การรับรู้ทางตาสัมพันธ์กับการลงมือปฏิบัติในเด็กนักเรียนชั้นประถมศึกษา กรุงเทพมหานคร

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บทคัดย่อ

วัตถุประสงค์ : เพื่อศึกษาการรับรู้ทางตาสัมพันธ์กับการลงมือปฏิบัติในนักเรียนชั้นประถมศึกษา กรุงเทพมหานคร

วิธีการศึกษา : เป็นการศึกษาเชิงพรรณาแบบภาคตัดขวาง โดยใช้แบบทดสอบ The Beery VMI 6th ฉบับเต็ม เทียบคะแนนการรับรู้ทางตาสัมพันธ์กับการลงมือปฏิบัติของเด็กไทยกับเกณฑ์ปกติ ในคู่มือแบบทดสอบ และศึกษาปัจจัยที่มีผลต่อความแตกต่างระหว่างค่าคะแนน ได้แก่ เพศและช่วงอายุของเด็กไทย ทั้งยังศึกษาปัญหาและข้อจำกัดของการทดสอบ The Beery VMI 6th ในเด็กไทย กลุ่มตัวอย่างเป็นนักเรียนที่กำลังศึกษาอยู่ชั้นประถมศึกษาปีที่ 1 ถึงปีที่ 6 อายุระหว่าง 6-12 ปี 11 เดือน จำนวน 520 ราย

ผลการศึกษา : เมื่อเทียบคะแนนการทดสอบกับเกณฑ์ปกติจากคู่มือ พบว่า สองในสามของกลุ่มตัวอย่าง (ร้อยละ 67.31) มีคะแนนเทียบเท่าระดับเกณฑ์เฉลี่ย ร้อยละ 21.72 มีความสามารถสูงกว่าเกณฑ์เฉลี่ย และร้อยละ 10.96 มีความสามารถต่ำกว่าเกณฑ์เฉลี่ย โดยนักเรียนที่ช่วงอายุ 6 ถึง 11 ปี มีคะแนนสูงกว่าเกณฑ์ปกติ ในขณะที่ช่วงอายุ 11 ถึง 13 ปี มีแนวโน้มของคะแนนต่ำกว่าเกณฑ์ปกติ และไม่พบความแตกต่างของค่าคะแนนระหว่างเพศชายและเพศหญิง

สรุป : แบบทดสอบ The Beery VMI 6th ฉบับเต็ม สามารถใช้เป็นแบบทดสอบเพื่อประเมินความสามารถด้านการรับรู้ทางตาสัมพันธ์กับการลงมือปฏิบัติของเด็กไทยชั้นประถมศึกษาได้ โดยต่อยอดจากการศึกษาครั้งนี้ที่พบว่าความสามารถของเด็กไทยตามระดับอายุแบ่งได้เป็น 3 กลุ่ม คือ กลุ่มอายุ 6-7 ปี 11 เดือน กลุ่ม 8-9 ปี 11 เดือน และกลุ่ม 10-12 ปี 11 เดือน อย่างไรก็ดี ควรมีการพัฒนาเกณฑ์ปกติเฉพาะเด็กไทย

คำสำคัญ : การรับรู้ทางตาสัมพันธ์กับการลงมือปฏิบัติ นักเรียนชั้นประถมศึกษา

Visual-Motor Integration of Primary School Children in Bangkok

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ABSTRACT

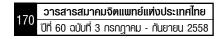**Objective** : To study visual-motor integration (VMI) among primary school children in Bangkok

Methods : We applied the Beery VMI 6th full form, and compared the results with the American norm. The research also explored variation differences in gender and age, including assessing the limits in applying the test on Thai students. The sampling group included 520 students in primary school, ranging in age between 6 and 12 years 11 months.

Results : Compared to the American norm using the VMI, around two-thirds of the participants (67.31%) had the same ability whereas 21.72% did better, and 10.96% did worse. While the VMI appeared to increase with age; students between 6 and 11 had a higher score, whereas those beetween 11 and 13 tended to have a lower one. There was no difference in the VMI score between boys and girls in this sample.

