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To Evaluate and Distinguish the Effects of Art Therapy and Visual Color Cues to Ameliorate the Symptoms of Parkinson's Disease - A Pilot Study

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ABSTRACT

Parkinson's disease is the 2nd most common neurodegenerative disease that worsens with time and mostly affects movement. The disease depicts complex multi-system symptomatology which includes both motor as well as non-motor manifestations. Complementary and alternative remedies are increasingly being used to treat its symptoms. Acknowledging the complex nature of Parkinson's disease (PD) symptoms, this research aims to treat both motor and non-motor symptoms, with a particular emphasis on gait abnormalities and cognitive loss. The study intends to examine how well two intervention strategies—visual color signals and art therapy— to improve overall cognitive functionality and FOG in people with Parkinson's disease.

OBJECTIVES: Study aimed to determine and distinguish the effectiveness of Art Therapy and Visual Color Cues on mainly cognitive skills and gait pattern in Parkinson's sufferers. The research aims to further our understanding of the connection between PD patients' gait, cognition, and treatment interventions. Through an extensive analysis of recent research findings and literature, the study seeks to provide light on how these factors interact and the potential effectiveness of different treatment approaches in treating Parkinson's disease symptoms.

METHOD: This study included 30 Parkinson's patients. In order to evaluate the efficacy of art therapy and visual cue training as two intervention modalities in enhancing cognitive abilities and freezing of gait (FOG) in individuals with Parkinson's disease (PD), a randomized controlled experiment was carried out. Each intervention group consisted of 15 individuals who were assessed before and after the trials, randomized at random to undergo 6 weeks of therapies, which included regular physiotherapy sessions three times a week for 40 minutes each. The art therapy group participated in a variety of creative activities meant to improve gait, attention, motivation, emotional control, and cognitive performance. However, the visual cue training group learned how to employ visual cues—like colored papers or objects on the floor—to enhance gait start and turning as well as cognitive status. The results of the six-week therapy period based on MOCA and Mini BESTest scores were compared to ascertain the effectiveness of each strategy in treating FOG and cognitive function in individuals with Parkinson's disease.

RESULTS: When Art Therapy (AT) and Visual Color Cues (VCC) were compared for Parkinson's patients, it was discovered that AT improved cognitive performance more as measured by improved Montreal Cognitive Assessment (MOCA) scores. Patient's outcomes for mobility and balance, as determined by the Mini-BES Test, differed, with some responding better to VCC and others to AT. The necessity for individualized treatment methods was highlighted by statistical analysis, which demonstrated substantial variations in MOCA and Mini-BES Test ratings among the two regimens.

CONCLUSION: This study concluded that both AT and VCC significantly improve cognitive function and gait performance in PD patients. However, the nature of the improvements suggests that while AT may have a more substantial impact on cognitive functions, VCC may be more effective in enhancing motor functions. Altogether, Art Therapy and Visual Color Cues both present viable non-pharmacological interventions for improving the symptoms of Parkinson's Disease.

Keywords: Art Therapy; Visual Color Cues; MOCA; Mini BES Test; Parkinson Disease; FOG; Visuo-spatial Functions; Cognition

INTRODUCTION

Parkinson's disease (PD) is a chronic neurological illness that worsens with time and mostly affects movement. The name of the illness comes from a British physician named James Parkinson, who first described it in 1817. Parkinson's disease is characterized by a decline of neurons that produce dopamine in the brain's substantia nigra [1][2]. Dopamine is one transporter that is necessary for seamless, synchronized muscle movements [3].

Most people think that the primary cause is malfunctioning of the basal ganglia, which include the putamen and caudate nuclei in the striatum, globus pallidus, subthalamic nucleus, and substantia nigra. It is a crucial component of the central nervous system that communicates with the brain's motor cortex via the thalamus to regulate movement [4]. Parkinson's disease is characterized by a decline of neurons that produce dopamine in the brain's substantia nigra. Dopamine is one transporter that is necessary for seamless, synchronized muscle movements. 60-80% of dopaminergic neurons are damaged prior to the onset of motor symptoms in Parkinson's disease [4]. While the precise etiology of Parkinson's disease (PD) remains unclear, a number of explanations have been proposed, including oxidative stress, protein folding errors, toxicity and aggregation, reduced proteolysis, and mitochondrial dysfunction. One distinguishing characteristic of Parkinson's disease (PD) is the unique accumulation of Lewy bodies inside dopaminergic neurons. The protein known as α-synuclein is the primary constituent of lewy bodies.

