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EFFECTS OF BACKWARD WALKING TRAINING VERSUS FORWARD WALKING TRAINING PROGRAM TO IMPROVE BALANCE AND MOBILITY IN CHILDREN WITH CEREBRAL PALSY

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Abstract

Introduction

Cerebral palsy (CP) is a neurological disorder affecting motor function, classified by severity using GMFCS. Interventions include forward walking training, backward walking training, using TUG Test, FW8 Test, Pediatric Balance Scale (PBS).

Aim of Study

To determine the Effects of backward walking training versus forward walking training program to improve balance and mobility in children with cerebral palsy.

Methodology:

The study was a single-blinded, randomized control trial carried out on 14 children (6- 14 years) having spastic cerebral palsy . Patients were randomized in either group for forward walking training or backward walking training received 4 weeks of BWT and 4 weeks of FWT (the training order of group B will be BWT and FWT, opposite to group A), with a washout period of 2 weeks during the post-intervention phase of the 1st period and the pre-intervention phase for the 2nd period. Descriptive statistics and percentages were obtained from all patients, and parameters were compared using the SPSS statistical analysis software with p < 0.05 considered significant.

Results:

Fourteen patients with spastic cerebral palsy (5 males, 7 females; mean ± SD age: 9 ± 2.48 years; height = 124 ± 9.69 cm; weight = 25.33 ± 8.21 kg) were included in the study. Participants' GMFCS level was I (n = 8) or II (n = 6). TUG test scores decreased from 13.7 ± 2.00 and 14.8 ± 1.73 to 13.1 ± 2.34 and 12.5 ± 1.70 in the BWT groups, respectively. A significant difference was found between the pre-test and post-test scores between the two groups (p < 0.05). The decrease in the BWT group was greater than that in the FWT group, and there was a significant difference between the two groups (p < 0.05). However, there was no significant difference between step number and step length (p > 0.05).

Conclusion:

To summarize, it is observed that both types of exercise improved overall movement abilities for kids with brain damage but found that backwards walking offers more advantages in making movements smoother and quicker. Integrating reverse gait technique

INTRODUCTION
CHAPTER 1

Certain components of reverse training are typically beneficial for people suffering from degenerative conditions. It has been demonstrated to improve knee proprioception accuracy, gait synergism, balance, and the peak torque of lower limb muscles (such the hamstring and quadriceps) while reducing pain from osteoarthritis in the knee. [1]

The restoration of independent gait is the main objective of rehabilitation for kids with cerebral palsy. Yet, children with cerebral palsy have limited range of motion, which leads to abnormalities in their gait, including a shortened stride, a sluggish gait, an extended swing phase, and postural instability. For this reason, it's critical to select an efficient training strategy that will enhance the balance and gait of kids with cerebral palsy. Walking exercise may be effective in enhancing gait function, postural control, and muscle tone. Walking exercise may be effective in enhancing lower extremity muscle strength, endurance, and coordination as well as gait function, tone, and postural control. In particular, children with cerebral palsy may benefit greatly from dual-task training, which focuses on improving the ability to manage two things at once, as it can help with balance and gait.[2]

In children with hemiparetic cerebral palsy, backward walking training is superior to forward walking training in terms of spatiotemporal gait characteristics and gross motor function assessments.[3]

A nonprogressive lesion in the developing brain causes a series of permanent conditions known as cerebral palsy (CP), in which abnormalities in posture and movement result in limitations on activities. Common CP conditions such balance and gait abnormalities limit a child's functionality, which leads to psychosocial negative consequences and a loss of independence in daily living activities [4].

Children with cerebral palsy frequently experience balance issues and gait impairments; gait training is a crucial component of their rehabilitation because it greatly enhances the children's socialization and quality of life. Since there is no known cure for cerebral palsy, the focus of treatment is shifting to enhancing activities like walking and self-care. Enabling the child with cerebral palsy is the ultimate goal of therapy [5].

