The Effectiveness Of Pragmatic Therapy In Improving Non-Verbal Communication In Individuals With Cerebral Palsy

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Abstract:

This study aims to explore the effectiveness f pragmatic therapy in enhancing non-verbal communication among individuals with cerebral palsy. To meet the study's objectives, a quasi-experimental design with a one-group approach was employed. The research sample comprised 10 children with cerebral palsy (4 females and 6 males), aged between 8 and 13 years. The non-verbal communication component of the TLC test, the ecological subtest for everyday signals, and the P.A.C.E program utilizing the Dominique Benishow cards were administered. Following data collection and statistical analysis, the results demonstrated significant statistical differences between the pre-test and post-test rank means on the non-verbal communication component of the TLC test for the study participants. These findings confirm that pragmatic therapy is effective in improving non-verbal communication in individuals with cerebral palsy.

Keywords: *Non-Verbal Communication, Pragmatic Therapy, Cerebral Palsy.*

1. Introduction / Problem Statement

Individuals with cerebral palsy often encounter considerable challenges in communication, primarily due to brain damage that affects their overall communicative abilities, both verbal and non-verbal. These communication difficulties are frequently compounded by other co-occurring disabilities in individuals with cerebral palsy.

Cerebral palsy manifests as impairments in motor control and coordination, typically occurring before or during birth or in the early months of life. At this early developmental stage, crying becomes the primary, and often sole, mode of communication for affected children, limiting their ability to communicate effectively. In a study on the impact of neuropsychological disorders on the cognitive abilities of children with cerebral palsy, Gran Gaelle (2013) emphasized that these children often face communication disorders, including dysarthria, aphasia, language delays, and mutism (Belkhiri, 2018, p. 14).

Children with cerebral palsy frequently experience challenges with speech clarity, which can result in misunderstandings and difficulties in self-expression. They may also struggle with controlling aspects of communication such as tone, rhythm, and body language, all of which contribute to their communicative difficulties (Awwad, 2018, pp. 22-23).

For many children with cerebral palsy, the ability to communicate is further impaired due to damage to the areas of the brain responsible for speech, often in conjunction with other

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cognitive and motor impairments (Al-Shammari, 2018, p. 48). Hani Saad (2012) similarly explored the relationship between cognitive impairments and communication disorders in individuals with cerebral palsy, finding a significant correlation between damage to specific cognitive functions and communicative abilities.

The brain damage that causes cerebral palsy can lead to additional impairments, including neurological and motor disabilities that may affect one or both arms and legs. This damage can also result in dysfunctions in psychological functions, whether individually or collectively, such as intellectual disabilities, visual or auditory impairments, or speech disorders (Al-Safadi, 2020, p. 39).

In this context, Farouk Al-Rousan (2001) noted that individuals with cerebral palsy experience a disruption in their motor abilities, which also affects their mental, social, and emotional development, thereby necessitating special education services (Ghazzal, 2018, p. 2).

Children with cerebral palsy, who are affected by physical disabilities, face not only motor impairments but also a range of accompanying challenges. Among these, communication difficulties present a major barrier to their adaptation and interaction with their environment. Despite the varying severity and manifestations of their disabilities, all forms create obstacles to effective communication with others (Awad, 2015, p. 2).

Non-verbal communication deficits, whether in speech, gestures, or body expressions, are prominent symptoms in children with cerebral palsy (Khayal, 2007, p. 4). These difficulties can significantly affect their daily lives, as well as their social and emotional development. Children with cerebral palsy often face challenges in clear communication, as noted in Hala Allam's (2016) study, which found that their language is typically incomplete and disordered, with deficits in both speech and articulation.

Moreover, Fred Shelton (2016) emphasized the importance of visual communication for learning, imitation, and social interaction, particularly as an alternative communication method for children unable to speak. Her study, conducted on children with cerebral palsy, further supports the necessity of non-verbal communication for these children to interact with and adapt to their environment (Zoghbi, 2021, p. 23).

While the ability of individuals with cerebral palsy to communicate verbally varies depending on the severity and extent of their condition, many resort to alternative methods to facilitate communication. In the absence of verbal language, non-verbal communication often becomes their primary mode of interaction. This is reflected in Lamour Mariamme's (2012) study on communication methods used by non-verbal children with cerebral palsy (IMC/IMOC), which found that these children depend on non-verbal communication as a substitute for verbal forms of communication.

