

Research Paper

## In-Hand Manipulation Among Intellectually Disabled Children: A Study

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### ABSTRACT

**Introduction:** In-hand manipulation (IHM) refers to the ability to move objects within one hand without the assistance of the other hand, a critical component of fine motor skills. This ability enables a range of everyday tasks, such as rotating a pencil, flipping a coin, or adjusting a button, which are essential for daily living and academic activities. For children with intellectual disabilities (ID), in-hand manipulation often presents significant challenges due to the interplay between cognitive impairments and motor deficits. Hand function plays a vital role in accomplishment of all Activities of Daily Living (ADL) and it depends upon a complex interaction of visual-perception and fine motor function which together known as visual perceptual fine motor function. These children may experience delays or difficulties in developing the fine motor control necessary for effective IHM, impacting their ability to perform basic self-care tasks, engage in play, or participate in school activities. The development of IHM is often hindered by reduced muscle tone, coordination issues, and slower cognitive processing, which are common in children with ID. As a result, these children may struggle with tasks that their typically developing peers can perform with ease, leading to further delays in their overall development and independence. Understanding and addressing the challenges of in-hand manipulation in children with intellectual disabilities is crucial for educators, therapists, and caregivers. Through targeted interventions, such as occupational therapy and specialized exercises, it is possible to improve these children's fine motor skills, enhancing their ability to participate more fully in everyday activities and ultimately improving their quality of life. **Aim:** To evaluate the In-hand manipulation skills among children with intellectual disability and compare the scores obtained by different types of ID. **Objectives** • Select a special school for intellectually disabled. • To assess the In-hand manipulation skills of the children with standardized assessment tool of in-hand manipulation. • To check the in-hand manipulation skill among mild & moderate intellectually disabled children. **Method of Study:** Ezhuchi special school for intellectually disabled children was selected for the study. A sample of 40 students, both mild and moderate intellectually disabled were selected. There were 20 male and 20 female children among the sample aging between 7 to 10 years. Assessment of in-hand manipulation by standardized assessment includes, with hand manipulation tasks administered. During the

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assessment, some of the activities were to be demonstrated due to problem for children to perform with just the verbal instruction. Such as performing the activity with stabilization and without stabilization (assessment procedure involves this). Their total score with the mean value of their total score were compared to make qualitative analysis. **Result:** The study shows that the moderate intellectually disabled children have scores of lower mean when compared to score of mild intellectually disabled. The mean of moderate ID total score is 23.3 and the mean of mild ID score is 33.9. Paired sample t-test gives a t-value of 5.06 and the probability value of 0.001 at 0.01 level of significance. **Conclusion:** Form this study it is concluded that there is delay in development of in-hand manipulation among intellectually disabled children. The moderate ID children lack IHM skills compared to mild ID children. Intellectually disabled children have problem in advancing and refining their skills. It is important for an occupational therapist to assess the level of in-hand manipulation of the children and provide intervention.

**Keywords:** *Intellectual Disability, In-hand manipulation (IHM), cognitive impairments, motor deficits, Hand function, Activities of daily living*

**H**and function is a continuum of activities that encompass gross grasp and release and number of fine functions, with the most sophisticated of these being is in-hand manipulation. One of the most important role in a child's life is being a student. As students, children are required to use fine motor skills in the classroom setting. McHale and Cermak (1992) found that children in elementary school engaged in activities that required fine motor skills for 30% to 60% of their school day. As children age and their fine motor skills develop, they become more able to manipulate objects in their hand. Fine motor skills include a number of hand skills, one of which is in-hand manipulation. It is one of the most complex fine motor skills. In-hand manipulation is the ability to hold and move an object within one hand which allow a person to move an object in his or her hand in order to use the object or release it efficiently (Exner, 1990). The fingers and thumb are used to best position the object for the activity. This adjustment of an object within the hand for optimum orientation after grasp is termed as "In-hand manipulation skills" (IHMS).

In addition to object characteristics, other factors can contribute to a child's use of in-hand manipulation skills; such factors include the cognitive-perceptual demands of the activity, the child's interest in the manipulative materials or the activity, processing tactile-proprioceptive information, visual acuity, and the child's motor-planning skills. Problems in any of these areas can affect development of in-hand manipulation skills.

**Hand function** plays a vital role in accomplishment of all Activities of Daily Living (ADL) and it depends upon a complex interaction of visual-perception and fine motor function which together known as visual perceptual fine motor function. This function includes four components; fine motor skills, visual skills, visual perceptual skills and visual motor skills. Fine motor skills include: reach, grasp, release and the more intricate skills of in-hand manipulation and bilateral hand use. Hand function depends on some factors like muscle strength, sensation, Range of motion and control of voluntary movements including fine motor control which supports the ability to various grasps and In-Hand Manipulation. Occupational therapists play an essential role in the evaluation and treatment of children with deficits observed in everyday tasks such as dressing and playing. Many of the above-mentioned dysfunctions can be effectively managed with focused intervention aimed at increasing proficiency of hand. In-hand manipulation is the ability to hold and move an object within one hand, to use the object or release it efficiently (Exner, 1990). IHMS has

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been unequivocally established as a prerequisite to academic and leisure activities. Delay or deficiencies in IHMS can be one of the reasons for poor academic performance and apparent clumsiness in children. Children who have difficulty with in-hand manipulation skills drop objects, use surfaces for support during manipulation, or are slow in the execution of skills. If IHM problems are not identified at an early age, further hand function deficits could develop and influence the child's function in daily activities such as in school, personal independence and play. Some daily activities in which in-hand manipulation is used are positioning a pencil when drawing and writing, adjusting the paper when cutting with scissors, doing up button, tying shoelaces and using a knife and fork. In-hand manipulation skills are essential to the handwriting process because they allow the child to move the pencil from the palm to the fingers, make needed adjustments to the pencil for writing, and turn the pencil from writing to erasing with one hand.