In Parkinson's disease, 90% phosphorylation of Lewy body α-synuclein results in neuronal death. Parkinson's disease (PD) results in a change in the a-synuclein protein from soluble to insoluble, which cannot be eliminated. Still, no conclusive evidence has been found to connect Lewy bodies to neuronal death in Parkinson's disease [5].

The greatest risk factor for Parkinson's disease (PD) is becoming older, despite the fact that the underlying cause of the illness is unknown. Parkinson's disease (PD) affects less than 1% of people under the age of fifty [4][5]. Although it mainly affects the elderly, younger people might also be impacted by the condition. The overall incidence of Parkinson's disease is higher in males than in women, with a proportion of men to women of around 3:1. Genetic and environmental influences are two of these.

Parkinson's Disease (PD) progresses through 4 stages which shows the impact of the disease on daily life of sufferer. In Stage 1, diagnostic stage, individuals experience the first symptoms, which are not particularly severe. During Stage 2,

maintenance stage, symptoms become more noticeable but can be managed effectively with medications. Stage 3, advanced stage, is marked by exaggerated symptoms and significant difficulties in performing activities of daily living. Finally, Stage 4, palliative stage, represents the most severe phase of the disease, where there is no cure, and the focus is on providing relief for some symptoms, stress, and pain [6].

Parkinson's Disease (PD) presents a range of motor and non-motor symptoms that significantly affect patients' quality of life. The motor symptoms of PD include tremor, an uncontrollable shaking of a body part, usually starting with the hands. Bradykinesia refers to a progressive stiffness of movement that affects an individual's ability to initiate and complete tasks. Akinesia is the incapacity to move willingly. Rigidity involves having inflexible muscles, which can cause stiffness, limited range of movement, and soreness in the joints. Postural instability, a stoop posture which affects coordination and balance, increasing the risk of falling [1][7].

Non-motor symptoms are also prevalent in PD. Cognitive changes include difficulties with concentration, memory, and other cognitive functions. Mood disorders such as anxiety and depression are common among Parkinson's disease patients. Autonomic dysfunction can cause digestive issues, bladder control problems, and challenges with blood sugar management. Sleep disturbances, including insomnia and severe daytime fatigue, are frequently experienced by those with PD. Loss of smell, a diminished capacity to recognize or distinguish scents, is also common. An early sign of PD is micrographia, which is abnormally tiny and cramped handwriting [1][2].

Cognition- The term "cognition" broadly describes the mental processes that enable us to interpret and use information. These brain processes enable us to carry out routine activities like paying attention, resolving conflicts, and recalling the locations of objects and instructions. "Memory" is frequently brought up while discussing cognition, however memory is simply one component of cognition. While not everyone with Parkinson's disease develops cognitive symptoms, they are prevalent. Some PD patients have just little cognitive impairments. In others, on the other hand, cognitive impairments could worsen and affect day-to-day functioning. In addition to bradykinesia, or slowness of movement, persons with Parkinson's disease frequently experience "bradyphrenia," a decline in thought processes and data processing, according to APDA.

Freezing of gait (FOG)- FOG is a phenomenon where individuals suffering from Parkinson's disease find it difficult to initiate or sustain a walking stride [8]. It often occurs when turning, maneuvering in confined spaces, or when you're anxious or preoccupied. FOG is one of the most debilitating symptoms of Parkinson's disease (PD) and usually does not go better with dopaminergic treatment. Due to a confluence of factors including the progression of the disease and extended use of anti-parkinsonian medications, FOG is more common in patients with advanced Parkinson's disease (PD). Two additional common FOG responsibilities are turning and maneuvering through small spaces, such as elevators or entry ways. if the initial clinical presentation of the disease led to a movement disorder. Over time, Parkinson's disease (PD) deteriorates, leading to significant disability and a reduced standard of living [3][9].