Similarly, Khayal Mahmoud Mohamed's (2007) study examined differences in non-verbal communication (such as hand gestures, eye contact, body movements, and facial expressions) across three groups: children with intellectual disabilities, children with cerebral palsy, and children with autism spectrum disorder. The findings revealed significant differences in the use of hand gestures, facial expressions, eye contact, and body movements, with children with cerebral palsy showing greater use of these non-verbal forms than the other groups, including children with Down syndrome, where notable differences in favor of the cerebral palsy group were observed for body gestures and facial expressions.

In contrast, the study by Mary JO et al. (2018), which evaluated early prediction characteristics related to communication (including speech, language, hearing, and augmentative communication) in children with neuro-motor disabilities, indicated that children with multiple co-occurring symptoms performed less effectively in communication tasks.

Children with cerebral palsy often employ various non-verbal communication strategies, including facial expressions, gestures, body movements, and proxemics. For non-verbal children, non-verbal communication becomes particularly crucial as it helps them to interact with others and express their needs and desires (Mohamed, 2018, p. 185). In this context, the study by Hustad et al. (2003) explored the effectiveness of direct non-verbal prompting in enhancing dialogue comprehension. The study, which involved both typically developing children and children with cerebral palsy, found a positive correlation between the use of gestural prompting in speech and the clarity of communication (Khayal, 2007, pp. 27-28).

Focusing on non-verbal communication in individuals with cerebral palsy is essential for their adaptation to their environment. This aligns with the findings of Wetherby et al. (1983), who indicated that individuals with cerebral palsy tend to rely more on gestures than verbal expressions, making non-verbal communication their primary means of expressing their needs (Ata, 2012, p. 43).

To enable individuals with cerebral palsy to adapt and interact effectively with their external environment, it is crucial to provide communication methods tailored to their specific disabilities. Pragmatic therapy, which seeks to enhance communication and social interaction in individuals with communication difficulties (both verbal and non-verbal), is particularly valuable in this context.

The therapy focuses on optimizing remaining communication abilities following brain injury, such as gestures and signals, to promote independence and facilitate adaptation to both external and family environments. This approach has been discussed in various theoretical studies, such as Arefi Afaf's (2019) work on the pragmatic approach to managing communication disorders in aphasia, specifically through the PACE technique. The study described the functional speech therapy technique for treating communication disorders in aphasia based on the pragmatic approach.

Additionally, Renard and Rosseau's (2009) study proposed a therapeutic P.A.C.E program, grounded in the pragmatic approach, which was applied to individuals with aphasia, primarily utilizing gestures and signals as communication tools. However, the results of the study contradicted the researchers' hypotheses, as many participants resorted to alternative communication methods not originally suggested, such as drawing and written language.

The aforementioned studies largely focused on the use of pragmatic therapy for neurological disorders. Given the limited number of studies exploring the effectiveness of pragmatic therapy in improving non-verbal communication in individuals with neurological disorders, particularly in Arab and Western societies (to the best knowledge of the authors), this study was initiated to investigate the potential impact of pragmatic therapy on non-verbal communication in individuals with cerebral palsy, a disability with a neurological origin.

Thus, the current study is guided by the following research questions:

_ Does pragmatic therapy improve non-verbal communication in individuals with cerebral palsy?
_ Are there significant differences between the pre-test and post-test mean ranks in the non-verbal communication component of the TLC test for children with cerebral palsy?

2. Concepts and Operational Terms of the Study

2.1 Non-verbal Communication:

Non-verbal communication is a method used by individuals to convey messages, express needs, desires, and emotions without relying on verbal language. It includes gestures,

signals, facial expressions, and movements of various body parts in different situations, all of which carry symbolic meanings that help individuals communicate and influence others, either positively or negatively (Bouazoni, 2022, p. 6).

Operational Definition of Non-verbal Communication:

The score achieved by children with cerebral palsy in the non-verbal communication section of the TLC (Test lilloi de communication) test.

