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# Analysis Of Minimal Detactable Change And Minimally Clinical Important Difference Of Bruininks -Oseretsky Test Of Motor Proficiency Second Edition [Bot-2] For Bilateral Coordination In Cerebral Palsy Patients:

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*Abstract:*

**Introduction:** Cerebral palsy is a group of permanent disorders affecting the development of movement and posture causing activity limitation, which is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.

**Method**: In this Study total 20 cerebral palsy patients both male and females were selected between the age group of 4-21 years. Bot-2 tests for Bilateral Coordination were done and the total scores were calculated. The Minimal Detectable Change was calculated using a formula and Minimal Clinically Important Difference was calculated using Receiver Operating curve analysis.

**Results**: The Minimal Detectable Change [MDC] was captured with a confidence level of 95% Minimal Clinically Important Difference [MCID] was calculated using Receiver Operating curve analysis and MDC value is 3.6755 and MCID value is 0.925.

**Conclusions**: The study indicates excellent value for MCID in Bot-2 compared to PMAL in Manual Dexterity. The clinimetric properties of MDC And MCID provided in this study allow clinicians and researchers to determine if a change score indicates a true or clinically meaningful effect at post treatment and at follow-up.

***Keywords:*** [Cerebral Palsy, Bruininks-Oseretsky test of motor proficiency, Minimal Detectable Change, Minimal Clinically Important Difference.]

## Introduction

Cerebral palsy (CP) is a group of permanent disorders affecting the development of movement and posture causing activity limitation, which is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. [1] The most common disorders are:1] abnormal muscle tone 2] muscle weakness,3] random and uncontrolled body movements4] balance and coordination problems [2,3]

**CP IS CLASSIFIED AS:**

Spastic: Seventy to 80 percent of patients with cerebral palsy have spastic clinical features. Affected limbs may demonstrate increased deep tendon reflexes, muscular hypertonicity, weakness, and a characteristic scissors gait with toe-walking.

The athetoid or dyskinetic type of cerebral palsy, affecting 10 to 20 percent of patients, is characterized by abnormally slow, writhing movements of the hands, feet, arms, or legs that are exacerbated during periods of stress and absent during sleep. The rarest form, ataxic cerebral palsy, affects 5 to 10 percent of patients and predominately impairs balance and coordination. These patients walk with a wide-based gait and have intention tremors that complicate performance of daily activities requiring fine-motor function.[4]

Etiology: Hypoglyemia Birth complications Trauma to mother Prematurity Delayed crying Infections, Low birth weight, Intracranial hemorrhage [5,6]

Bilateral coordination refers to the ability to coordinate both sides of the body at the same time in a controlled and organized manner, for example; stabilizing paper with one hand while writing/cutting with the other. It is the ability to use both sides of body in an integrated and skillful manner. Good bilateral coordination/integration is an indicator that both sides of the brain are communicating effectively and sharing information. Inadequate bilateral coordination can adversely affect overall motor coordination as well as cognitive development, thus negatively affecting academic performance. Bilateral coordination forms part of the general evaluation of the motor skills. In clinical practice, bilateral integration deficits in children are identified by observations of poor coordination of two body sides, avoidance of crossing of midline, failure to develop a preferred hand and possibly right-left confusion. [8,9,10]

The MDC has been defined as the smallest amount of change that is greater than measurement error. In other words, if change occurs that is outside the normal variation of a measurement on repeated trials, we can be confident that this change is not simply due to random variability. The MDC is often calculated by obtaining a reliability statistic of the measurement in question on patients who have not clinically changed. The MDC threshold is set using a confidence level. A 95% confidence level indicates that there is only a 5% chance that a change above this threshold could be due to chance variability in a truly unchanged patient. Although a change greater than the MDC indicates that the change is unlikely to be due to chance variability, it does not indicate whether this degree of change is clinically meaningful. For this reason, the MCID is a necessary supplement to the MDC. The measurement error is defined the systematic and random error of a participant's score that is not attributed to true changes in the construct to be measured. The preferred and common statistic for measurement error in studies based on classical test theory is MDC.MDC at 95% confidence interval (MDC95) was estimated using the follow formula: z score × $\sqrt{}$ 2×SEM = 1.96×$\sqrt{}$ 2×SD× [1 − r]. The z score was based on 95% confidence interval (z = 1.96), SD is the standard deviation, and r is the coefficient of the test-retest reliability. If a child has change scores equal to or over the MDC95 threshold, the changes are indicative of a change in ability rather than measurement errors. The term MCID was first defined by Jaeschke etc. as 'the smallest difference in score in the domain of interest which patients perceive as beneficial and which would mandate, in the absence of troublesome side effects and excessive cost, a change in the patient's management. Anchor Based Method- comparing the change in the situation of a patient as captured by an