### **1. DEVELOPMENT OF IN-HAND MANIPULATION:**

Understanding the typical development of IHM skills is important in order to provide the occupational therapist with a foundation in the evaluation and treatment process. Different variables related to the developmental trends of IHM are described in the literature, some of which were considered relevant for this study. These variables include the age at which IHM emerges and is mastered, the patterns of movement. When reviewing IHM developmental milestones or the age at which each aspect of IHM emerges and is mastered, it was found that IHM usually develops over a period of time ranging from 12 months to seven years of age. Rapid development is usually noted between the ages of three and six years. During the first six months of life, the infant lacks IHM skills with the development of finger-to-palm translation occurring between the ages of 12 and 15 months. Between the ages of two and three years, the child is able to manipulate an object with one hand and stabilize the object with the other hand, while at the age of three years complex rotation is developed. Between three and five years of age, most children develop the requisites of rotation, shift and translation. Finally, at the age of six years, IHM with stabilization occurs. The time required to complete the IHM task decreases, and the consistency and maturity of the methods used to manipulate the objects, increase.

Ongoing research by Exner and colleagues suggests that children continue to refine in-hand manipulation skills up to approximately 9 to 10 years of age and continue to develop speed of skill use through 12 years of age.

### **2. DEVELOPMENTAL CONSIDERATIONS:**

Motor skill prerequisites for in-hand manipulation include the following:

- Movement into and stability in various degrees of supination
- Wrist stability
- Opposed grasp with thumb opposition and object contact with the finger surface (not in the palm)
- Isolated thumb and radial finger movements
- Control of transverse metacarpal arch
- Dissociation of the radial and ulnar side of the hand
- Successive increase and decrease in finger force

### **3. COMPONENTS OF IN-HAND MANIPULATION:**

In-hand manipulation includes five basic types of patterns: Translation, palm-to-finger translation, shift, simple rotation, and complex rotation. All skills require the ability to control the arches of the palm.

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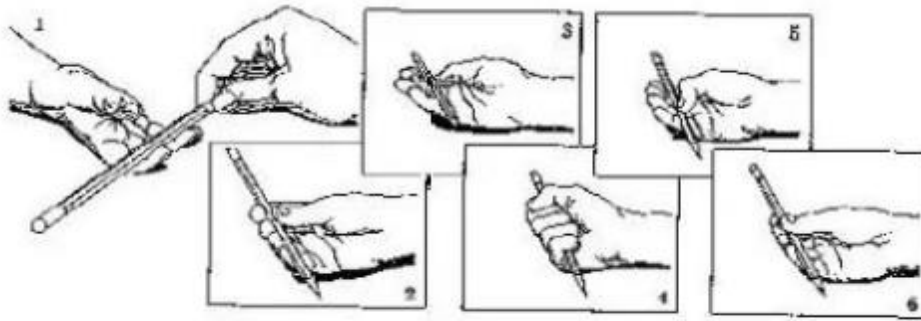
**TRANSLATION:** Long, Conrad, Hall, and Furler described translation as a linear movement of the object from the palm to the fingers or from the fingers to the palm; the object stays in constant contact with the thumb and fingers during this pattern. The fingers and thumb maintain grasp but move into and out of MCP and IP flexion and extension-

### a) Finger to Palm Translation:

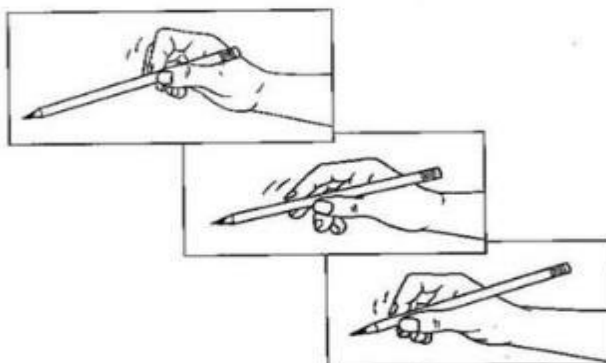
Exner described the pattern of finger-to-palm translation as grasping the object with the pads of the fingers and thumb and moving it into the palm. The object moves in a linear direction in the hand, and the fingers move from an extended position to a more flexed position during the translation.

### b) Palm to Finger Translation:

Palm-to-finger translation is the reverse of finger-to-palm translation. However, palm-to-finger translation requires isolated control of the thumb and use of a pattern beginning with finger flexion and moving toward finger extension. This pattern is more difficult for the child to execute than finger-to-palm translation.



**SHIFT:** Shift involves linear movement of the object on the finger surface to allow for repositioning of the object on the pads of the fingers. In this pattern the fingers move just slightly at the MCP and JP joints, and the thumb typically remains opposed or adducted with MCP and IP extension throughout the shift. The object usually is held solely on the radial side of the hand. Shift can be distinguished as simple shift and complex shift movement. Simple shift is the movement of the thumb and all participating digits as one unit, while complex shift occurs when digits are repositioned on an object to move the object in a linear direction.

