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Effect of Fine Motor Skill Training on Decoding Skills in School Going Children

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Abstract: ***Objectives: To find the effect of fine motor skill training on decoding skills in school going children between the ages of 4 to 9 years and to compare its effect between both the genders. Study design: An Experimental study on 30school going children between the ages of 5-9 years, was conducted in Pune,India.The Abecedarian Reading Assessment for decoding skills. The children underwent fine motor skill training for a period of 2 weeks, three times per week for 45 minutes, which included, weight bearing exercises, Theraputty exercises, Theraband exercises, activities using different texturesand ADL activities. Paired T test was used for statistical analysis. Results: A total of 30 children with a mean age of 7 years were included. Paired T test showed statistically significant improvement in post training decoding skills (t=16.9, p=<0.0001) in male children (28.55; 39.55)of age 6 years (23.60;34.80). Conclusion: Fine motor skill training was found to be effective in improving decoding skills.***

Keywords: fine motor skill training, decoding skills, Abecedarian Reading Assessment, school going children

1. Introduction

Fine motor skills are marker for a variety of skills that includes copying designs from an external stimulus and generating forms of memory; in either two or three dimensions [1]. They include multiple tasks with visual, cognitive and manual dexterity demands (e.g. drawing with a pencil to either copy an outside image, or spontaneously generate an image) and spatial organization (e.g. building with blocks). Decoding skills are those that facilitate the reader to turn the symbols of text (i.e. graphemes) into sounds (i.e. phonemes) [2].During the preschool years i.e. between the ages of 4 and 6 years, children develop hand skills, precision handling and mature manual dexterity [3]. A typical developing child draws a circle at the age of 3, a cross at the age of 4, and a triangle at the age of5 years [4].

Decoding skills are chiefly needed to identify words. Literacy skills that are vital precursors of word reading comprise letter knowledge i.e. saying ‘‘bee’’ for the letter ‘‘b’’; letter–sound associations i.e. saying ‘‘buh’’ for ‘‘b’’; phonemic awareness i.e. saying word ‘‘cat’’ has the sounds /k/ /a/ /t/; reading words quickly and handwriting into sounds i.e., phonemes [2].Toassess early reading skills,the Abecedarian Reading Assessment was designed. Using this assessment information, each student’s learning needs are effectively catered by the teachers. To be booming readers of English text, children must be able to swiftly recognize both regular and irregular words. TheDecoding subtest has three tasks: Fluency, Regular Words, and Irregular Words. A child that swiftly and easily reads the words in the Fluency task does not need to be evaluated with the other two tasks. Children struggling with the words in the Fluency task, however,(depending on the frustration level of the child) need to be tested with the Regular Words task. The words for the tasks in this subtest are selected from two databases that list words according to how often they come up in language or text (called the Word Frequency) and according to how early in life most people learn the words (called the Age of Acquisition) [5].

Younger children easily learn to associate whole words with concepts or ideas – at this early stage in reading development, children can “recognize” familiar words, but that does not necessarily mean they are “decoding” them. Decoding words involves sounding them out and arriving at a pronunciation that other mature readers agree with. Furthermore, that decoding process should not be laborious. [6].

Fine motor skills are the strongest predictor of kindergarten retention controlling for vocabulary, auditory and visual skills, and socio-demographic factors.Correct identification of motor deficits in children is an essential prerequisite for an effective clinical intervention [7]. Thus, this study is aimed at finding the effect of fine motor skill training on decoding skills in school going children

2. Literature Survey

Sebastian Suggate, et al. (2015) studied **“**The effect of fine and grapho-motor skill demands on preschoolers’ decoding skill”, on 51 preschool children. Children were given three writing conditions, impaired writing condition-they wrote with a pencil that had a conical shape, made of steel or polystyrene, normal writing condition and pointing condition- were they pointed at the letters with the light pencil. Results showed that children learned the most decoding skills in the normal writing condition, then by the pointing and impaired writing conditions. The findings thus suggest experimental evidence that having lower FMS is unfavorable for reading development [1].