Conclusion : The Beery VMI 6th full form can be used for evaluating Thai primary school children, however, further study regarding the VMI norm among Thai children should be done. According to the current study there should be three age groups; 6 -7 years 11 months, 8-9 years 11 months, and 10-12 years 11 months.

Keywords : visual-motor integration, primary school children

Introduction

Over the passing decade, Thailand has focused more on juvenile education. Since the year 1997, the Thai Constitution stipulates that every Thai person is entitled to the same equal rights for the service of standard education program for no less than 12 years. Since then, the Thai educational program has been continually developing in a more concrete way. At present this has been developed to be the Basic Education Core Curriculum B.E. 2008. The regulation concerning the implementation of the fundamental education has been included in the Eighth National Economic and Social Development Plan (B.E. 1997-2001). The key concept is "people are the central part of the development". Such a concept has been carried until the present day by incorporating it into the Eleventh National Economic and Social Development Plan (B.E. 2012-2016).[1]

The aforementioned information reveals that the development of human resources for the country needs collaboration from all parties, initiating from the child development by helping children to obtain fundamental education since Prathomsuksa 1. Nonetheless, only education support might not be sufficient because the children also need both physical and psychological development in order to continue their education effectively. In this context, visual-motor integration, which is a physical development of young children, is vital for the beginning stage of child learning because it is an essential skill of using hand to copy characters, or in other words, it is handwriting skill.[2-5] Though the writing practice comprises of several elements such as visual perception, motor planning, motor memory and sequencing,[6-7] no skill is more crucial than visual-motor integration because it is the clear indicator of writing skills in children.[8]

According to previous research, the children have to learn how to draw geometric shapes first then they learn how to write a letter. The children who are good at drawing geometric shapes will be also good at writing.[2] Thus, for the children who have visual-motor integration deficit, they should be promptly assisted in order that they will be able to sustain their writing skills,[5,7,9] intellectual capabilities[10-11] and academic achievement.[4,12-15] There are several other research papers which confirm that visual-motor integration is related to learning outcomes of children.[3,6,9] For instance, the finding by Frostig (1973) explains that the children who had low scores in the visual test tend to have poor learning outcomes and difficulties in adapting themselves in class.[16]

Accordingly, we need a standard visual-motor integration tool for conducting assessment of Bangkok childrens' abilities. However, the researcher is interested in the Developmental Beery-Buktenica Test of Visual-Motor Integration, 6th edition (The Beery VMI 6th), which is the test of visual-motor integration through a drawing of geometric shapes. The test has 30 geometric shapes, designed from age 2 to 100 years. The Beery VMI test has a high degree of reliability and validity, as well as sensitivity to visual-motor integration deficit. In addition, it has certain criteria

in scoring and it is a non-language test so there is no bias in term of culture. It is easy to understand and requires a short testing period with ease preparation of the tools that requires only paper and a pen or a pencil with no eraser. [4] The test result can be used as initial information to further develop the children who have visual-motor integration deficit.

Objectives

1. To study the visual-motor integration ability in the Bangkok primary school children

2. To compare the visual-motor integration ability of Bangkok children who are in the normal criteria with the norm of the Beery VMI 6th manual

3. To compare gender and age differences in visual-motor integration

4. To study limitation of the full form of the Beery VMI 6th in Thai children

Methods

The sample size was calculated from 364,588 primary school students in Bangkok.[17] The calculation was initially aimed at the sample size of 400 students. However, during data collection, it appeared that there was a higher number of students who met the criteria than the originally calculated numbers of the sample size. According to the methodology, it was suggested that the researcher should not cut off those students who met the criteria, therefore, all 520 students were included in the sample size.