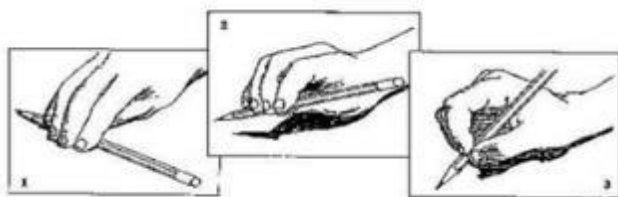


**ROTATION:** Rotation is specifically required to shape a grasp, rotate an object positioned between the finger tips and to turn an object over and over between the fingers. The two patterns of rotation are simple rotation and complex rotation.

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### a) Simple Rotation:

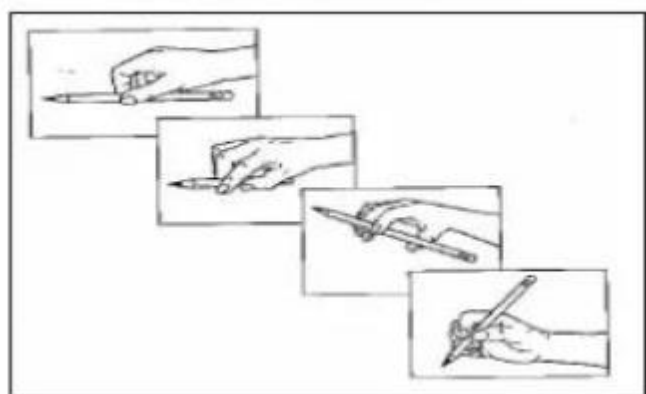
Simple rotation involves the turning or rolling of an object held at the finger pads approximately 90 or less. The fingers act as a unit (little or no differentiation of action is shown among them), and the thumb is in an opposed position.



### b) Complex Rotation:

Complex rotation involves the rotation of an object 180 to 360 once or repetitively. During complex rotation the fingers and thumb alternate in producing the movement, and the fingers typically move independently of one another. An object may be moved end over end.

#### Complex Rotation



### Stabilization

Stabilization occurs when one or more objects or parts of objects are held in the ulnar aspect of the palm so that the thumb and radial fingers can participate in another hand skill. All of the above-mentioned components of in-hand manipulation can be performed with stabilization or without stabilization. The ability to perform an activity with stabilization indicate that the child has a very good manipulation skills.

### *Problems that Limit In-Hand Manipulation*

Children who have difficulty with in-hand manipulation skills drop objects, use surfaces for support during manipulation, or are slow in the execution of skills. Praxis and motor control problems, particularly of the intrinsic muscles, may be a major cause of limited in-hand manipulation skill development. Attentional and cognitive problems may also contribute to these problems in some children.

Problems that limit in-hand manipulation include the following:

- Limited finger isolation and control
- Inability to effectively cup the hand to hold objects in the palm
- Inability to hold more than one object in the hand at the same time
- Insufficient stability for controlling object movement at the finger pads, resulting in objects being dropped frequently

### ***Assessing In-Hand Manipulation Skills***

1. **Identifying Skill Proficiency:** Determining how well a person can manipulate objects within their hands, such as rotating, shifting, or adjusting the grip. This helps to identify the level of fine motor control.
2. **Diagnosing Impairments:** Detecting any deficiencies or impairments in hand function that could affect daily activities. This can be critical in understanding conditions like cerebral palsy, developmental coordination disorder, or after a stroke.
3. **Monitoring Progress:** Evaluating changes in in-hand manipulation skills over time to track progress in rehabilitation or development. This can inform adjustments in therapeutic interventions.
4. **Developing Treatment Plans:** Using the assessment results to create personalized treatment or intervention plans aimed at improving fine motor skills and hand function.
5. **Predicting Functional Outcomes:** Understanding the impact of in-hand manipulation skills on a person's ability to perform daily tasks, such as dressing, eating, or writing, which are crucial for independence.
6. **Supporting Educational or Vocational Planning:** For children or adults with motor skill challenges, these assessments can help in planning educational accommodations or vocational training to match their capabilities

### ***Activities of Daily Living in Which in-Hand Manipulation is Used:***

- Adjusting tooth brush while brushing teeth.
- Picking up multiple pieces of silverware from the table after dinner.
- Folding laundry.
- Adjusting shoelaces when tying shoes.
- Scissors grasp and cutting paper.
- Paper management
- Rotating a pencil within the hand.
- Erasing with a pencil.
- Fastening buttons.
- Removing and replacing marker caps Opening jars.
- Counting the cash
- Holding and adjusting utensils within the hand & scooping food.
- Adjusting food within the hand & finger while eating

### ***Relation Between IHMS and Fine Motor Function***

IHMS is considered as an important component of fine motor skill and several researchers have investigated this relationship of IHMS to fine motor function. Case-Smith evaluated the relationship between IHMS and fine motor activities and found moderate to high correlation between two IHMS task (rotate a peg 180) and Peabody Developmental Motor Scales (PDMS)-fine motor scale in children aged 4 to 6 years.