Kinematic and kinetic alterations cause numerous issues with the spastic kind of cerebral palsy, which is the most prevalent kind. In spastic cerebral palsy, the growth of muscles is slower than that of bones. Joint structure changes as it grows.[6]

Although the usefulness of BWT in multiple sclerosis (MS) and other neurological diseases has not been investigated, it can improve balance, gait, and functional mobility in neurological diseases.[7]

In stroke and Parkinson's disease patients, backward walking training (BWT) is a popular and effective training method for improving balance, gait, and functional mobility. Because BWT involves more postural challenges than forward walking training, it is more successful in improving balance and gait function. However, no research has looked at how BWT training affects gait, balance, and functional mobility yet.[8]

The ultimate goal of cerebral palsy treatment is to improve function, so improving motor skills is essential. Mobility includes things like walking speed, walking distance, flexibility, and balance. It is known that walking forward, backward, sideways, and cross-legged are used at various points in therapeutic exercises to improve balance and body coordination. In mental health treatment, back gait training (BWT) is a method that has recently been used to improve motor skills. Walking backward uses the same cycle but is not the opposite of stepping forward, as it requires more physical, mental, and emotional effort. Studies in the literature on healthy stroke patients and older adults have shown that BWT improves balance, body control, gait, and motor skills. It will also have positive biomechanical and physical effects on forward walking, lower extremity muscle strengthening, and cardiovascular responses.[13]

For children with brain injury, BW is also a beneficial physical activity. For example, it can improve walking ability and strengthen the gluteus maximus (RF) and tibialis anterior (TA) muscles. BW walking rehabilitation emphasizes placing the feet behind the body, encouraging hip extension and knee flexion, and requires more attention (since there is no evidence of growth) and practice, as this is difficult for many people with mental illness. Children with paralysis. Early development of structural network models and their relationship to brain dysfunction is important for understanding the pathogenesis of CP. In fact, spinal cord circuits are not simple relay structures for communication between central and peripheral structures, and their early maturation is closely related to the development of descending pathways. Furthermore, animal studies suggest that different supraspinal neural circuits may play a role in the processing and control of BW and FW. Although individuals with cerebral palsy are still able to support body weight and other walking tasks, the question remains whether the additional difficulty of walking will lead to or affect a change in physical strength.[16]

Dynamic stability and the potential to stroll freely are vital for purposeful independence, and enhancing the social participation of kids with Spastic Diplegia. Backward gait training at the treadmill makes use of the equal rhythmic motion this is, much like forward treadmill on foot however is more difficult to the steadiness machine. consequently, it is purported that backward gait training on a treadmill would possibly cause more over-floor balance and gait enhancements: than ahead treadmill schooling.[17]

Backward locomotion (backward taking walks and walking) is an increasing number of utilized in sports activities and medicinal drug. Kinetic and kinematic evaluation of backward walking showed its advantages over the standard technique of movement that may be efficiently used inside the athletic education and for treatment and rehabilitation after various illnesses. in the course of sports schooling backward on foot/going for walks may be used as one of the strategies of health to enhance physical staying power. [19]

Backwards walking has shown promise as an intervention in lots of at-chance populations. The cause of this study turned into to determine the blessings of backward walking education on stability, mobility, and plantar flexor persistence in people 60 years of age and older.[20]

AIM AND OBJECTIVES

The objective of the study will be to determine the Effects of backward walking training versus forward walking training program to improve balance and mobility in children with cerebral palsy.

CHAPTER 2
LITERATURE REVIEW

In a 2021 study conducted in South Korea, 12 patients with spastic cerebral palsy (5 males, 7 females, mean age Â± SD: 10 Â± 2.48 years, height = 125 Â± 9.99 cm, weight = 27.33 Â± 7.35 kg) were included in this study. Participants had GMFCS grade I (n = 8) or grade II (n = 4). The TUG test scores of the FWT and BWT groups decreased from 13.85Â±2.00 and 14.90Â±1.73 in the BWT group to 13.24Â±2.24 and 13.33Â±1.70. There was a significant difference between the pre-test and post-test scores between the two groups ($p < 0.05$). In the comparison between the groups, the loss in the FWT group was less than in the BWT group and there was a significant difference between the two groups ($p<0.05$).[1]

A total of 30 children of both sexes with hemiplegic cerebral palsy (10 to 14 years of age, Gross Motor Function Classification System classification I or II) participated in this study. They were divided into two equal groups. The step length, walking speed, cadence, stance time, swing time percentage, and total motor performance measurements (D and E dimensions) of the experimental group were ±0.19 better than the control group (0.55±0.16, 0.53±0.16), 121.73±2.89, 54.73±1.67, 44.40±1.40, 90.20±6.44, 82.47±12.82, respectively) (0.39±0.13, 0.46±0.5, 0.01, 0.46±0.50, 01. 125.8042. 80.47±12.61), respectively (p≤<≤0.05). [3]