Marie-Laure Kaiser, et al. (2009), studied "Relationship between Visual-Motor Integration, Eye-Hand Coordination, and Quality of Handwriting". Copying and tracing items showed a stronger relationship than the other items, FMS was needed especially when the area was small and the space between lines was thin. The child had to anticipate the change of curve and the needed to stop or to slow his or her movement more often and more quickly. Thus they concluded that irregularities in tracing letters could be related to difficulties in visual control of a movement or in motor control [3].

3. Method

Institutional ethical clearance and permission letters from the concerned schools was taken.30 children were randomly selected from eight schools in Pune district, aged 5-9 years, studying in English medium State Board schools, in the period of August 2016 to November 2016. Children with Autism and Attention deficit disorder were excluded from the study. Baseline data of decoding skill was taken using the Abecedarian Reading Assessment.

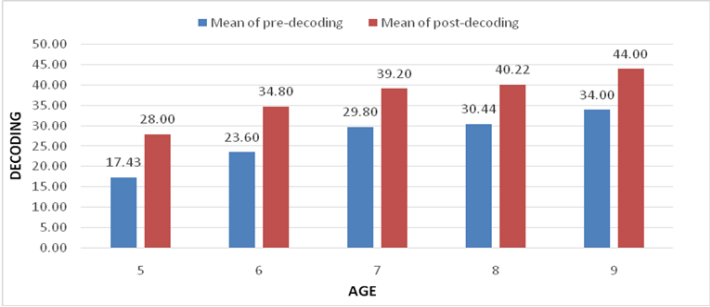
4. Intervention

Fine motor skill training for a period of 2 weeks, three times per week for 45 minutes, which included weight bearing exercises like hitting the pegs with hammer, hand weight bearing,finger painting and wheel barrow walking, Theraputty exercises included pressing the Theraputty balls with fingers, placing pegs in the Theraputty and making various shapes of it, Theraband exercises like strengthening exercises for elbow, shoulder and scapular muscles, activities using different textures included activities with poky links in sand, using a spoon to lift marbles from rice and making different letters in sand. Children were also taught ADL activities like zipping, buttoning-unbuttoning, tying shoe laces and using fork and spoon.After every two session of the training the difficulty level was increased.After two weeks of intervention, decoding skills were again assessed.

5. Statistical Analysis

Table 1: Mean of pre and post training decoding with age

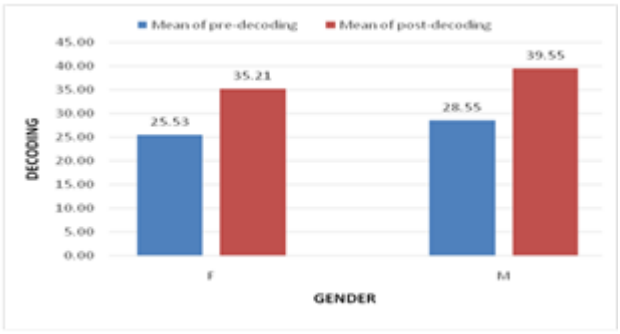
Age	*N*	*Mean of pre-decoding*	*Mean of post-decoding*	*Mean difference*
5	7	17.43	28.00	10.57
6	5	23.60	34.80	11.2
7	5	29.80	39.20	9.4
8	8	30.44	40.22	9.78
9	4	34.00	44.00	10
Mean		26.6	36.8	
t value		16.9		
p value		0.0001		



Graph 1: Mean of pre and post training decoding with age

Table 2: Mean and standard deviation of pre and post training decoding with gender

Gender	*N*	*Mean of pre-decoding*	*Mean of post-decoding*	*Mean difference*
F	19	25.53	35.21	9.68
M	11	28.55	39.55	11.00
Mean		26.6	36.8	
Standard deviation		±3.4	±2.9	



Graph 2: Mean of pre and post training decoding with gender

6. Results

30 children with fine motor skill deficit participated for the training protocol. Demographic data, pre and post training scores of The Abecedarian Reading Assessment were taken. Data was analyzed with ages and gender. Means and standard deviation of the data was taken.