outcome measure to an external criterion. This external criterion is often a patient's own categorization of their personal change. Another anchor-based method is looking between patients at a single point in time, the so-called 'between-patient' difference. Analysis of minimum detectable change and minimally clinically important difference of BOT-2 for bilateral coordination in cerebral palsy patients. To analysis minimal detectable change of BOT-2 for bilateral coordination in cerebral palsy patients. To analysis minimally clinical important difference of BOT-2 for bilateral coordination in cerebral palsy patients.

## MATERIALS & METHODS

Experimental study was done on 20 samples of spastic diplegics and data was collected according to the inclusion and exclusion criteria. Study was approved by the ethical committee. The nature of study was explained and written consent was obtained from the parents prior to the study.

**Inclusion criteria:**

1. Spastic diplegics
2. Both male and female children
3. Children who are able to follow commands

**Exclusion criteria:**

1. Parents who are unwilling to participate.
2. Auditory and Cognitive impairments.

PROCEDURE:

Bruiniks Oserestsky test of motor proficiency [ BOT -2] AGE - 4-21Core Areas: Upper limb Bilateral Coordination consist of 7 sub items:

1.Touching nose with index fingers-eyes closed
2.Jumping jacks
3. jumping in place-same sides synchronized
4. Jumping in place –opposite sides synchronized
5. pivoting thumbs and index fingers
6.Tapping feet and fingers –same sides
7.Tapping feet and fingers –opposite sides

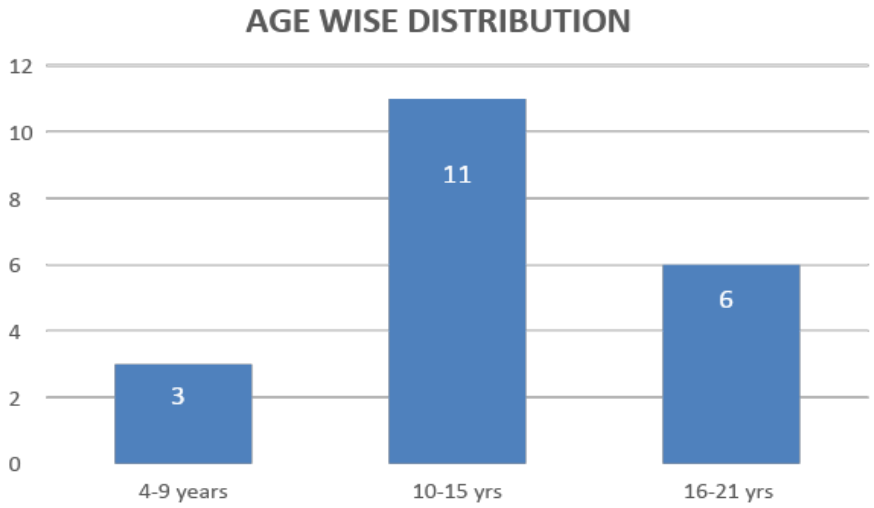
**Statistical Analysis**

The study included 20 participants both male and females between the age group of 4-21 years. The present study aimed to Calculate the minimal detectable change of and minimal clinically important difference of Manual Dexterity Component using BOT-2. The study included 20 participants both male and females between the age group of 4-21 years. Bot-2 tests for manual dexterity were done and the total scores were calculated. The Minimal detectable change value is calculated using the formula. The MCID is calculated using the roc curve (receiver operating characteristic curve) using NCSS software. An ROC (Receiver Operating Characteristic) curve is a graphical representation of the performance of a binary classification model. It plots the true positive rate (sensitivity) against the false positive rate (1-specificity) at different classification thresholds.[8]