A rigorous analysis of randomized trials was performed. The aim was to investigate whether learning to walk backward affects walking speed and balance in children with cerebral palsy. Children with cerebral palsy classified as gross motor function classification system I to III were eligible for the trial. The trial could provide backward walking training as a stand-alone intervention or with forward walking training. Walking speed and balance were the important outcomes. Appraisal, Development, and Analysis were used to determine the evidence base's quality, and the PEDro score was used to assess the methodological quality of the included trials. There were eight articles involving 156 participants. Using random-effects meta-analysis, we estimated that backward walking training increases walking speed by 0.10 m/s [95% confidence interval (CI) 0.05–0.16] and increases walking speed by 2 points on the Children's Balance Scale (0–56) (95% CI 1.5–2.2) more than forward walking training. In addition, adding backward walking training was estimated to increase walking speed by 0.20 m/s (95% CI 0.07–0.34) and reduce the angular deviation of the center of gravity by 0.5 degrees (95% CI −0.7–−0.3). The quality of the evidence was classified as low or moderate. In conclusion, overall, backward walking training appears to be as effective or somewhat better than forward walking training in improving walking speed in children with CP. Adding backward walking training increased the benefit in a statistically significant and clinically important way.[9]

A study was conducted in Taif Saudia Arabia in 2024. Fifty-five children with hemiplegic cerebral palsy participated in this study. They were divided into two groups. Both groups received regular physical therapy three days a week for 12 weeks. Group A and Group B received specially designed FW walking (25 min/h) and specially designed BW walking training (25 min/h), respectively. Improvement in body balance, body deviation, abdominal tilt, abdominal torsion, body mobility and mobility were greater in group B than in group A (p≤<≤.05). Significant improvements were seen in all parameters in both groups (p≤<≤.05). [10]

A randomized controlled trial was conducted on 20 children aged 7-14 years recruited from Children's Hospital, Lahore and Jinnah Hospital. The participants were divided into two groups: Group A (forward walking training) and Group B (backward walking training). Each group trained for 40 minutes three times a week for four weeks. Balance and mobility were assessed using the Up and Go Test (TUG), Children's Balance Test (PBS), and Figure-8 Walking Test (FW8T). Statistical analysis was performed using SPSS version 25 and intergroup comparisons were made using the Mann-Whitney U test. Compared with the forward walking group, the backward walking group showed significant improvement in TUG ($p = 0.03$), PBS ($p = 0.01$), and FW8T ($p = 0.01$). [11]

Thirty children with cerebral palsy (CP) were included in the study and their mean age was 10.43 ± 2.76 years. Backward walking ability was assessed by a 3-meter backward walking test (3MBWT). Proprioception was assessed using a digital goniometer, body control using the body composition measurement system (TCMS), muscle strength using a digital Myo dynamometer, and gait using the Gillette Functional Assessment Questionnaire (SSS). When spasticity in Grade I and II children was compared with GMFCS, significant differences were found regarding hamstring, soleus, and gastrocnemius spasticity in Grade I children ($p < 0.05$). When the 3MBWT, TCMS, and FAQ results were compared, a significant difference was found at Level I ($p < 0.05$). No significant correlation was found between 3MBWT and lower extremity proprioception and TCMS ($p > 0.05$). There was a significant negative correlation between 3MBWT and FAQ ($p<0.05$). No significant correlation was found between 3MBWT and lower extremity muscle mass ($p>0.05$). Only hip extension proprioception and iliopsoas strength were significantly correlated ($p=0.023$). No significant correlation was found between SSS and low muscle strength ($p>0.05$).[12]

A study was conducted in Turkey in 2024 to evaluate the effects of reverse treadmill walking training (BWT) on walking speed, balance, mobility, and walking endurance in children with cerebral palsy (CP). 6'18; GMFCS Levels I and II). They were assigned to the control group and the BWT group. After routine neurodevelopmental-based physical therapy of all participants, the BWT group received BWT (15 minutes twice a week for 8 weeks), while the control group did not receive BWT. 10-meter walk test (10MWT), Child Weight Scale (PBS), Time and Go Test (TUG) and Two-Minute Walk Test (2MWT) were selected as outcome measures. and endurance, as in BWG, training increased 2MWT distance (3.5%) and PBS (3.5%) and decreased TUG by 5.1% (all $p<0.001$). Walking speed increased by 7.4% ($p < 0.001$). Changes in the control group assessment were stable and not significant. [13]