2.2 Pragmatic Therapy:

Pragmatic therapy focuses on maximizing the use of remaining communication abilities following brain injury, such as gestures, signals, and facial expressions. According to Mazou (2007), the goal of pragmatic therapy is not only to reduce the direct symptoms of the disorder but also to improve the individual's ability to communicate effectively with peers and adapt to their family and society (Violaine, 2016, p. 10).

Thus, the aim is to enhance the remaining abilities after the injury and apply them in everyday life. For this study, the P.A.C.E (Promoting Aphasia Communication Effectiveness) program, utilizing Dominique Binichou's cards, was employed.

2.3 Cerebral Palsy:

Cerebral palsy is a developmental and neurological disorder that is neither progressive nor hereditary, affecting the brain during the early stages of a child's life. It results from damage or injury to the brain due to incomplete development of the motor cortex, leading to a range of sensory, motor, and neurological challenges. These may include limb deformities, paralysis, imbalance, speech difficulties, and seizures (Belkhiri, 2018, p. 22).

3. Field Study

3.1 Study Methodology:

Given that the primary aim of this study is to assess the effectiveness of pragmatic therapy in improving non-verbal communication in individuals with cerebral palsy, a quasi-experimental design with a one-group pretest-posttest approach was employed. In this design, pragmatic therapy is considered the independent variable, while non-verbal communication serves as the dependent variable.

The quasi-experimental design with a single-group setup is commonly used in social and educational sciences to examine the impact of a specific intervention or treatment on a single group. This design consists of two main phases: the first phase involves measuring the disturbance or behavior before the intervention (pre-test), and the second phase involves applying the intervention or therapy, followed by a post-test to measure the phenomenon or behavior again. By comparing the results of the first and second phases, the effects of the intervention on the same group can be assessed (Al-Kadhimi, 2013, p. 141).

In line with this design, the researchers conducted the following measurements for the experimental group:

- Pre-test measurement for the experimental group, conducted prior to the application of the therapeutic program.
- Post-test measurement for the experimental group, conducted after the completion of the therapeutic program.

3.2 Study Limitations:

Time Frame:

The study was conducted between April 16, 2023, and May 19, 2023, spanning one month. The sessions were held three times per week at the center and twice per week at the school,

with each session lasting between 15 and 45 minutes. This resulted in a total of 10 sessions per participant.

Geographical Scope:

The field study was conducted across two locations:

_ The Psychological Pedagogical Center for Mentally Disabled Individuals in Batna-2, Batna City, Algeria.
_ Sifah Al-Jabal 2 Primary School, Batna City, Algeria.

3.3 Study Sample:

The study sample was selected purposively and consisted of 10 children with cerebral palsy. Seven children were selected from the Psychological Pedagogical Center for Mentally Disabled Individuals in Batna-2 (2 females and 5 males), and 3 children were selected from Sifah Al-Jabal 2 Primary School (2 females and 1 male). The children's ages ranged from 8 to 13 years.

3.4 Study Tools:

The following tools were used to answer the research questions and test the study's hypotheses:

_ TLC (Test lilloi de communication).
_ The ecological subtest of daily communicative gestures (Le Sub test échologique des gestes).
_ Dominique Binichou's cards for the P.A.C.E therapeutic program (Promoting Aphasia Communication Effectiveness).

3.5 Presentation and Analysis of Results:

To test the hypothesis that "there are statistically significant differences between the pre-test and post-test mean ranks in the non-verbal communication component of the TLC test for the sample of children with cerebral palsy," the sample was initially evaluated, followed by the application of the program and a subsequent re-evaluation. Below are the results of the pre-test evaluation:

3.5.1 Presentation of Pre-test Results for the Non-verbal Communication Component of the TLC Test and the Ecological Subtest of Daily Communicative Gestures:

To assess the pre-test results for both the TLC test and the ecological subtest of daily communicative gestures, these tests were administered to 10 participants (the study sample). The pre-test scores were determined by calculating the raw scores for each item and the corresponding percentages for each of the 10 cases in the non-verbal communication section, as shown in the table below:
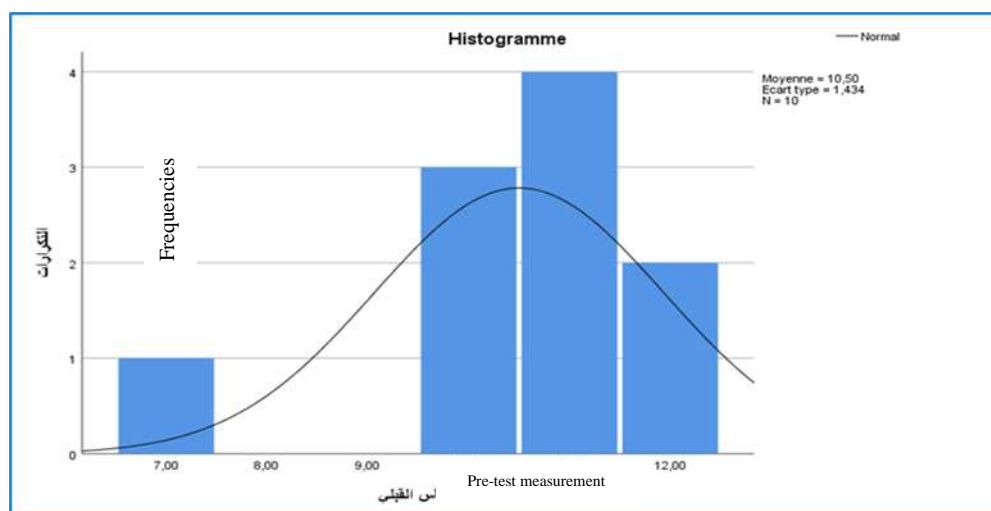
Table (5) presents the results for the non-verbal communication section of the TLC test during the pre-test evaluation:

Cases	Raw Scores for Items	Percentage
Case 1	11	64%
Case 2	11	64%
Case 3	10	58%
Case 4	12	70%

Case 5	12	70%
Case 6	12	70%
Case 7	10	58%
Case 8	11	64%
Case 9	10	58%
Case 10	7	41%

Table (5) illustrates the raw scores obtained by the cases in the non-verbal communication section of the TLC test for the pre-test evaluation, along with the corresponding percentage of success. Generally, the results indicate that most cases scored between 7 and 12 points. The lowest score was 7 (Case 10), while the highest score of 12 was achieved by three cases (Cases 4, 5, and 6).

Figure 11: Graphical representation of the pre-test results for the TLC test

To present the pre-test results for the ecological subtest of daily communicative gestures, the table below shows the percentage of responses from the 10 cases for each item:

Table (6) presents the results for the ecological subtest of daily communicative gestures (pre-test evaluation):

Items	Verbal Production	Written Production	Motor Production
1. Gesture for advancing	30%	0%	30%
2. Greeting gesture ("Hello")	20%	0%	50%
3. Offering a handshake	40%	0%	40%
4. Gesture for thinking	0%	0%	0%

5. Gesture of expressing surprise	0%	0%	40%
6. Gesture for expressing disregard by raising hands	0%	0%	0%
7. Gesture for expressing pain	0%	0%	0%
8. Gesture for expressing acceptance by nodding the head	20%	0%	50%
9. Gesture for expressing refusal by shaking the head	20%	0%	50%
10. Gesture for expressing denial by shaking the finger	50%	0%	90%

Table (6) highlights the pre-test results for the ecological subtest of daily communicative gestures, which complements the non-verbal communication section of the TLC test. The evaluation results reveal substantial variation in the responses of the cases. Notably, there was a significant lack of verbal production, with only 40% of the cases showing verbal responses. Written production was absent in all cases, while motor production ranged from 30% to 50%. However, the cases experienced considerable difficulty in mimicking gestures and comprehending certain signals, which can be attributed to their disabilities.