Therapeutic interventions

Art therapy sessions

An expanding and innovative approach, art therapy has been utilized to treat many different types of illnesses. However, the use of art therapy for Parkinson's disease has been expanding. Art therapy is the use of creative expression, such as painting or drawing, as a treatment to treat Parkinson's disease symptoms that include cognitive, emotional, and physical [10-12].

Art therapy is a treatment option used in ongoing sessions to "improve cognitive and sensorimotor functions, foster self-esteem and self-awareness, cultivate emotional resilience, promote insight, enhance social skills, reduce and resolve conflicts and distress, and advance societal and ecological change" according to the American Art Therapy Association (AATA; American Art Therapy Association, 2021). Furthermore, according to the AATA, AT involves the mind, body, and spirit in ways that go beyond just verbal articulation by using integrative methodologies. Alternative receptive and expressive communication modalities that get beyond language's limits are made possible by opportunities presented by kinesthetic, sensory, perceptual, and symbolic experiences. Transformation at the individual, group, and social levels is empowered and given voice via visual and symbolic manifestations.

Enhancing or regaining a person's functionality and sense of personal well-being is the aim of art therapy (ATs) (American Art Therapy Association, 2021). The application of artistic interventions for medical purposes has been shown to have long-lasting positive effects on well-being in recent scientific research. The arts may assist caregivers, encourage activities that promote health, help avoid health problems, and have an impact on social well-being. Additionally, they can lessen stress, which can assist a variety of illnesses, be averted or progressed more slowly (Stuckey and Nobel, 2010; Fancourt and Finn, 2019). For persons suffering from mental illness, the arts may have a great impact on how they express themselves and perspective.

The goals of art therapy for Parkinson's disease patients include enhancing gait, cognitive skills, reducing depressive and anxious symptoms, and enhancing their standard of life. All the prior studies so far suggested that working on artistic projects can help individuals suffering from Parkinson's disease feel more successful and enjoy themselves while also improving their mobility and coordination. It has demonstrated improvements in cognitive performance, FOG, and stress reduction [13].

Visual color cues session

When symptoms of Parkinson's disease (PD) intensify or as a result of bad medication responses, patients may experience problems with vision, cognition, and mobility. Impaired perception can make it more difficult to distinguish objects, perceive depth, and move safely in a location. Cognitive alterations can also make formerly routine tasks more difficult, such as walking [14][15].

However, visual cues can help someone with Parkinson's disease (PD) stay on course and lessen their bouts of freezing. A visual cue is the information we deduce from the shapes, hues, sizes, patterns, and motions we see all around us. In order to help patients with Parkinson's disease (PD) comprehend and interpret their surroundings, identify objects and people, and recognize emotions as well as patterns of movement and gait, the brain processes visual data [9][16][17].

Cueing has been found to be effective in reducing freezing of gait (FOG) while turning, according to studies on particular physiotherapeutic techniques. "Applying temporal or spatial stimuli associated with the initiation and ongoing facilitation of motor activity" is the definition of cueing (Lim et al.,2005). In people with Parkinson's disease (PD), it temporarily enhances step length, cadence, asymmetry, and gait pattern. This is achieved by artificially creating movement patterns to make up for the lack of self-initiated movement, hence lowering the risk of festination and FOG (Jahanshahi M et al.,1995).

When it comes to the effects of visual cueing on freezing episodes in people with Parkinson's disease (PD), different studies have produced different results. For example, (Bryant et al.,2010) found that cueing with the help of laser lights reduced the number of freezing episodes, while (Velik et al.,2012) found that applying

visual cueing projected from the chest reduced the number and duration of freezing episodes.

Assessment tools

Two very important evaluation tools-MOCA and Mini BES Test-were used to determine the scoring.

MOCA, or the Montreal Cognitive Assessment

The MOCA is a widely used assessment instrument to determine if cognitive decline is present or not. Evaluations include those for vocabulary, conceptual thinking, mental processing, orientation, late retention, close attention, and visuospatial abilities [18]. Highly sensitive and specific as it evaluates variety of skills than any other tool [18].