The research employed multi-stage sampling

Sampling level 1

The primary school program in Bangkok is the responsibility of two authorities: Bangkok Primary Educational Service Area Office under the Ministry of Education and Department of Education under Bangkok Metropolitan Administration. Thus, the sampling of 2 schools under each authority would have the sample size of 4 schools, which were school A and school B from Bangkok Primary Educational Service Area Office, and school C and school D from Department of Education Bangkok Metropolitan Administration.
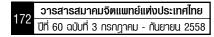
Sampling level 2

Sampling was performed in 4 schools. The sample size was the entire class and carried out by sampling 1 class per primary school level. (Prathomsuksa 1 to 6)

Research instrument

The Beery-Buktenica Developmental Test of Visual-Motor Integration, 6th Edition (Beery VMI 6th)-Full form. Score one point for each imitated or copied item, up to three consecutive failures and no point for each copied item that does not match the manual criteria. There are high levels of reliability of the Beery VMI test such as test-retest reliability and interrater reliability which are 0.88, and 0.93, respectively.[4]

Data collection

The researcher and the research assistants collected data by using the Beery VMI 6th. The test required the students to copy geometric shapes.

The instruction was provided to the participants before starting the test. Only the paper sheet and a pencil were allowed for the test. The testing process required per each group was 30 minutes. The test was conducted by group; one class per group. In case there were more than 20 students in one class, another one research assistant would be presented (2 research assistants in total) so that the test time ran for 10 to 15 minutes for each class.

   Data analysis

   1. Descriptive statistics: means and standard deviation used for analyzing score derived from the full form of the Beery VMI 6th, classified by age and gender

   2. Comparing ability of Bangkok students with the norm of the Beery VMI 6th

   3. Comparing gender differences in raw score by using t-test

   4. Comparing age differences in raw scores by using one-way ANOVA

Results

   Part 1 : Visual-motor integration of primary school students in Bangkok

   Table 1 showed that both genders had the same maximum score at 30 while the minimum score of the boys was 13 and that of the girls was 14. With respect to the age range, it was revealed that different age yielded different mean by the way that the score tended to increase by age.

Table 1   Number of students, minimum, maximum, mean and standard deviations of raw scores measured by the Beery VMI 6th, categorized by gender and age group

		N	Min	Max	Mean	SD
Gender	Male	237	13	30	22.60	3.330
	Female	283	14	30	22.50	3.089
Age group (years/months)						
	1. 6/0-6/11	71	13	27	19.58	2.832
	2. 7/0-7/11	93	16	26	20.77	2.542
	3. 8/0-8/11	82	15	28	22.07	3.050
	4. 9/0-9/11	81	17	29	22.88	2.571
	5. 10/0-10/11	96	16	30	24.63	2.514
	6. 11/0-11/11	83	19	28	24.37	2.433
	7. 12/0-12/11	14	23	29	25.14	2.033
	Total	520	13	30	22.55	3.198

   It also indicated that the percentage of distribution was fairly close to one another, except group 7 of the students with ages between 12 years to 12 years 11 months that yielded the lowest number of 14 persons, accounting for only 2.7% of the total samples. When converted the

raw score mean of 22.55 to the standard score by using the Beery VMI 6th manual, the relative level of performance at average level (mean) of the standard score was 101.55. The distribution of standard score and relative level of performance in the Beery VMI 6th manual was shown in Table 2.

Table 2 showed that more than half of the Bangkok primary school students (67.31%) were categorized in the average level whereas the proportion of 21.72% were classified as the higher average level (above average, high, very high) and the remaining of 10.96% were lower than the average level (below Average, low, very low).

Table 2   Relative level of performances, frequency and percentage of standard score according to the Beery VMI 6th manual

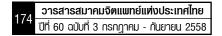| standard score	performance	Frequency	Percentage (%)
> 129	Very High	2	0.38
120-129	High	19	3.65
110-119	Above Average	92	17.69
90-109	Average	350	67.31
80-89	Below Average	43	8.27
70-79	Low	13	2.50
< 70	Very Low	1	0.19
Total		520	100

Part 2 : Comparing ability of Bangkok students with the norm of the Beery VMI 6th

Table 3 showed the comparison of Bangkok children ability with the norm of the Beery VMI 6th that obtained from American children ability. Bangkok students obtained the 19.58, 20.77, 22.07 and 24.63 mean of raw scores at younger ages than the norm. For the mean of 22.88, Bangkok students could achieve at the same level as the norm. However, at the means of 24.37 and 25.14, Bangkok students were in the older ages than the norm.