Relationship between IHMS and handwriting has been explored by some researchers. Cornhill and Case-Smith (1996) found a strong correlation between handwriting, evaluated by Minnesota handwriting test and IHMS tasks using pegboard. According to them IHMS, eye-hand coordination, and visuo-motor integration scores strongly correlate to good or poor handwriting. Improved performance was seen in students with fine motor delays when intervention for visuo-motor and IHMS was given. IHMS and eye hand coordination was related to a student's ability to perform functional tasks like holding a pencil. Early tool use

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and imaginative games with manipulation activities have a positive impact on IHMS and on pencil control for handwriting. However, Feder and colleagues did not see meaningful correlations between the evaluation tool of Children's Handwriting Manuscript and IHM measured using a pegboard. Humphry. et.al, investigated the relationship between IHMS and functional task among 184 children between the ages of 2 years to 7 years. They found low to moderate correlation between IHMS and performance of functional tasks like buttoning and cutlery use. Cognitive motor behaviour in Intellectually disabled children.

The cognitive-motor behavior of intellectually disabled children in in-hand manipulation is characterized by the interplay between their cognitive limitations and motor abilities during tasks requiring fine motor control. In-hand manipulation involves the precise movement of objects within the hand, such as rotating, shifting, or stabilizing small items. For children with intellectual disabilities, these tasks can be particularly challenging due to their delayed cognitive processing and motor coordination. Cognitively, these children may struggle with planning and executing the sequences of movements needed for effective in-hand manipulation. They often require more time to process instructions and may have difficulty understanding complex tasks, which affects their ability to coordinate the necessary motor actions. The reduced dexterity and fine motor control can lead to challenges in grasping, adjusting grip, and manipulating objects efficiently.

### ***Need for the Study***

As there exist developmental delay, it is common among the children with intellectual disability to lack In hand manipulation. They face problem in their hand writing and the ability to use writing tools like pen or pencil. It is the responsibility of an occupational therapist to find a way to help these children to overcome these problems by assessing the In-hand manipulation skills at early stage. By finding their development with IHM and training can help to overcome these hurdles. Teaching them would have a direct positive impact in the lives in later stages making it easier to learn new skills. Thus, this study finds essential practical applications.

## **REVIEW OF LITERATURE**

Joppy Asgari, et.al. (2021) Identification of fine motor skills in children with intellectual disability. The study was conducted among children with intellectual disability. Depending upon observation and various activities conducted, the children were classified into 2 groups, i.e., "start developing" means children those who have a delay in the motor activities. These children can do activity with some assistance. And the other "developing according to expectation" means children who can do age related fine motor activity. They can perform motor activities with independence. About 70% of the selected samples came under the first group which is "start developing". The result shows that the children those who are intellectually disabled have a delay in fine motor skills

Kavitha raja, et.al. (2019) Assessment of in-hand manipulation: Tool development. The aim of the study was to develop tool for in-hand manipulation skills (IHMS) and to establish its psychometric properties. The test was administered to 123 typically developing and 15 children with hand dysfunction Cerebral palsy, developmental co-ordination and down syndrome. Rasch analysis for rating scale structure, fit statistics and dimension analysis were done. Content validation was analysed qualitatively. Content validation was performed by ten rehabilitation professionals. The four-level ordinal scale was appropriate according to Rasch analysis. The result showed that the final test has 47 items and the tool had excellent inter-tester reliability and test stability. They finally concluded that the Assessment of in-

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hand manipulation is a robust tool for clinical use in assessment of In-hand manipulation skills.

Visser Marieta, et.al. (2016) In-Hand Manipulation in children 6 and 7 years of age. The aim of the study was to investigate the IHM skills in six and seven years old children. 158 children in the age group 6-7 years were selected for the study. The Free State University In-Hand manipulation (FSU IHM) checklist were used to score the performance. The result indicated that, most children in both these age groups could perform translation, simple and complex rotation & shift with stabilization. It was found that complex rotation with stabilization was more difficult for both age groups to perform.

Natalie Smith — Zuzovsky, et.al (2004) The Effect of seated Positioning quality on typical 6 and 7 years old children's object Manipulation skill. The purpose of this study Was to examine the effect of optimal seated positioning in individually fitted furniture (Vs) sub-optimal seated positioning in standard classroom furniture on BIT performance in early-elementary school age children. For the study children 58 children at the age of 6 and 7 years old were selected. Draft #11 of the In-Hand Manipulation Test- Quality section (IMT—Q) was used in this study. The result revealed that IMT-Q scores for children who were positioned optimally was slightly more than that of children who were positioned sub-optimally.

Pehoski, et.al. (1997) In-Hand Manipulation in young children: Translation movements. The study was designed to look at the development of in-hand translation skill in young children. For the study 154 right-handed children between 0-3 years and 6-11 years were selected. Manipulation skills were videotaped. The numbers of pegs handled in each trial as well as the methods used to move the peg to and from the palm were recorded. The result showed that, Boys and girls didn't show any significant difference in their performance. Age was found to be a significant factor in both the number of pegs handled and the method used in handling them. The older children tended to place more pegs successfully and were more likely to use the methods most commonly used by the adults.