Dr. Ziad Nasreddine created the Montreal Cognitive Assessment (MoCA) in Montreal, Canada in 1995 so that medical practitioners could identify cognitive impairment. Multiple cognitive domains are evaluated by the MoCA. These are: Abstraction, Naming, Memory, Attention, Language, Visuospatial/Executive, and Orientation (to place and time).

Many of the components are recognizable from or comparable to previous cognitive function assessments. A clock-drawing activity and a trail-making task-which is allegedly helpful in determining driving fitness-are used to evaluate visual-spatial ability. A sustained attention test (target detection by tapping), a serial subtraction problem, and forward and backward digits are used to assess attention, concentration, and working memory (Occupational Medicine, 2015).

Mini BESTest - Mini Balance Evaluation Systems Test

A clinical evaluation instrument called the Mini-BESTest (Mini-Balance Evaluation Systems Test) is used to evaluate a person's gait impairment and equilibrium, especially in those with neurological conditions like Parkinson's disease or TIA. It was created using reliable psychometric principles and is considered highly useful in clinical settings. Practitioners have reported that it is simple to master and believe it offers pertinent and beneficial data that aligns with functional abilities [8].

It is a streamlined form of the originally established Balance Evaluation Systems Test (BES Test), which was designed to reduce time requirements without compromising the comprehensive assessment of balance skills. The 14 items on Mini BES Test cover four of the six parts of the original BES Test and evaluate the uni-dimensional construct of dynamic balance [19].

1) Anticipatory postural adjustments 2) Reactive postural control 3) Sensory orientation 4) Dynamic gait

Art therapy also fosters gross and fine motor activity and aids in visual-spatial processing in addition to promoting overall psycho-social well-being [11-13]. However the visual shrink of a pattern can provide navigational benefits for a person with Parkinson's disease (PD) to follow a path and reduce freezing in gait. The parallel process of hedonic absorption replenishes internal resources and provides a respite from the chronic, progressive symptoms of Parkinson's disease. It involves representing complex motor, non-motor, emotional, and somatic processes non-verbally to affect relief and change [9][16][17].

The current study aims to evaluate the art therapy and visual therapy to ameliorate the symptoms of Parkinson disease. Many prior studies have been done to prove the effectiveness of these two mentioned therapies separately while this study aimed to analyse the comparison in the effects of respective therapies with respect to each other and symptoms particularly FOG and cognition.

MATERIALS & METHODS

Participant Recruitment --> Baseline Assessment --> Intervention Groups --> Intervention Implementation → Pre-Intervention Assessment --> Post-Intervention Assessment --> Data Analysis

--> Results and Discussion --> Conclusion and Recommendations

Sample: An assortment of 30 people was scheduled to participate in the effort, consisting of 6 females and 24 males. The patients were equally divided into 2 groups. Every participant was chosen from a cohort drawn from hospitals, home-based and specialized clinics. With a standard deviation of 3.89, the sample size's mean age was above 68. The trial lasted six weeks, with three 40-minute sessions per week.

The study looked at two metrics, physical deterioration and mental decline, which are very prevalent in Parkinson's disease patients. The study included two severely affected factors: a reduction in cognitive performance, a non-motor manifestation, and freezing of gait, a motor symptom.

The patients in the experimental group were taken on the basis of the criteria mentioned in Table 1.

Table 1. Inclusion and Exclusion Criteria

Criteria Type	Criterion	Details
Inclusion	PD Stage	Advanced stage Parkinson's Disease
	Age Range	45-75 years
	History of FOG	Documented history of Freezing of Gait (FOG)
	Gait Disturbances	Mini-BES Test score < 24
	Cognitive Impairment	Montreal Cognitive Assessment (MoCA) score < 24
Exclusion	Other Conditions	Presence of other neurological or musculoskeletal conditions affecting gait
	Age Below 45	Age < 45 years
	Age Above 75	Age > 75 years
	Visual Impairment	Documented visual impairment
	High Mini-BES Test Score	Mini-BES Test score > 24
	High MoCA Score	MoCA score > 24
Consent	Informed Consent	Written consent obtained from all participants