In 2024, a study was conducted in Turkey to evaluate the effects of repetitive treadmill walking training (BWT) on walking speed, balance, mobility and walking endurance in children with cerebral palsy (CP). Height 1.83 m; GMFCS Level I and II. They

are placed in the control group and the BWT group. After all participants completed daily neurodevelopmental-based physical therapy, BWT was applied to the BWT group (15 minutes twice a week for 8 weeks), while BWT was not applied to the control group. 10-meter walk test (10MWT), Child Benchmark (PBS), Timed Walk Test (TUG) and Two-Minute Walk Test (2MWT) were selected as outcome measures. Walking speed, balance, flexibility and endurance, as in BWG, training increased 2MWT distance (3.5%) and PBS (3.5%) and decreased TUG by 5.1% (overall p<0.001). 7.4% increase in walking speed (p < 0.001). Changes in the control group were stable and insignificant.[14]
A simple study was conducted in a telerehabilitation clinic with 24 spastic diplegic cerebral palsy patients who met the inclusion criteria and were selected for the study. Our department conducted on-site evaluations for 20 children with gastrointestinal disorders and implemented a pre- and post-training training program lasting a total of six weeks. (April 2021 - May 2021). A total of 12 subjects in groups A and B received exercise therapy at home and were made to walk back and forth on the ground. In addition, the same physical therapy was applied to children in both groups. Preliminary results of Group A and Group B were included in the statistical analysis. The pre-PBS means for the two groups were 33.33 and 33.38, respectively. The t value was 0.3721, the obtained t value was smaller than the table value, and the P value did not show significance according to the pre-test. The post-test PBS mean values were found to be 46.08 and 46.33 for both groups, respectively. The t value was 2.38967, and the obtained t value was larger than the table value. The P value shows that the post-test comparison is significant. Another thought of mine has been confirmed. Therefore, statistical data shows that there are significant differences after the comparisons. When the initial values of Total Motor Function Scale-88, Pediatric Berg Balance Scale and TUG test scores were compared, significant differences were found for all variables.[15]
publish hoc analysis showed the combination schooling GP extensively outperformed others. In static stability (floor location and period), it differed from ahead (P3), backward (P5), and sideway (P6) GPs (all p < 0.0016). In dynamic balance, massive variations have been found in surface vicinity (vs. backward, P5 = zero.0242) and period (vs. ahead, backward, and sideway; all p < 0.0012). For motor feature, gross motor feature measure (GMFM-D) changed into higher than sideway (P6 = 0.0259), and GMFM-E become better than forward (P3 = 0.0028) and sideway (P6 = 0.0041). The combination GP additionally confirmed longer stride length and quicker gait pace than all others (all p < 0.0021), and had narrower step width than ahead, backward, and sideway GPs (P3 = 0.0461, P5 = 0.0127, P6 = 0.0011).[18]

CHAPTER 3
METHODOLOGY

1 Research Design:
It will be a Randomized Control Trial Study.

2 Clinical Settings:
The data will be collected from BVH. Bahawalpur, Civil Hospital Bahawalpur.

3 Sample Size
The sample size for the study will be 14.

4 Sampling Technique:
A Non probability convenience sampling technique will be used for the selection of participants in the study.

5 Duration of Study
The study will be completed within 6 months after synopsis submission.

5.Selection Criteria:
5.1. Inclusion Criteria
Only CP patients will be included.
Patient will be included from Bahawalpur only.
Patient will be included having maximum age of 14 year.

5.2. Exclusion Criteria:
Other cities patient will not be included.
Patient less than 6 years age.
Patient suffering from other neurological conditions.

Treatment Protocol:
After selection and assessment, participants will be divided into two groups. At each group, the participants in both groups will receive conventional treatment.

Group A
Group A children will be trained backward walking 40 min per day.

Group B:
Group B children will be trained forward walking 40 min per day.