C E Exner (1997) “Clinical Interpretation of In-hand manipulation in young children: translation movements”. The aim of the study was to clinically interpret the translation movements in young children. The researcher said that children with moderate and severe problems with hand skills are very unlikely to be appropriate candidates for intervention for in-hand manipulation skills. But children with mild disabilities may be easier for the therapies to identify when using the data on developmental trends and descriptions of strategies for execution of in-hand manipulation skills. The researcher concluded that the identification of level of disabilities with hand skills had the potential lead to intervention that could positively influence the child's performance of a variety of functional tasks that rely on In-hand manipulation skills.

J case— smith(1996). Fine motor outcomes in pre-school children who receive occupational therapy services. The aim of the study was to examine the functional performance and fine motor skills acquisition in pre-school children when occupational therapy services are included as part of the educational program. The study also investigated the relationships among fine motor skills and fictional performance in self-care, mobility and social function. For the study 26 pre-school children were selected and given weekly occupational therapy. Their In-hand manipulation skill, eye-hand coordination, grasping strength and functional performance in self-care, mobility and social function were measured at beginning and end



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of the school year. The result of the study showed significant improvements in eye-hand coordination and mobility functions. The revealed significant co-relations for in-hand manipulation, eye-hand coordination and grasping strength with self-care and mobility.

R.Humphry, et.al (1995). Of In-Hand manipulation and relationship with activities. The aim of the study was to examine the age-related increase of in-hand manipulation. The consistency of using a manipulation strategy and the relationship between the frequency of IHM and activities which typically require the use of intrinsic hand control. 184 children between the age of 2 and 7 years were selected. Their IHM skills of rotation. Finger to Palm translation, Palm to finger translation observed. The child's use of a manipulation strategy was recorded. Result revealed that the two types of In-hand manipulation increase with age and the study illustrated the uneven nature of development of different types of In-hand manipulation.

Jane case-smith (1991). The effect of Tactile Defensiveness and Tactile Discrimination on In- hand manipulation. The aim of this was to compare the in-hand manipulation efficiency in children with and without tactile defensiveness and low tactile discrimination. 50 children aged 4 to 6 years were tested by using the three subtests of Southern California Sensory Integration Tests (SCSIT Ayes, 1980) measured tactile function and three in-hand manipulation tasks. The result revealed that children with both defensiveness and discrimination problems demonstrated the least efficiency on all of the in-hand manipulation task. The result suggested that a child's tactile function should be considered in therapy to improve manipulation skill.

### **METHODOLOGY**

Understanding and addressing the challenges of in-hand manipulation in children with intellectual disabilities is crucial for therapists, and caregivers. Through targeted interventions, such as occupational therapy and specialized exercises, it is possible to improve these children's fine motor skills, enhancing their ability to participate more fully in everyday activities and ultimately improving their quality of life.

**Aim:** To evaluate the In-hand manipulation skills among children with intellectual disability and compare the scores obtained by different types of ID.

#### ***Objectives***

- Select a special school for intellectually disabled
- To assess the In-hand manipulation skills of the children with standardized assessment tool of in-hand manipulation
- To check the in-hand manipulation skill among mild & moderate intellectually disabled children

#### ***Study Setting***

This study was carried out at Ezhuchi mentally retarded special care school, Kondur, Cuddalore.

#### ***Selection criteria***

##### **Inclusion criteria:**

- Both male and female children between the age group of 7 to 10 years, with mild or moderate intellectually disabled as identified by IQ scores by the school authorities.

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### Exclusion criteria

- Children above 10 years and below 7 years of age and
- Children with severe or profound intellectually disabled, Autism Spectrum Disorder, Attention Deficit Hyperactivity disorder and children with other Developmental delays, Epilepsy children were excluded from the study.

### **Study Design:**

Sample = 40

Design = single group, experimental study

### **Study Procedure:**

A sample of 40 students, both mild and moderate intellectually disabled were selected. There were 20 male and 20 female children among the sample aging between 7 to 10 years. Assessment of in-hand manipulation by standardized assessment includes, with hand manipulation tasks administered. During the assessment, some of the activities were to be demonstrated due to problem for children to perform with just the verbal instruction. Such as performing the activity with stabilization and without stabilization (assessment procedure involves this). Their total score with the mean value of their total score were compared to make qualitative analysis.

### **Materials Used:**

Assessment of In-Hand Manipulation

### **Data Analysis**

60 children were evaluated for the study. **Out of them 40 children** were selected based on the selection criteria. They were separated into two groups as mild intellectually disabled children and moderate intellectually disabled children based on the already available IQ score mentioned in school documents.

**Table- 1 Distribution of age**

S.NO.	AGE	Number of Participants	Percentage
1	7 years	10	25%
2	8 years	14	35%
3	9 years	6	15%
4	10 years	10	25%
	<b>TOTAL</b>	40	100%

This table shows that majority of the sample belong to 8 years.