Procedure for art therapy sessions-

- First, respondents were required to reproduce four drawings (each with a distinct hue) created by the therapist, and they also had to remember the precise order in which the patterns appeared. Subsequently, the therapist created designs on little cards and placed them in a certain configuration on the ground.
- The participants were then told to start rotating at 45°, 90°, 180°, and 360° in addition to navigating the obstacle over and around the drawings that were placed on the floor, in the same order as they had drawn the pictures earlier.
- Lastly, each participant was given four separate artworks to do, representing everything from nature to their home, work, etc. They were also told to record the order in which they drew them.
- The next time they met, they were to report the exact order in which they finished their drawings, followed by going through the whole procedure again.
- The process of drawing was repeated in an effort to enhance memory and cognitive function. Nonetheless, the goal of using drawings to navigate obstacles was to enhance FOG and the workings of the visuospatial pathway.

Figure 1.

Figure 1. Patient in art therapy session

Procedure for visual color cues sessions-

- To aid with memory of the exact color and order of colors, each participant was first given five color cards.
- The next task given to the participants was to line up the color cards in the proper order, start turns at 45°, 90°, 180°, and 360° within the circular area on the floor, and draw the figure of S and 8 all around and above the cards.
- In order to enhance the walk and FOG following cards, Beam of light was also later used as a clue.
- Before the next session began, participants were required to verify with the therapist how the color cards were arranged exactly. The color cycle was repeated in order to improve memory and cognitive performance.

Figure 2.

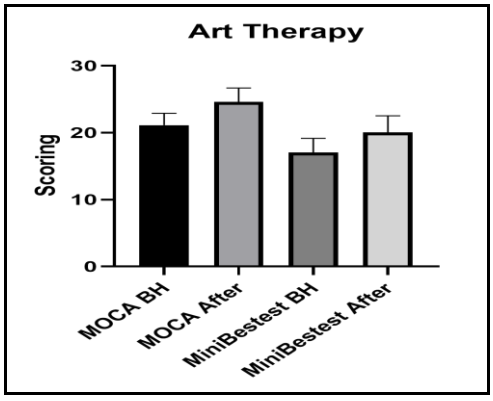
Figure 2. Patient in visual color cues session

RESULT

Readings for MOCA and Mini BES Test were obtained both before and after the examination. According to the findings, there was a marginally significant improvement on both the Mini BES Test and the MOCA for the considered symptoms

ART THERAPY:

Graph 1.



Graph 1. AT Scoring

The study showed a statistically significant enhancement in both metrics after an art therapy session. After art therapy, the scales became better. Following testing, there was an improvement in functioning as shown by the MOCA scale, which evaluates mental abilities. Mini BES Test, that was employed to assess balance, showed a statistical betterment in FOG.
(scores are attached in Table S1)

Table S1: Art Therapy Data

Patient No	MOCA BH	MOCA After	Mini Bestest BH	Mini Bestest After
1	21	26	13	20
2	23	26	17	21
3	22	27	13	19
4	21	25	15	15
5	23	23	16	19
6	20	20	18	18
7	20	22	17	20
8	24	27	18	20
9	24	26	18	19
10	21	25	19	20
11	20	24	19	23
12	18	24	17	23
13	20	27	19	23
14	21	25	20	24
15	19	22	17	17

A t-test was used to statistically analyze the data in order to track how art therapy affected the patient's Parkinson symptoms. After interpreting the data, which is presented in the table, it was discovered that art therapy can ameliorate the cognitive and physiological deterioration linked to Parkinson's disease. The p-values for Mini Bes test and MOCA were 0.0012 and 0.0001, respectively, and both were substantially lesser than 0.05.