6. Ethical Consideration:

i. The rules and regulations set by the ethical committee of Superior University of Lahore will be followed while conducting the research and the rights of the research participants will be respected.

ii. Written informed consent (attached) will be taken from all the participants.

iii. All information and data collection will be kept confidential.

iv. Participants will remain anonymous throughout the study.

v. The subjects will be informed that there are no disadvantages or risks on the procedure of the study.

vi. They will also be informed that they will be free to withdraw at any time during the process of the study.

vii. Mention if there will be any known risks associated with this research.

viii. Mention if there will be benefits to the participant that would result from their participation in this research.

ix. We will do everything we can to protect your privacy. Your identity will not be revealed in any publication resulting from this study.

x. Your participation in this research study is voluntary. You may choose not to participate and you may withdraw your consent to participate any time. You will not be penalized in any way should you decide not you participate or to withdraw from this study.

7. Data Collection Procedure:
The Single blinded randomized clinical trial study, is conducted in the hospital setting according to predetermined inclusion and exclusion criteria . Consent was taken from each participant before initiating the treatment protocol with the help of the consent form. Before the beginning of the study; participants will be under go subjective and objective examination including collecting demographic variables as age, gender, past medical history.

In group A each participant of this groups received 4 weeks of FWT and 4 weeks of BWT (the training order of A group will FWT and BWT), with a washout period of 2 weeks during the post-intervention phase of the 1st period and the pre-intervention phase for the 2nd period. The assessments were measured at four time points, that is, during the pre- and post-intervention phases of the 1st and 2nd periods. In group B each participant of B group received 4 weeks of BWT and 4 weeks of FWT (the training order of group B will be BWT and FWT, opposite to group A), with a washout period of 2 weeks during the post-intervention phase of the 1st period and the pre-intervention phase for the 2nd period. The assessments were measured at four time points, that is, during the pre- and post-intervention phases of the 1st and 2nd periods.

8. Data Analysis:
The data will be analyzed by using SPSS 26.0 version as Statistical Package for the Social Sciences (SPSS) 26.0.0. The quantitative variable as age will be presented in the form of mean and standard deviation (mean ± S.D). The qualitative variables as gender, side of elbow involvement and duration of pain will be presented in the form of frequencies and percentages described through the tables and bar/pie charts graphically. Additionally; Normality of data will be assessed by using Shapiro Wilk test. The within group analysis will be determined by Paired T-Test/ Wilcoxon test and across the group analysis will be determined through Independent T-Test/ Mann Whitney Test with p-value <0.0CHAPTER 4

RESULTS
Fourteen patients with spastic cerebral palsy (6 males, 8 females; mean ± SD age: 9 ± 2.48 years; height = 124 ± 9.69 cm; weight = 25.33 ± 8.21 kg) were included in the study. Participants' GMFCS level was I (n = 8) or II (n = 6) (Table 2). TUG test scores decreased from 13.7 ± 2.00 and 14.8 ± 1.73 to 13.1 ± 2.34 and 12.5 ± 1.70 in the BWT groups,

respectively. A significant difference was found between the pre-test and post-test scores between the two groups ($p < 0.05$). The decrease in the BWT group was greater than that in the FWT group, and there was a significant difference between the two groups ($p < 0.05$). 0.05 N.). The difference between pre-test and post-test estimates was found to be -1.60 ± 0.48 and -0.70 ± 0.47 for the BWT and FWT groups, respectively. There was a significant difference between the two groups ($p < 0.05$). The difference between the pre-test and post-test scores was found to be 3.17 ± 0.40 and 1.33 ± 0.51 for the BWT and FWT groups, respectively. There was a significant difference between the two groups ($p < 0.05$) (Table 2). The difference between the pre-test and post-test values of the BWT group and the FWT group was found to be 0.19±0.11 and 0.06±0.02, respectively. This shows that among the various spatiotemporal gait parameters, only the walking speed increased significantly. However, there was no significant difference between step number and step length ($p > 0.05$) The Pediatric Balance Scale (PBS) scores showed a significant enhancement, with Group A's scores adding from 40.15 ± 4.12 to 45.60 ± 3.28 and Group B's scores adding from 41.30 ± 4.60 to 46.70 ± 4.00. The enhancement was statistically significant, favoring the backward walking group (Table 3). For the Figure- 8 Walk Test(FW8T), Group A bettered from 12.70 ± 3.47 to 11.40 ± 3.31, while Group B bettered from 12.70 ± 2.76 to 10.10 ± 2.45. The backward walking group proved a statistically significant enhancement compared to the forward walking group($p = 0.01$) . (Table 4).