**Table -2 Distribution of gender**

S.NO.	GENDER	Number of Participants	Percentage
1	Male	20	50%
2	Female	20	50%
	<b>TOTAL</b>	40	100%

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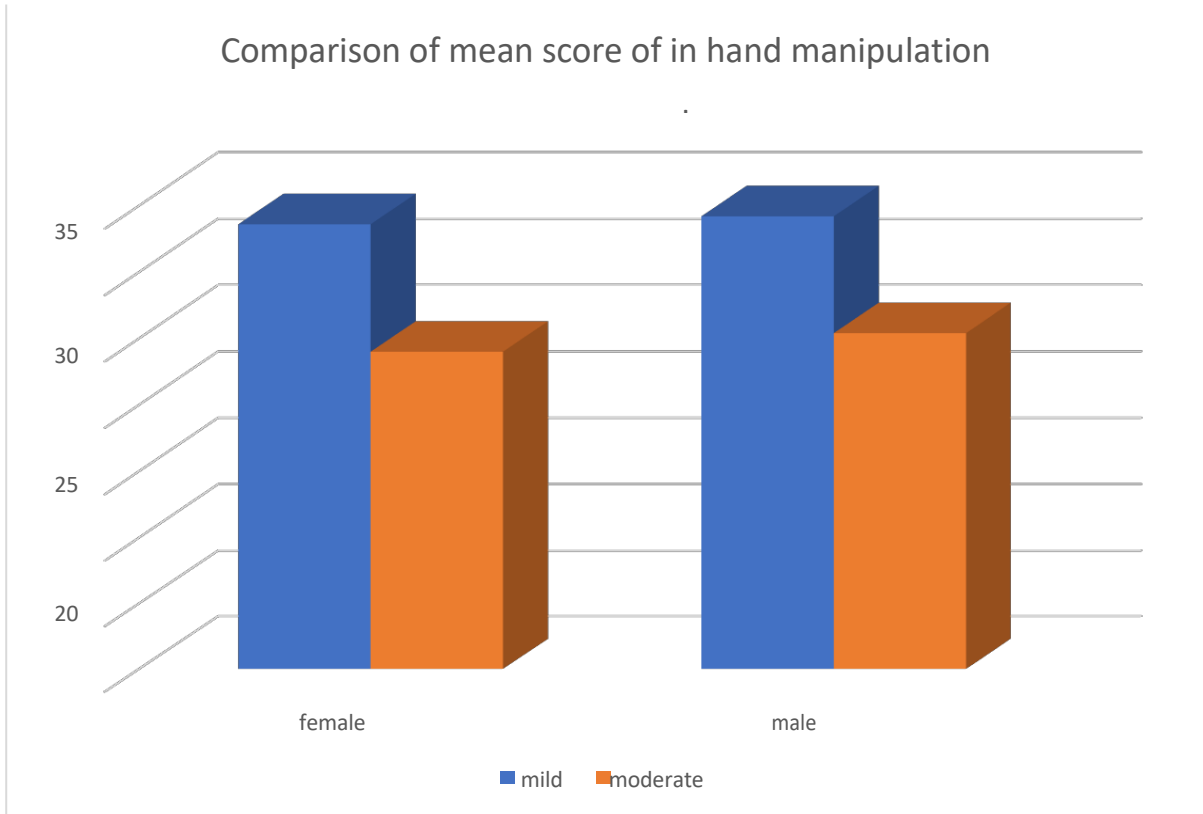
*Table -3 Assessment score for mild ID group*

S.NO.	SHIFT	F to P	P to F	SR	CR	TOTAL
<u>1</u>	<u>5</u>	<u>11</u>	<u>10</u>	<u>6</u>	<u>6</u>	38
<u>2</u>	<u>5</u>	<u>13</u>	<u>13</u>	<u>8</u>	<u>7</u>	46
<u>3</u>	<u>5</u>	<u>13</u>	<u>10</u>	<u>10</u>	<u>9</u>	47
<u>4</u>	<u>5</u>	<u>9</u>	<u>8</u>	<u>4</u>	<u>5</u>	31
<u>5</u>	<u>6</u>	<u>10</u>	<u>11</u>	<u>7</u>	<u>7</u>	41
<u>6</u>	<u>4</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>5</u>	34
<u>7</u>	<u>4</u>	<u>8</u>	<u>8</u>	<u>10</u>	<u>5</u>	35
<u>8</u>	<u>4</u>	<u>6</u>	<u>7</u>	<u>3</u>	<u>4</u>	24
<u>9</u>	<u>6</u>	<u>13</u>	<u>10</u>	<u>10</u>	<u>6</u>	45
<u>10</u>	<u>4</u>	<u>8</u>	<u>8</u>	<u>10</u>	<u>5</u>	35
<u>11</u>	<u>5</u>	<u>9</u>	<u>8</u>	<u>4</u>	<u>5</u>	31
<u>12</u>	<u>3</u>	<u>9</u>	<u>8</u>	<u>6</u>	<u>4</u>	30
<u>13</u>	<u>5</u>	<u>13</u>	<u>10</u>	<u>10</u>	<u>9</u>	47
<u>14</u>	<u>3</u>	<u>6</u>	<u>6</u>	<u>8</u>	<u>3</u>	26
<u>15</u>	<u>4</u>	<u>9</u>	<u>8</u>	<u>3</u>	<u>4</u>	28
<u>16</u>	<u>4</u>	<u>9</u>	<u>8</u>	<u>5</u>	<u>4</u>	30
<u>17</u>	<u>5</u>	<u>9</u>	<u>8</u>	<u>6</u>	<u>5</u>	33
<u>18</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>8</u>	<u>3</u>	25
<u>19</u>	<u>4</u>	<u>9</u>	<u>8</u>	<u>3</u>	<u>4</u>	28
<u>20</u>	<u>6</u>	<u>11</u>	<u>9</u>	<u>9</u>	<u>9</u>	44