Table 3   Bangkok children ability compared with the norm of the Beery VMI 6th

Mean of Raw Score	Mean : Age Group of Thai Primary School Students (years/months)	Mean : Age-Equivalent of the Beery VMI 6th Manual (years/months)
19.58	6/5	7/4
20.77	7/5	7/11
22.07	8/4	8/8
22.88	9/5	9/5
24.63	10/5	10/9
24.37	11/5	10/7
25.14	12/1	11/3

Part 3 : Comparing gender differences in raw score by using t-test

Table 4 showed that there was no difference in the mean of raw scores between the boys and the girls.

Part 4 : Comparing age differences in raw scores by using one-way ANOVA

From Table 5, when compared in term of ages, it was found that the mean of raw score converted from the Beery VMI 6th test of at least one group was significant difference from the rest at .001. This was followed by the Post-hoc through multiple comparisons of the means by using the Scheffe's method. The results showed that the visual-motor integration ability increased

with age. In term of scores by age group, some of age groups had no difference in score. As a consequence, the age group could be reclassified from 7 groups previously into 3 groups as follows:

6 to 7 years 11 months

8 to 9 years 11 months

10 to 12 years 11 months

The reclassified age groups were conducted based on the one-way ANOVA and the Post-hoc with Dunnett T3 method. The result showed that at least one group had significant difference from the rest at .001 and the visual-motor integration of Bangkok primary school children increased by age.

Table 4   Comparing of raw score mean derived from the Beery VMI 6th among gender

Gender	n	Mean	SD	t	P-value
Male	237	22.60	3.330	.346	.730
Female	283	22.50	3.089		
Total	520	22.55	3.198		

Table 5   Comparing of mean and standard deviation of the raw scores derived the Beery VMI 6th among age groups

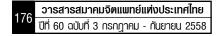| Age Group (year/month)	n	Number of boys	Number of girls	Mean	SD	F	P-value
6/0-6/11	71	30	41	19.58	2.832	41.378***	.000
7/0-7/11	93	45	48	20.77	2.542		
8/0-8/11	82	41	41	22.07	3.050		
9/0-9/11	81	33	48	22.88	2.571		
10/0-10/11	96	45	51	24.63	2.514		
11/0-11/11	83	37	46	24.37	2.433		
12/0-12/11	14	6	8	25.14	2.033		
Total	520	237	283	22.55	3.198		

*** p < .001

Discussion

1. 67.31% out of the total sample groups of 520 students with ages between 6 to 12 years 11 months possess visual-motor integration in average level in comparison to the norm of the Beery VMI 6th, which means that the majority of Bangkok children have visual-motor integration at the same level as the manual. Meanwhile, the proportion of 21.72% was in the higher level than average (above average, high, very high), which means that this group of children possess higher visual-motor integration than the norm. The remaining 10.96% was in the lower level than average (below average, low, very low) which means that these children possess lower visual-motor integration than the norm. At this point, it is worth noting that this group of children need more skill development due to the reason that visual-motor integration involves several abilities of children such as handwriting, reading and mathematics skills.[3-5, 7, 9, 12-15] In addition, the visual-motor integration also impacts the daily and social lives of the children. The children who have poor visual-motor integration will be clumsy in activities which require a use of hands such as buttoning, tying the shoes, spoon handling and using a computer. Since these children are inclined to have poor handwriting, they might be reluctant to write and this will impact on their academic performance, which will finally impair their sentiment and self-esteem.[18]

2. For the comparison of raw scores between Thai children with those of the Beery VMI 6th manual, it was found that Bangkok children with ages between 6 to 11 years tended to have higher visual-motor integration than norm. The results are in line with the study by Keerati Bunnagulrote about the Beery VMI-3rd edition (VMI 3R) in developing the norm of 1,055 Thai students whose ages range from 6 years 6 months to 9 years 6 months, which concluded that the norm of Thai students in every age group was higher than the norm of VMI 3R.[19] The research by Amornpun Thavornsuwanchai studying about characteristic measurement of the VMI 4R in 748 students in the primary level 1 to 6, whose ages range from 7 to 11 years and 11 months domiciled in all districts of Chonburi province also found that Thai children possess higher visual-motor integration in comparison to the norm with the same age group.[20] Furthermore, the study by Wichulada Suwannapu about the visual-motor integration in 386 kindergartners whose ages range from 3 years 6 months to 6 years 5 months by applying the Beery VMI 5th revealed that Thai children achieved relatively higher scores when compared with the test norm.[21]