Table1: Frequency Distribution of Gender in Treatment Groups

Gender	Forward Walking Group (n = 7)	Backward Walking Group (n = 7)	Total (N = 14)
Male	5 (71.43%)	1 (14.28%)	6 (42.85%)
Female	2(28.57%)	6(85.72%)	8(35.0%)
Total	7 (100.0%)	7 (100.0%)	14 (100.0%)

Table 2: Comparison of Time-Up-and-Go (TUG) Test Between Groups

Variable	Forward Walking Group (n = 7)	Backward Walking Group (n = 7)	p- value
Pre-Treatment	13.70 ± 2.00	14.8 ± 1.73	0.03
Post-Treatment	13.10 ± 2.34	12.50 ± 1.70 -	-

Table 3: Comparison of Pediatric Balance Scale (PBS) Between Groups

Variable	Forward Walking Group (n = 7)	Backward Walking Group (n = 7)	p- value
Pre-Treatment	40.15 ± 4.12	41.30 ± 4.60	0.01
Post-Treatment	45.60 ± 3.28	46.70 ± 4.00 -	-

Table 4: Comparison of Figure-8 Walk Test (FW8T) Between Groups

Variable	Forward Walking Group (n = 10)	Backward Walking Group (n = 10)	p- value
Pre-Treatment	12.70 ± 3.47	12.70 ± 2.76	0.01
Post-Treatment	11.40 ± 3.31	10.10 ± 2.45 -	-

CHAPTER 5
DISCUSSION

The present study showed that both forward walking training and backward walking training significantly improved balance and mobility in children with cerebral palsy. However, the backward walking training group demonstrated better results in the timed-up-and-go test, Pediatric Balance Scale, and Figure-8 Walk Test compared to the forward walking group. These findings are consistent with previous research that suggested that backward walking exercises promote greater activation of lower limb muscles, improve dynamic postural stability, and enhance neuromuscular coordination in children with cerebral palsy (2 ,3). The increased neuromuscular demand and proprioceptive engagement required in backward walking may explain its improved effects on balance and gait parameters observed in the present study. Backward walking training has been established as a challenging but effective rehabilitation strategy due to its ability to stimulate specific muscle groups and improve functional abilities typically achieved by forward walking (11). The findings of the present study are consistent with the results of Choi et al, who reported that backward walking training significantly improved walking speed, step length, and overall balance compared to forward walking in children with cerebral palsy (19). Similarly, El-Basatini et al. found that incorporating backward walking into traditional therapy resulted in better postural stability and dynamic balance outcomes in children with hemiparetic cerebral palsy, which supports the results of this research (17). The effectiveness of walking backwards can be attributed to the increased reliance on sensory feedback and motor planning required to perform the task, thereby increasing motor LE. Strengths of the study include its randomized clinical trial design and the use of well-validated outcome measures such as the PBS, TUG, and FW8T, which ensured the reliability and validity of the findings. In addition, the sample was homogeneous in terms of cerebral palsy type and age, reducing potential confounds and enhancing the internal validity of the study. However, there were some limitations that must be acknowledged. The small sample size may limit the generalizability of the findings, and future research with larger sample sizes is recommended to confirm the results. Moreover, the study was conducted over a short period of four weeks, which may not be sufficient to capture the long-term effects of the interventions on balance and gait. A longer follow-up period is needed to determine whether the observed benefits are sustained over time. Another limitation was the lack of control over participants' engagement in other physical activities outside of the study sessions, which may have influenced the results. The findings have important clinical implications, suggesting that incorporating backward walking into rehabilitation programs for children with cerebral palsy may improve balance and mobility more effectively than traditional forward walking training. Clinicians should consider using backward walking as an adjunct to conventional therapy to target specific deficits in postural stability and motor coordination. This study also provides a foundation for future research to explore the mechanistic basis of the optimal effects of backward walking on neuromuscular function and balance control. Future studies should aim to include a wider age range and others Subtypes of cerebral palsy to better understand differential effects.

CONCLUSIONS/RECOMMENDATIONS

To summarize, it is observed that both types of exercise improved overall movement abilities for kids with brain damage but found that backwards walking offers more advantages in making movements smoother and quicker. Integrating reverse gait techniques within mainstream therapeutic protocols might enhance motor recovery for these individuals significantly; additional studies are needed to assess their sustained impact over time and evaluate their effectiveness across various healthcare environments.[11]