*Table 4 Assessment score of moderate ID group*

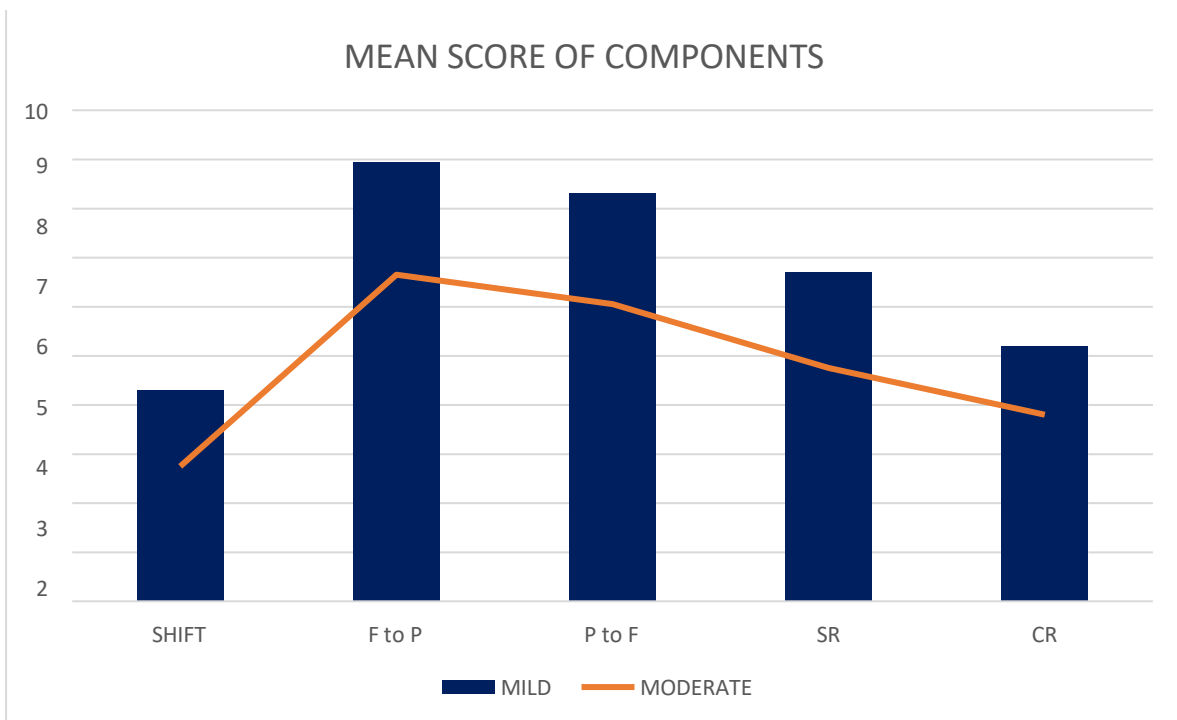
S.NO.	SHIFT	F to P	P to F	SR	CR	TOTAL
<u>1</u>	<u>4</u>	<u>8</u>	<u>8</u>	<u>3</u>	<u>4</u>	27
<u>2</u>	<u>1</u>	<u>5</u>	<u>7</u>	<u>4</u>	<u>1</u>	18
<u>3</u>	<u>2</u>	<u>8</u>	<u>6</u>	<u>4</u>	<u>3</u>	23
<u>4</u>	<u>2</u>	<u>7</u>	<u>5</u>	<u>5</u>	<u>2</u>	21
<u>5</u>	<u>1</u>	<u>5</u>	<u>5</u>	<u>3</u>	<u>4</u>	18
<u>6</u>	<u>3</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>2</u>	20
<u>7</u>	<u>1</u>	<u>5</u>	<u>6</u>	<u>8</u>	<u>3</u>	23
<u>8</u>	<u>2</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>3</u>	23
<u>9</u>	<u>1</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>3</u>	18
<u>10</u>	<u>4</u>	<u>9</u>	<u>8</u>	<u>5</u>	<u>4</u>	30
<u>11</u>	<u>2</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>4</u>	21
<u>12</u>	<u>3</u>	<u>6</u>	<u>5</u>	<u>5</u>	<u>4</u>	23
<u>13</u>	<u>4</u>	<u>8</u>	<u>6</u>	<u>8</u>	<u>5</u>	31
<u>14</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>8</u>	<u>3</u>	25
<u>15</u>	<u>2</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>3</u>	23
<u>16</u>	<u>3</u>	<u>6</u>	<u>5</u>	<u>5</u>	<u>3</u>	22
<u>17</u>	<u>4</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>5</u>	34
<u>18</u>	<u>4</u>	<u>8</u>	<u>8</u>	<u>10</u>	<u>6</u>	36
<u>19</u>	<u>2</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>4</u>	28
<u>20</u>	<u>5</u>	<u>10</u>	<u>8</u>	<u>4</u>	<u>3</u>	30

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**Table 5 Comparing the mean of scores (In-hand manipulation components)**

	<b>SHIFT</b>	<b>F to P</b>	<b>P to F</b>	<b>SR</b>	<b>CR</b>
<b>MILD</b>	<b>4.3</b>	<b>8.95</b>	<b>8.3</b>	<b>6.7</b>	<b>5.2</b>
<b>MODERATE</b>	<b>2.75</b>	<b>6.65</b>	<b>6.05</b>	<b>4.75</b>	<b>3.8</b>



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The presented data show that mild ID has higher mean in all of the components when compared with moderate ID. Both mild ID and moderate ID have scored the highest mean in same component (Finger to Palm translation) and the lowest mean in the (Shift) component. When we arrange the components in descending order, Finger to Palm Translation, carries least problem than 2) Simple Rotation. Then Palm to Finger translation, and Complex Rotation and Shift. Hence, when focusing on the intervention for both mild ID and moderate ID, the first skill that should be developed is Shift.