3.5.2 Implementation of the P.A.C.E Therapeutic Program:

The pragmatic therapeutic technique (P.A.C.E) was applied to the study sample for a period of 4 weeks, with two sessions at Sifah Al-Jabal 2 School and three sessions at the Psychological Pedagogical Center -2. The therapy was applied over 10 sessions, each lasting between 15 and 45 minutes per case. The following table outlines the progression of the therapy sessions:

Table (7) shows the progression of the therapy sessions for the P.A.C.E therapeutic program:

Session	Actions
Session 1	The therapeutic technique was explained to the cases, followed by the presentation of three cards from the "school" series. The researchers relied on verbal production, gestures, and body language to explain the cards. The 10 cases used verbal communication for some responses, while others used signals and gestures. Not all cases were able to identify the cards, and there was noticeable difficulty and slow response from the cases.
Session 2	In the second session, the same series ("school") was used to build the cases' confidence and to practice the therapeutic technique. The cases still showed a slow response and difficulty in using appropriate gestures and signals.
Session 3	The same "school" series was used in this session, but verbal communication was supported with non-verbal communication (facial gestures and hand signals). There

	was improvement in the cases' responses, and most cases managed to identify one of the three cards correctly.
Session 4	In the fourth session, a new series ("family") was introduced due to the cases' positive interaction with the therapy technique. Four cards were used, with verbal communication, drawing, and writing used to explain the cards. Some cases relied on verbal communication, others on gestures and signals, and one case used written production. The correct card was identified in most attempts.
Session 5	A new card from the "family" series was added, with verbal and non-verbal communication (gestures, signs) used to explain the content of the cards. Some cases correctly identified most of the cards in several attempts, while others struggled. Communication varied among the cases, with verbal communication, signs, gestures, movements, and writing used.
Session 6	The same series as previous sessions was used, with the addition of two more cards. Verbal and non-verbal communication was utilized, with the cases mainly relying on non-verbal communication (gestures, signs, facial expressions). One case did not manage to identify the cards, but most did.
Session 7	In this session, the same series used in previous sessions was supplemented with additional series ("school," "family," "professions") to increase the complexity. Eight different cards from the various series were used. The cases interacted positively, and they used a variety of communication channels, including verbal, gestures, and signs. There was noticeable improvement in their engagement and response.
Session 8	A combination of series ("school," "family," "professions," "outing") was used, along with eight cards from different series to further complicate the therapeutic technique. Verbal, visual communication, and body gestures were used to explain the cards. Communication channels varied among the cases. Most of the cases identified all the cards, showing high enthusiasm and enjoyment.
Session 9	In the second-to-last session, 10 cards from past series ("professions," "school," "family," "outing") were used. Verbal communication and demonstration were applied to explain the cards. The cases relied on imitation, verbal and non-verbal communication, and some used writing and drawing. All cases identified all the cards correctly during this session.
Session 10	In the final session, the same series as in previous sessions were used, but with improved verbal and non-verbal communication to ensure optimal understanding. The cases were able to identify most of the cards correctly, relying primarily on non-verbal communication (gestures, signs, and facial expressions). The cases showed significant improvement in non-verbal communication, demonstrating enthusiasm, interaction, and enjoyment throughout the therapy, especially compared to earlier sessions.

3-5-3 Presentation of the Post-Test Results for the Non-Verbal Communication Section of the TLC Test and the Ecological Subtest for Daily Communicative Gestures:

To obtain the post-test results for the TLC test, the raw scores for the items and the percentages for each of the 10 cases in the non-verbal communication section were calculated, as shown in the following table:

Table (8) presents the post-test results for the non-verbal communication section of the TLC test:

Cases	Raw Scores for Items	Percentage
Case 1	15	88.23%
Case 2	17	100%
Case 3	15	88.23%
Case 4	17	100%
Case 5	17	100%
Case 6	16	94%
Case 7	15	88.23%
Case 8	16	94%
Case 9	16	94%
Case 10	14	82.35%

Table (8) shows the raw scores obtained by the cases in the non-verbal communication section of the TLC test for the post-test evaluation, along with the corresponding success percentage. This table generally indicates that most of the cases obtained somewhat varied and relatively high results. The lowest score was 14 points, achieved by Case 10, while the highest score of 17 points was obtained by three cases.

Figure (12): Graphical representation showing the post-test results of the TLC test.