Nonetheless, Bangkok children with ages range from 11 to 13 years are inclined to have lower visual-motor integration than the norm. Bangkok children with average ages of 11 years 5 months got the mean raw scores from the Beery VMI 6th test at 24.37, in the same range of ability level of the children with average ages of 10 years 7 months in comparison to the norm of the Beery VMI 6th. Meanwhile, the children with the

average age group of 12 years 1 month achieved the mean of raw scores at 25.14 when compared to the children with ages 11 years 3 months. Such lower than norm may result from different cultures of education system and life style of the children during these ages. The children might somewhat fade from the handwriting skill which requires pen or pencil, but attached to computers and social networking. In other words, it can be said that the norm of the Beery VMI 6th does not suit Bangkok children with ages range from 11 to 13 years and therefore it should be the development of the norm specifically for Thai children.

3. The comparison of the raw score mean measured by the Beery VMI 6th in term of gender differences and it was found that there was no difference in the raw score mean between the boys and the girls. This means that both Bangkok boys and girls can use the same norm which is in line with the Beery VMI 6th test: the norm of which is applicable to both males and females. In case the development of the norm for Thai children is persuaded, the norm should be applicable to both genders.

Although there are several research papers about visual-motor integration to support both gender differences and no gender differences[19,21-25] Beery claimed that the studies which had more power of statistical analysis confirmed that the Beery VMI is an unbiased test towards the gender. Accordingly, the study of the Beery VMI norm in 1981 found no gender differences with statistical significance at the level .05, but the edition in 2003 found only one item from the entire test that has gender bias and the latest edition in 2010 indicated no gender differences.[4]

4. For the comparison of the raw score means from the Beery VMI 6th in term of age groups, it was found that mean of raw scores obtained from the Beery VMI 6th of at least one group is statistically different from the rest, with the significant level at .001. This means that the visual-motor integration will increase with ages. This is in line with the theory of cognitive development by Piaget which says that the cognitive development of human will increase with age.[26] In Thailand many researchers found that the visual-motor integration increases along with the ages.[19-22]

Nonetheless, by conducting the Scheffe analysis, some age groups that were close achieved no different scores. Therefore, the age groups were reclassified from the previous 7 groups to the following 3 groups: Group 1-6 to 7 years 11 months, Group 2-8 to 9 years 11 months and Group 3-10 to 12 years 11 months then the age group difference was analyzed with one-way ANOVA and Post-hoc with Dunnett T3. It was found that Bangkok children under the 3 age groups had different scores with statistical significance at .001: indicating that the visual-motor integration increases with ages. Such age group reclassification aligned with ability of Thai children can be further developed to be the norm for primary school children in Bangkok.

Strength and Limitation

In term of strength, this research is the first study that apply the Beery VMI-6th edition, which is the latest version and has been improved the norm of children aged 2-18, to determine visual-motor integration ability of Bangkok children in the primary school level with a big sampling group of 520 students in comparison to the initial target sample of 400 students which could help enhance the statistical test. The sampling group was a good representation of population given that the sampling covered the schools under the two governmental authorities (Bangkok Primary Educational Service Area Office and Department of Education Bangkok Metropolitan Administration). However, the research had limitation in that it did not cover the private schools, but since a proportion of the children studying in the governmental schools is greater than that of the children studying in the private schools, it was deemed that the sampling was a good representation of population. For the data collection, it was true that the children with special needs such as those with ADHD also attended ordinary schools, but there was only a few of them and this was in line with normal circumstance. Since the group testing normally required a clinical setting but the data collection in schools has limitation regarding place, the researcher tried to manage the environment to be suitable for doing the test. For example, arranging tables to be far enough from one another while the researcher did not interact with the children to ma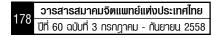ke sure that the children perceived they were doing a test and not a typical class. In addition, the data showed that a proportion of the children whose ages range from 12 to 12 years and 11 months was smaller than other age groups, but it was still sufficient for conducting one-way ANOVA.

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