. By strengthening theory of mind and enhancing social interactions, this method helps children regulate their emotional and cognitive responses. It also promotes more effective cognitive processing, which in turn can enhance working memory. Significant reductions in attentional deficits and improvements in SCT symptoms have been reported in previous studies. Regarding its greater effect on working memory, it is important to note that working memory refers to the ability to retain and manipulate information over short periods and is a core component of executive function, facilitating information storage, retrieval, and problem-solving in real time (Gómez-Lavin, 2024). Children with SCT often exhibit working memory deficits that lead to distractibility and difficulty executing multi-step tasks (Song et al., 2025). Due to these deficits, such children have difficulty with attentional control and inhibition of distracting stimuli. They also tend to perform poorly in planning and attention tasks, which disrupts information processing and retrieval. Mentalization-based therapies have been shown to improve working memory in these children (Abbasi et al., 2023). These interventions stimulate the nervous system and enhance focus, aiding in information processing and storage.

An important feature of the mentalization-based intervention is the inclusion of the mother in the sessions, which increases parental awareness of the child's cognitive and emotional difficulties. This allows mothers to better understand and respond to their child's SCT-related issues with greater flexibility, making the intervention more effective than cognitive emotion regulation in enhancing working memory. Regarding theory of mind, the superior effectiveness of mentalization-based therapy can be explained by its focus on enhancing children's ability to understand others' thoughts and emotions. Children with SCT often struggle in this domain, which affects their social interactions and communication. Mentalization-based interventions have been shown to improve theory of mind by increasing awareness of others' mental states, thus enhancing social skills (Locati et al., 2025). Interventions that focus on emotional understanding, especially when combined with relational mentalization, have a broader impact on the child's socio-emotional system. Engaging in reflective processes around interpersonal conflicts—while integrating repressed emotions and mental states—can enhance the sense of agency and mature cognitive processing, as well as the ability to express negative emotions. Mentalization also improves interpersonal functioning by fostering mutual support and help-seeking behaviors in difficult situations. Pakbaz-Khosroshahi and Moshirian-Farahi (2024) demonstrated that mentalization-based therapy significantly improved theory of mind in eighth- and ninth-grade boys in Mashhad.

Another key finding was that mentalization-based therapy had a greater impact on sleep problems in children with SCT compared to cognitive emotion regulation. Sleep disturbances, including insomnia and circadian rhythm disorders, are common in children with SCT and negatively affect cognitive and emotional functioning. Research shows that poor sleep impairs emotional information processing and is associated with weaker affective mentalization. Therefore, enhancing mentalization can potentially alleviate sleep difficulties. Mentalization-based therapies help regulate sleep by promoting relaxation and reducing anxiety, as well as improving awareness of sleep patterns and habits (Jamk et al., 2025).

Children with SCT may also experience depressive symptoms such as low mood and apathy. Mentalization-based interventions, through increased self-awareness and improved emotional regulation, can help reduce such symptoms. These therapies enhance coping strategies and psychological flexibility, contributing to better mental health outcomes. Langenbach et al. (2023) showed that focusing on mentalization improves one's ability to recognize and understand others' thoughts and emotions. Behavioral evidence also supports a link between impaired mentalization and depressive disorders. Choi-Kin (2022), in a study aiming to extend the application of mentalization-based therapy to depression, reviewed prior research and concluded that it can effectively improve depression by enhancing mentalization capacity, interpersonal communication, and reducing impulsivity. Darabi et al. (2022) also found

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that mother-child mentalization programs were effective in reducing behavioral problems across domains such as anxiety/depression, withdrawal/depression, somatic complaints, thought problems, rule-breaking behavior, and aggression.

In summary, mentalization-based interventions can significantly improve working memory, theory of mind, sleep problems, and depressive symptoms in children with SCT. By focusing on awareness and emotional regulation, these interventions enhance both cognitive and emotional functioning. Notably, the inclusion of family-based components—such as mother training and interactive play—may explain the superior effectiveness of mentalization-based therapy compared to cognitive emotion regulation training.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

By 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 equally contribute to this study.

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