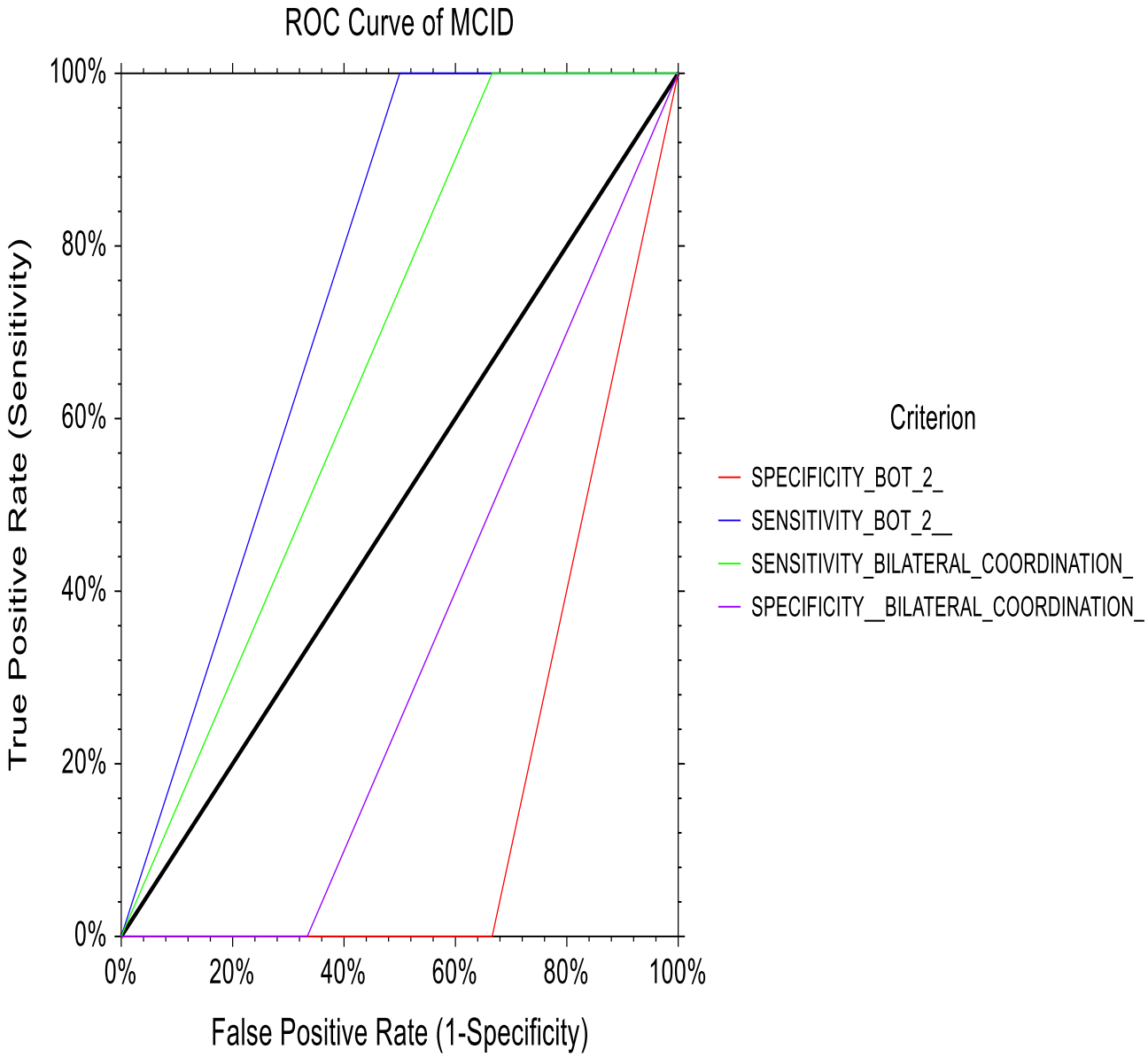
The MDC was captured with a confidence level of 95% MDC and MCID was calculated using ROC curve analysis and MDC value is 3.6755 and MCID value is 0.925.

**Age wise distribution**

20 patients, between the age group 4-21 years with Diplegic Cerebral Palsy were selected according to inclusion and exclusion criteria and data analysis was done. In the total 20 counts,3were in the age category of 4-9 years,11 were in the 10-15 years and 6 were categorized in 16-21 years age group.