*Table- 6 Paired Sample t-test for assessing in-hand manipulation among intellectually disabled children*

GROUP	N	MEAN	Standard deviation	t-value	p- value
Mild	20	33.9	7.4	5.06	0.0001
Moderate	20	23.3	3.9		

The descriptive statistics for the dataset include a sample size of 40 individuals. The table show the paired sample t-test done to assess in-hand manipulation among intellectually disabled children. The table shows the mean score obtained among mild intellectual disability (33.9) and moderate (23.3). The paired sample t-test shows the t-value is 5.06 and the probability is 0.001. There is decrease in mean value in for assessment done with moderate ID when compared with mild ID. This indicates that there is delay in IHM among moderate ID when compared to mild ID.

### RESULT

Total 40 Intellectually disabled children were included in this study. They were assessed with assessment of in-hand manipulation to check their in-hand manipulation skills. The study shows that the moderate intellectually disabled children have scores of lower mean when compared to score of mild intellectually disabled. The mean of moderate ID total score is 23.3 and the mean of mild ID score is 33.9. the paired sample t-test gives a t-value of 5.06 and the probability value of 0.001 at 0.01 level of significance.

### DISCUSSION

The aim of the study is to assess the in-hand manipulation among intellectually disabled children. The study was conducted among 40 children who are either mild or moderate intellectually disabled children. There were 20 male and 20 female children among the sample aging between 7 to 10 years old. By the assessment of in-hand manipulation, activities to perform were given accordingly. They were observed and scoring were given. During the assess some of the activities were to be demonstrated repeatedly since there was a problem for children to perform with just the verbal instruction. Some of the children had problem to perform the activity with stabilization and without stabilization for assessing purpose. After a strong assessment the mean of their total score were tabulated and compared. The mean of moderate ID children total score was lower when compared with the mean of mild ID children total score. The difference in the mean of the total score is about 10.6. Their t-value was 5.06 with p-value of 0.001 at 0.01 level of significance.

### CONCLUSION

Form this study it is concluded that there is delay in development of in- hand manipulation among intellectually disabled children. The mean moderate ID children lack IHM skills compared to mild ID children. Intellectually disabled children have problem in advancing and refining their skills. It is important for an occupational therapist to assess the level of in-hand manipulation of the children and provide intervention.

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### ***Limitation and Recommendation***

#### **Limitation:**

- Though population of study is from two special school of Cuddalore district, one special school alone permitted for daily assessment of children.
- Study was done to check the in-hand manipulation skills
- Conducted for intellectually disabled children in special school who did not attend inclusive educational curriculum.

#### **Recommendation:**

- Large sample can be taken
- Study can be conducted in more than one special school
- Study can be conducted to assess hand function of normal school going children of the same age.

## **REFERENCES**

### **JOURNAL REFERENCES:**

- Case Smith (1996), Fine motor outcomes in pre-school children who receive occupational therapy services. *American Journal of Occupational Therapy* 1996.
- G Suganya, N Balakrishnan (2022) Self-Efficacy Findings in Families of Intellectually Disabled Children of Cuddalore District, Tamilnadu Vol 09 (02): 2022 Pages: 73-78
- G.Suganya, .N.Balakrishnan (2022) Optimizing Psychological Wellbeing, by Lowering Parental Stress in Parents of Intellectually Disabled Children. Volume 05 Issue 07 July 2022 DOI: <https://doi.org/10.47191/ijmra/v5-i7-27>
- Joppy Asgari, et.al. (2021). Identification of fine motor skills in children with intellectual disability. *American Journal of Occupational therapy* 2021.
- Kavitha Raja, Payal Katyayal, Saumen Gupta (2019). Assessment of In-hand manipulation: Tool development. *International Journal of Health & Allied Sciences*.
- Laura H Dinehart, Handwriting in early childhood education: current research and future implications. *Journal of Early Childhood Literacy* (201 5), Vol. 15(1) 97-118
- Marieta Visser, Mariette Nel, (2016) In-hand manipulation of children aged four and five years old. *South African Journal of Occupational therapy*,2016;46(2):5258
- Natalie Smith-Zozovsky, Charlottle E. Exner (2004). The effect of seated positioning Quality on typical 6 and 7 year old children's Object manipulation skills. *American Journal of Occupational Therapy*, 58,380- 388.
- Sang-Min Seo, The effect of fine motor skills on legibility in preschool age children (2017) *The Journal of Physical Therapy Services*,30:324327,2018
- Suganya G (2022) Elucidating Self Efficacy & Parental Bonding on Mental Health in families of Intellectually Disabled Children *Acta Neurophysiologica*, Vol. 4 Issue 2

### **BOOK REFERENCE:**

- Case-Smith O' Brien; *Occupational therapy for children* (6th edition)  
*Hand Grasps and Manipulation Skills*, Sandra J Edwards et.al., Second Edition  
Lawrence Rarick; *Physical Activity: Human Growth and Development*

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### ***Conflict of Interest***

The author(s) declared no conflict of interest.

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