Table (9) presents the post-test results for the ecological subtest of daily communicative gestures, calculated in the same way as the pre-test. The results are shown in the following table:
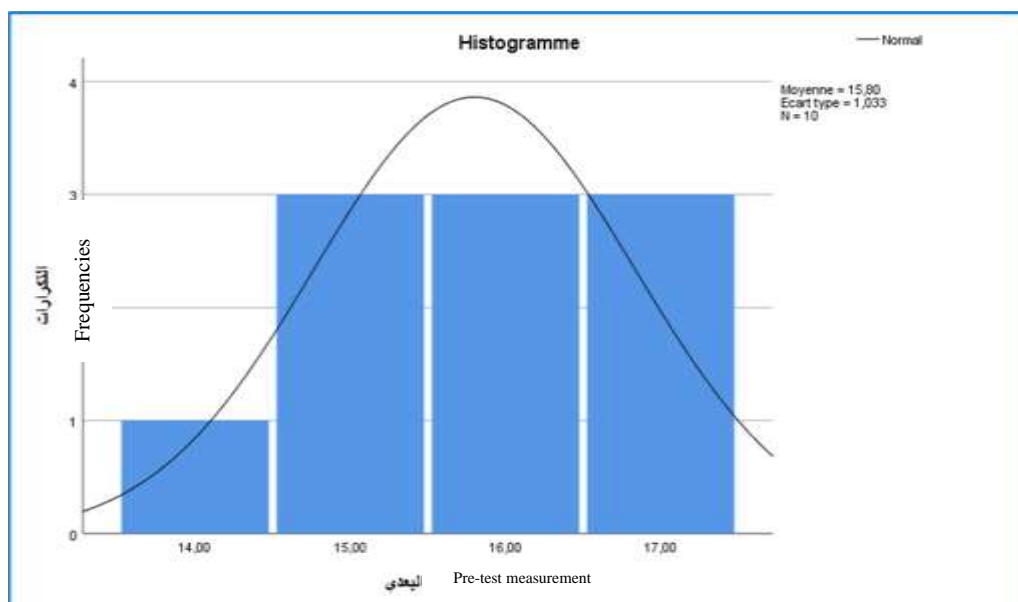

Table (9): The post-test results for the ecological subtest of daily communicative gestures (post-test evaluation):

Items	Verbal Production	Written Production	Motor Production
1. Gesture for advancing.	40%	0%	100%
2. Greeting gesture ("Hello").	50%	0%	100%
3. Offering a handshake.	50%	0%	100%
4. Gesture for thinking.	40%	0%	100%
5. Gesture of expressing surprise.	40%	0%	100%
6. Gesture for expressing disregard by raising hands.	40%	0%	100%
7. Gesture for expressing pain.	40%	0%	90%
8. Gesture for expressing acceptance by nodding the head.	50%	0%	100%
9. Gesture for expressing refusal by shaking the head.	50%	0%	100%
10. Gesture for expressing denial by shaking the finger.	50%	0%	90%

The table above shows the post-test evaluation results, where there is a significant improvement in motor production, ranging from 90% to 100%. The cases were able to understand and reproduce the gestures, accompanied by facial expressions. Additionally, there was a slight improvement in verbal production for some of the cases.

3-5-4 Presentation and Analysis of the Hypothesis Results:

Hypothesis Statement:

- This hypothesis stated that **"there are statistically significant differences between the mean ranks of the pre-test and post-test results in the non-verbal communication section of the TLC test for children with cerebral palsy."**

To verify the hypothesis and test the differences between the two related samples with small sizes, a non-parametric statistical method was used, specifically the Wilcoxon signed-rank test. This test is appropriate for examining the hypothesis of the study.

First, we ensured the normality of data distribution, which is a requirement for conducting the parametric test. The results showed that the data did not follow a normal distribution, with a significance value of 0.047 (which is less than 0.05). Therefore, the non-parametric Wilcoxon test was used, as it does not require normality for the sample distribution.

Table (10) shows the calculated means and standard deviations:

	Mean	Standard Deviation	Median	Kurtosis		Skewness	
				Statistic	Standard Error	Statistic	Standard Error
Pre-Test	10,50	1,43	7,00	3,96	1,33	-1,70	0,69
Post-Test	15,80	1,03	14,00	-0,90	1,33	-0,27	0,69

 The calculated means and standard deviations for both the pre-test and post-test, as shown in Table (10), indicate that the mean for the pre-test (Mean = 10.50) is lower than the mean for the post-test (Mean = 15.80). Additionally, the standard deviation for the post-test (1.03) is smaller than the standard deviation for the pre-test (1.43). The median for the pre-test (7.00) is much lower than the median for the post-test (14.00).