Graph 1:ROC Curve of Mcid




Graph 2: Sensitivity Specificity of Bot-2 and bilateral coordination

| Criterion | Count | AUC | Std Error Z-Value to Test AUC>0.5 | Upper 1-Sided P-Value | 95% confidence limits Lower | Upper |
|---|---|---|---|---|---|---|
| Sensitivity BOT-2 | 0.1667 | 0.1054 | -3.162 | 0.9992 | - 0.004 | 0.3633 |
| Specificity Bot-2 | 0.7500 | 0.1118 | 2.236 | 0.0127 | 0.4399 | 0.9003 |
| Sensitivity Bilateral coordination | 0.6667 | 0.1054 | 1.581 | 0.0569 | 0.4077 | 0.8264 |
| Specificity Bilateral coordination | 0.3333 | 0.1054 | -1.581 | 0.9431 | 0.1137 | 0.5219 |

Table 1 : Sensitivity and Specificity of BOT-2 and Bilateral coordination

MCD AND MCID OF BOT-2 AND BILATERAL COORDINATION

| SD | n | SEM | MDC95 | MCID |
|---|---|---|---|---|
| 4.356674 | 20 | 1.94 | 5.36 | 0.8 |

Table 2 : Results of the MDC95 and MCID values of manual dexterity using bot-2 are shown in table 2.

**DISCUSSION**

This study is done to know analysis of to analysis minimal detectable change of BOT-2 for bilateral coordination in cerebral palsy patients and To analysis minimally clinical important difference of BOT-2 for bilateral coordination in cerebral palsy patients. The BOT-2 is a commonly used diagnostic instrument in the evaluation of the development of psychometrics' in the age range from 4 to 21. The MDC has been defined as the smallest amount of change that is greater than measurement error. In other words, if change occurs that is outside the normal variation of a measurement on repeated trials, we can be confident that this change is not simply due to random variability. The term MCID was first defined by Jaeschke et as 'the smallest difference in score in the domain of interest which patients perceive as beneficial and which would mandate, in the absence of troublesome side effects and excessive cost, a change in the patient's management. MCIDs represent the minimum outcomes score change patients should experience in order for them, their providers, or other overseeing bodies to confirm that therapy is creating a positive difference. Based on the MDC and MCID values identified in this study may be able to determine whether a change score indicates a true or clinically meaningful effect at post treatment and at follow up. Our findings provide BOT-2 and Bilateral coordination benchmarks needed for clinical decision making and for bridging the gap between evidence and

practice. The 7 components of BOT-2 were Touching nose with index fingers-eyes closed , Jumping jacks , jumping in place-same sides synchronized, Jumping in place –opposite sides synchronized, pivoting thumbs and index fingers , Tapping feet and fingers –same side ,Tapping feet and fingers –opposite sides .These tools were used to calculate BOT -2 score of the participants The MCID is calculated with anchor based approach for external criterior as well as the outcome measure to know which is more effective using ROC curves in which left hand corner shows good results .In general, an AUC of 0.5 suggests no discrimination (i.e., ability to diagnose patients with and without the disease or condition based on the test), 0.7 to 0.8 is considered acceptable, 0.8 to 0.9 is considered excellent, and more than 0.9 is considered outstanding. The MDC value is calculated using a formula MDC95 = 1.96 × √2 × SEM. and MCID value is calculated using statistical analysis and ROC curve. An ROC (Receiver Operating Characteristic) curve is a graphical representation of the performance of a binary classification model. It plots the true positive rate (sensitivity) against the false positive rate (1-specificity) at different classification thresholds. ROC Curve o f MCID Suggests The Value Of Area Under Curve Of Bot-2 Is And bilateral coordination Is 0.
This Indicates That Bot-2 Is An Excellent Outcome Measure To Estimate MCID as compared to bilateral coordination. The MDC90 Value is 5.36. The MCID Value is 0.7.

## CONCLUSION

The study confirmed excellent value for MCID in bot-2 compared to bilateral coordination. The clinometric properties of MDC And MCID provided in this study allow clinicians and researchers to determine if a change score indicates a true or clinically meaningful effect at post treatment and at follow up.

LIMITATIONS:

The limitations of the study design include the participant characteristics and the outcome measures. Children with GMFCS levels I–III were included in the data analysis, and those with GMFCS level IV -V were excluded. Thus, the study results cannot be generalized to all children with CP. Additionally, this study did not measure participation-level outcomes or health-related quality of life. It took a lot of effort and resources to find the population of children with cerebral palsy since there are so few of them. Only one component is difficult to take results so overall all components may be beneficial.

***Declaration by Authors***
**Ethical Approval:** Approved
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**Conflict of Interest:** The authors declare no conflict of interest.

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