Table 2 (A). Statistical Data for the t-test of Art Therapy

Table Analyzed	Art Therapy
Column B	MOCA After
vs.	vs
Column A	MOCA BH
Unpaired t test	
P value	<0.0001
P value summary	****

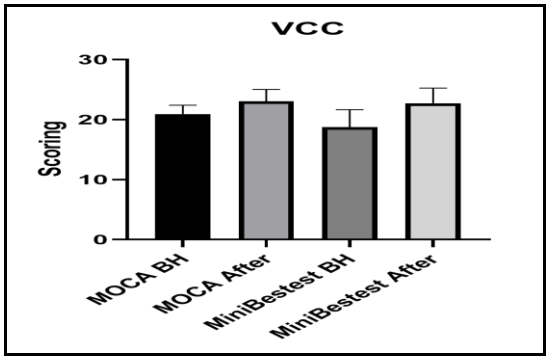
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=4.895, df=28
Data analyzed	
Sample size, column A and B (each)	15

Table 2 (B). Statistical Data for the t-test of Art Therapy

Table Analyzed	**Art Therapy**
Column D	Mini Bes test After
vs.	vs.
Column C	Mini Bes test BH
Unpaired t test	
P value	0.0012
P value summary	**
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=3.600, df=28
Data analyzed	
Sample size, column C and D (each)	15

VISUAL COLOR CUES:

Graph 2.



Graph 2. VCC Scoring

Table S2: Visual Color Cues Therapy Data

Patient No	**MOCA BH**	**MOCA After**	**Mini Bes test BH**	**Mini Bes test After**
1	21	24	14	19
2	23	20	13	17
3	20	23	16	20
4	21	24	19	22
5	23	24	20	21
6	20	24	17	23
7	21	26	18	25
8	19	23	20	23
9	18	21	21	24
10	23	23	23	24
11	20	20	19	26
12	20	23	17	23
13	22	23	23	24
14	21	21	20	25
15	22	27	21	25

A session on visual color signals resulted in a statistically significant improvement on both metrics, as seen in the graph. The scales improved following the therapy. The

memory performance measure, the MOCA scale, showed improved functioning after testing. The motor appearance measure, Mini BES Test, demonstrated a quantifiable enhancement in FOG.

After interpreting the data, which is presented in the table, it was discovered that visual treatment can help with the cognitive and physiological deterioration linked to the disease. 0.0024 and 0.0004, respectively, were the p-values for MOCA and Mini Bes test, which were substantially lesser than 0.05.

Table 3 (A). Statistical Data for the t-test of Visual Color Cues Therapy

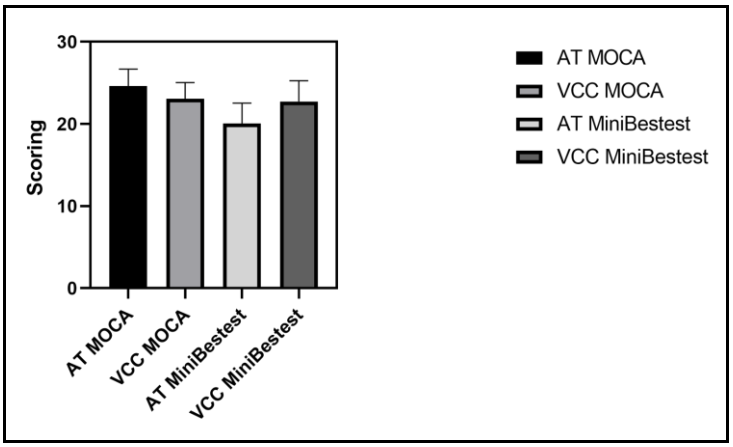
Table Analyzed	**VCC**
Column B	MOCA After
vs.	vs.
Column A	MOCA BH
Unpaired t test	
P value	0.0024
P value summary	**
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=3.336, df=28
Data analyzed	
Sample size, column A and B (each)	15

Table 3 (B). Statistical Data for the t-test of Visual Color Cues Therapy

Table Analyzed	**VCC**
Column D	Mini Bestest After
vs.	vs.
Column C	Mini Bestest BH
Unpaired t test	
P value	0.0004
P value summary	***
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=4.001, df=28
Data analyzed	
Sample size, column C and D (each)	15

OVERALL ANALYSIS

Graph 3.