To verify the hypothesis, we first calculated the direction of the differences between the pre-test and post-test, as shown in Table (11):

Table (11) shows the direction of the differences between the pre-test and post-test:

	Sample Size	Mean	Standard Deviation	Minimum Value	Maximum Value
Pre-Test	10	10.50	1.434	7.00	12,00
Post-Test	10	15.80	1.033	14.00	17,00

The results in the table above indicate that the mean score for the pre-test (Mean = 10.50) was lower than that for the post-test (Mean = 15.80), showing an increase in the mean for the non-verbal communication section. The data distribution is well-centered, with the standard deviation for the pre-test (1.43) and the post-test (1.03). The scores in the pre-test ranged from 7 to 12 points, while in the post-test, the scores ranged from 14 to 17 points.

The significance of the differences between the pre-test and post-test was calculated using the Wilcoxon statistical test to verify the hypothesis, and Table (12) shows the results.

Table (12): Wilcoxon Test Results for the Statistical Significance of Differences Between the Pre-Test and Post-Test for the Non-Verbal Communication Section of the TLC Test for the Study Sample

		Number	Mean Rank	Total Rank	Z-Value	Significance Level
Pre-Treatment Performance - Post-Treatment Performance	Negative Rank	0	0,00	0,00	-2,83	0,005
	Positive Rank	10	5,50	55,00		
	Tied Rank	0				
	Total	10				
	A. Post-Treatment > Pre-Treatment					
	B. Post-Treatment < Pre-Treatment					
	C. Post-Treatment = Pre-Treatment					

The results from Table (12) show the differences in performance scores before and after treatment. Notably, the number of negative ranks (i.e., scores that differed in the post-test compared to the pre-test) is zero. This indicates that none of the scores worsened in the post-test; in fact, all scores were better in the pre-test. The total value for negative ranks is thus 0.

The table further illustrates the number of positive ranks (i.e., scores that showed improvement from pre-test to post-test). All the scores from the sample members showed improvement in the post-test compared to the pre-test, with positive ranks totaling 10, and the total value for positive ranks amounting to 55. The average for negative ranks was 0,

while the average for positive ranks was 5.5. This suggests that the therapeutic program brought about measurable improvements in the participants' performance.

Moreover, the table clearly demonstrates statistically significant differences between the mean ranks of the pre-test and post-test for the children with cerebral palsy (study sample) in the non-verbal communication section of the TLC test. The Z-value was -2.831, which is statistically significant at the 0.05 level. This indicates a significant difference in the performance scores between the pre-test and post-test, supporting the hypothesis that the pragmatic therapy was effective in improving non-verbal communication among children with cerebral palsy.

3-5-5 General Discussion:

Reminder of the Hypothesis: "There are statistically significant differences between the mean ranks of the pre-test and post-test results in the non-verbal communication section of the TLC test for children with cerebral palsy."

To verify this hypothesis, a statistical analysis was conducted on the results from applying the non-verbal communication section of the TLC test to assess non-verbal communication among children with cerebral palsy before and after treatment. After processing the data using the Wilcoxon test, statistically significant differences were found in the mean ranks of the children's performance pre- and post-treatment in the non-verbal communication section of the TLC test.

To the best of the researchers' knowledge, there are no previous studies that have specifically addressed the effectiveness of pragmatic therapy in improving verbal or non-verbal communication in children with cerebral palsy. However, a study by Bosco et al. (2018) aimed to assess the effectiveness of a pragmatic therapy program using everyday communicative activities for individuals with neurological impairments. The study demonstrated a general improvement in pragmatic abilities post-training, with participants showing progress in both verbal and non-verbal communication skills. Given that cerebral palsy is a neurological condition, the results from this study align with the current study's findings, though these interpretations may be further enhanced by additional theoretical frameworks.

Through the results obtained from the non-verbal communication section of the TLC test, it was found that the pragmatic therapy (P.A.C.E) applied to children with cerebral palsy (study sample) contributed significantly to enhancing their non-verbal communication skills, particularly in the interactive pragmatic domain.