Table 1 shows t value of pre-decoding -post-decoding as 16.918. Statistical analysis shows the value of p being <0.0001, which implies that it is highly significant.Children of age 6 years showed greater improvement in decoding skills post training (23.60;34.80).

Table 2 shows mean and standard deviation for gender with change decoding. Males had a higher change in decoding post treatment (28.55; 39.55).

7. Discussion

Previous Researches doneconsidered that FMS is essential in early reading development [1]. Only correlational design has been conducted in this aspect, thus, it has been tricky to be sure that FMS are an important in early reading development.

Hence, this study evaluated the effect of fine motor skill intervention on decoding skills and its differences among the ages and genders.

Previous research showed that FMS explain a disparity in reading development [8]. Adding more support to this evidence, this study showed that intact fine motor skills result in improvement of decoding skills, over and above attention, working memory, phonemic awareness, and pretest decoding skill. Obviously, children with greater working memory can better hoard and process the taught letter– sound and sound–word relations during the learning stage, in turn leading to greater learning. In a similar manner, children with greater phonemic awareness might experience less difficulty in recognizing the letter sounds. Furthermore, attention can also be correlated with FMS[9].

The children were given fine motor skill training over a period of two weeks which showed significant improvement in fluent words, irregular words and regular words. Clinically it was noted that the pre decoding score was much better for older children, as they might already be aware of the words in The Abecedarian Scale.With the improvement in decoding skills, teachers claimed that students showed significant gains in writing and reading out sentences simultaneously, which was not possible before the fine motor skill intervention.

Females showed better improvement in the age averaging between 5 to 6 years, while males showed improvement in age averaging between 8 to 9 years. This could be due the more samples that included the females were from ages between 5 to 7 years.During the intervention period it was noted that children had typical posture, i.e. scapula of the dominant hand was elevated and adducted, which may be due to the fact that the child required additional force to hold the pencil and imprint it on the paper. Also the spine seemed to be tilted away from the dominant side, which would be due to the inability to adequately use the limb for functional activities. The current study did not evaluate the posture as it was out of the scope of this study.Some children also showed shabby appearance, i.e. untied laces all the time, a piece of shirt always tucked out and untidily knotted tie. This could be due to the fact that such children may have developmental co-ordination disorder, or it may be due to the inability to use hand to perform such skills[10].

Sebastian Suggate, Eva Pufke, HeidrunStoeger in July 2015 studied “The effect of fine and grapho-motor skill demands on preschoolers’ decoding skill”,showed that children learned the most decoding skills in the normal writing condition, then by the pointing and impaired writing conditions[1]. Thus this study tried to provide the most normal condition of writing, by providing fine motor skill intervention. The children were first made to hold a thick object like a ladies finger so that they can learn pincer grasp. Paint colors were applied to its end and the children were asked to draw stand lines, sleeping lines and slanting lines at first. This was then progressed to teaching children to draw letters and numbers. Children who were even more affected were taught letters in numbers in a large box at first and then were made to draw in decreasing size of the box. This kept the children engaged and made learning playful. Once this skill was practiced and mastered the children were then asked to form letters and numbers using their pencil. Children showed significant gains in drawing letters like L, E, T, N, V, Y and O. and numbers like 1, 8 and 0. This practice made improvements in decoding fluent words.

Current study gives the foresight that fine motor skill intervention given at early academic period can improve performance in mathematics and other play activities which could accelerate fine motor skill activities.

The fact that children with lower FMS are likely disadvantaged during reading and writing tasks, the current findings conclude that reading instruction should be delayed until the child has matured with his fine motor skills.

Future research is needed to explore and enhanceapproaches to help children who enter school with lower FMS thus facilitating improvements in decoding skills.

8. Conclusion

Thus fine motor skill training was effective in improving decoding skills in females of ages 5 to 6 years and males of age 8 to 9 years.

9. Future Scope

The study can be conducted for a longer duration of the sessions of fine motor skill training. Children with gross motor, balance and co-ordination difficulties can also be included.

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