Graph 3. General AT v/s VCC

Table 4 (A). Statistical Data for the t-test for Art Therapy V/S Visual Color Cues Therapy

Table Analyzed	**AT vs VCC**
Column B	VCC MOCA
vs.	vs.
Column A	AT MOCA
Unpaired t test	
P value	0.049
P value summary	*
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=2.058, df=28
How big is the difference?	
Mean of column A	24.6
Mean of column B	23.07
Difference between means (B - A) ± SEM	-1.533 ± 0.7449
95% confidence interval	-3.059 to -0.007413
R squared (eta squared)	0.1314
Data analyzed	
Sample size, column A and B (each)	15

Table 4 (B). Statistical Data for the t-test for Art Therapy VS Visual Color Cues Therapy

Table Analyzed	**AT vs VCC**
Column D	VCC Mini Bestest
vs.	vs.
Column C	AT Mini Bestest
Unpaired t test	
P value	0.0067
P value summary	**
Significantly different (P < 0.05)?	Yes
One- or two-tailed P value?	Two-tailed
t, df	t=2.931, df=28
How big is the difference?	
Mean of column C	20.07
Mean of column D	22.73
Difference between means (D - C) ± SEM	2.667 ± 0.9099
95% confidence interval	0.8028 to 4.531
R squared (eta squared)	0.2347
Data analyzed	
Sample size, column C and D (each)	15

Table 5. Statistical ANOVA summary AT v/s VCC

Table Analyzed	**AT vs VCC**				
Data sets analyzed	A-D				
ANOVA summary					
F	10.27				
P value	<0.0001				
P value summary	****				
Significant diff. among means (P < 0.05)?	Yes				
R square	0.3549				
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Treatment (between columns)	159.8	3	53.26	F (3, 56) = 10.27	P<0.0001
Residual (within columns)	290.4	56	5.186		
Total	450.2	59			
Data summary					
Number of treatments (columns)	4				
Number of values (total)	60				

Based on the study, there may be differences in the degree to which individuals with Parkinson's disease benefit from art therapy and visual color cues in terms of improving their cognitive abilities and balance. Visual color signals as evaluated by mini BES Test and MOCA are compared to the outcomes of art therapy. Visual color signals and art therapy evaluation methods are both improving, according to the graph. (scores are attached in Table S3)

Table S3: Art Therapy VS Visual Color Cues Data

Patient No	AT MOCA	VCC MOCA	AT Mini Bestest	VCC Mini Bestest
1	26	24	20	19
2	26	20	21	17
3	27	23	19	20
4	25	24	15	22
5	23	24	19	21
6	20	24	18	23
7	22	26	20	25
8	27	23	20	23
9	26	21	19	24
10	25	23	20	24
11	24	20	23	26
12	24	23	23	23
13	27	23	23	24
14	25	21	24	25
15	22	27	17	25

In contrast, those who get visual color cues show lesser improvement on the MOCA scale than those who receive art therapy. Patients seem to respond differently to different interventions; some seem to perform more positively to Visual Color Cues, while others seem to perform more to Art Therapy, based on their average Mini-BES Test ratings.

The difference in MOCA scores between the AT and VCC groups is statistically significant, as indicated by the p-value of 0.049. The average MOCA score for the AT group was higher than the VCC group's (23.07) at 24.6. A 95% confidence range spanning from -3.059 to -0.007413 indicates the magnitude of the difference in average MOCA scores across the groups, which is -1.533 points. A small but considerable impact is indicated by the fact that the differences in treatments explain 13.14% of the disparity in MOCA scores.

The Mini-BES Test scores of the AT and VCC groups differed statistically significantly, as indicated by the p-value of 0.0067. The average Mini-BES Test score for the VCC group was greater than the AT group's (20.07) at 22.73. With a 95% confidence range spanning from 0.8028 to 4.531, the mean Mini-BES Test score variation across the categories is 2.667 points. A moderate-to-large influence is indicated by the fact that the difference in therapies explains 23.47% of the difference in Mini-BES Test scores.

Respondents in the VCC group frequently have superior averages for Mini-BES Test whereas those in the AT group generally achieve greater mean scores for MOCA, despite the fact that the MOCA and Mini-BES Test results of the AT and VCC groups differ substantially. These findings suggest that VCC may be more useful for improving balance, while AT may be more advantageous for preserving cognitive function. However, more experimental research is needed to confirm the mentioned results and focus on knowing the mechanism within.