The improvement was especially evident in areas such as turn-taking, use of appropriate tone, and accuracy in utilizing symbols and gestures. There was also noticeable progress at the lexical level, with symbolic elements and gestures becoming more automatic and meaningful. The children showed their ability to perform and use various sign languages, body gestures, facial expressions, and other communicative signs. This progress was particularly evident during the therapeutic sessions using the P.A.C.E technique.

Despite the speech difficulties typically faced by children with cerebral palsy, which often lead to disrupted spoken language, they appeared to have compensatory abilities in using non-verbal communication. This included gestures, facial expressions, and other strategies to facilitate communication. These compensatory methods served as alternative communication strategies, enabling them to engage in social interaction despite their linguistic challenges.

This observation aligns with Khayal (2007), who noted that the linguistic challenges faced by this group do not prevent them from engaging in communication with others (p. 45). It also resonates with previous studies, such as those by Otapowicz et al. (2005), Hustad et

al. (2001), and Hastad & Garcia (2003), which emphasized the significance of non-verbal communication strategies for individuals with motor impairments.

These studies confirmed that children with these disabilities benefit from educational strategies that incorporate linguistic materials along with gestural and symbolic expressions. As a result, non-verbal communication becomes an effective means for them to express their needs. Non-verbal methods are often easier to use and less prone to misunderstandings compared to verbal communication (Khayal, 2007, p. 46).

Drawing from theoretical literature, pragmatic models explain how individuals use language when interacting with their environment. This forms the basis of the pragmatic approach, which focuses primarily on communication and often disregards the concept of language impairment. In some cases, therapists may not be able to rehabilitate language functions using the remaining linguistic abilities, and thus, compensatory strategies are employed through non-verbal communication techniques (Chomel et al., 2010, p. 182).

The pragmatic therapeutic approach is widely regarded as a treatment method for neurological disorders (Maurer, 2014, p. 28). It operates on the principle of utilizing the remaining communicative abilities following brain injury, such as developing compensatory strategies (e.g., gestures, facial expressions) that help individuals interact with their external environment (Tayyar, 2020, p. 8). A study by Gabbatore et al. (2015) on rehabilitating individuals with brain injuries using pragmatic therapy showed improvement in patients' performance, both in linguistic and non-linguistic abilities after training.

This improvement in non-verbal communication among children with cerebral palsy can be interpreted as a result of the nature of the P.A.C.E pragmatic therapy. The therapy relies on patients utilizing their remaining functional abilities, engaging various communication methods to achieve effective interaction as fully as possible (Ariba, 2014, p. 9).

Therefore, based on the previous findings, the researchers conclude that pragmatic therapy is effective in enhancing non-verbal communication in children with cerebral palsy through the P.A.C.E technique. This technique compensates for the lost communicative functions and helps enhance the remaining communicative abilities following the neurological damage caused by cerebral palsy. The neurological origin of cerebral palsy thus explains the effectiveness of this therapy for this group.

Conclusion:

Based on the theoretical analysis of the key concepts of this study and the presentation of its results, interpreted in light of previous studies and the theoretical framework, the findings of this research are distinct and innovative. To the researchers' knowledge, there is a notable scarcity of studies utilizing pragmatic therapy as a tool for improving non-verbal communication in individuals with motor neurological disabilities. This gap is highlighted in the results related to the hypotheses, and this study contributes valuable new insights to the body of scientific knowledge.

To further advance research in the field of speech therapy, the researchers propose several areas for future study. These suggestions aim to address questions raised by the current study, explore the potential for generalizing its findings, and assess the consistency of these results when applied to other sample groups, considering variations in age or type of disability. The following studies are recommended:

- Designing tests specifically to measure non-verbal communication in individuals with motor neurological disabilities.

    - Evaluating the effectiveness of pragmatic therapy in improving verbal communication among individuals with motor neurological disabilities.

    Assessing the impact of pragmatic therapy on both verbal and non-verbal communication in individuals with other neurological impairments.

    Investigating the effects of pragmatic therapy on enhancing both verbal and non-verbal communication in children with motor neurological disabilities.

    Evaluating verbal and non-verbal communication using the TLC test in individuals with motor neurological disabilities.

    Exploring the effectiveness of pragmatic therapy in improving non-verbal communication in adults with motor neurological disabilities.

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