DISCUSSION

The data analysis comparing Visual Color Cues (VCC) with Art Therapy (AT) in

Parkinson's disease patients produced several important findings.

The Montreal Cognitive Assessment (MOCA) results indicated that patients engaging in Art therapy frequently scored higher than those using Visual Color Cues. This suggests that Art therapy may offer a robust enhancement in cognitive functions among PD patients [10,14,18,20,21]. Art therapy, which often involves creative and expressive activities, might stimulate various cognitive processes such as attention, memory, and executive functions, leading to improved cognitive outcomes [10-12]. This aligns with previous research indicating that engaging in creative activities can enhance neural connectivity and cognitive reserve, potentially mitigating cognitive decline in neurodegenerative diseases like Parkinson's [12,13].

The results of the Mini-BES Test, which evaluates mobility and balance, showed more variability. Some patients showed better outcomes with Visual Color Cues, while others responded more favorably to Art Therapy. This suggests that individual differences play a significant role in how patients responded to these interventions [16,19,22]. Visual Color Cues, which might involve using color-coded paths or markers to guide movement, could help patients improve their gait and balance by providing external visual stimuli that enhance motor planning and execution. On the other hand, Art Therapy might improve mobility and balance through activities that encourage physical movement and coordination, thereby enhancing motor skills [12,13].

The mathematical modeling used in the analysis revealed significant differences in both MOCA and Mini-BES Test scores between the two regimens, with effect sizes ranging from intermediate to large. These findings underscore the clinical relevance of the differences observed. The effect sizes indicate that both interventions have the potential to produce meaningful changes in cognitive and motor functions in PD patients. The intermediate to large effect sizes suggest that these interventions can have a substantial impact, potentially improving the quality of life for patients.

This study can provide valuable contribution to the growing body of research. By treating both musculoskeletal and cognitive symptoms, the study contributes to an overall improvement in patient results and standard of life. However, Small sample size may undermine statistical power and restrict applicability to a larger PD population. The study acknowledges that the number of participants within every mediation group may be limited.

A small sample size can undermine the study's statistical power and restrict the applicability of the conclusions to a larger population of Parkinson's disease patients. Even with legitimate distinctness during periods when groups are not recognized due to insufficient sample intensity, there is still a chance of Type II error. distinct Therapies: The study allows one to be astounded by the fact that art therapy and visual color cues are two clear forms of treatment that may employ rather distinct operational strategies. Variability in these investigations might affect scenario effects and make it difficult to interpret the findings. Variability may impact results and limit the specific results of each therapy.

That's why, larger-scale and longitudinal studies can help further to understand the potential and lasting benefits of these therapies. Increasing the sample size to increase generalizability and mathematical capacity, defining mediation codes to reduce instability, and keeping in mind the impact of adult-related factors on situation consequences going forward on research designs are some ways to address these constraints.

CONCLUSION

This dissertation looks at how two different approaches—visual color signals and art therapy—relate to each other and to the extent that both motor (FOG) and non-motor (cognition) manifestations have improved. The study emphasizes how

important it is to incorporate manifestations into Parkinson's disease therapy regimens.

Art therapy has been demonstrated to be a helpful tactic that fosters freedom of expression, learning about oneself, and general wellness in PD patients. Visual color signals effectively guided mobility and decreased moments of stuck gait, improving cognitive abilities, gait patterns, and perception of space. Responses among participants varied, suggesting that the effectiveness of a measure may depend on an individual's needs and preferences. Art therapy outperformed visual color signals on the MOCA scale, indicating that it is more effective in improving cognitive function. Based on their mean Mini-BESTest ratings, certain patients seemed to react more favorably to Visual Color Cues, while others seemed to benefit more from Art Therapy.

In-depth research in this area may lead to the development of more effective and specific PD management techniques. The findings highlight the ability of visual color cues and art therapy to improve operational results in affected individuals while also expanding our knowledge about novel therapies for Parkinson's disease.

Declaration by Authors

Ethical Approval: Approved

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