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Difficulties in Graphomotor Activities of Children Carrying Out the One-Year Preschool Preparation Obligation and in First-Grade Primary School Children

SUMMARY

The article analyzes the problems concerning the course of graphomotor activities in first-grade primary school children and in children carrying out the compulsory one-year preschool preparation. The study defines the range and intensity of undesirable behaviors, with emphasis on the phenomena classified within such categories as: the way of holding the writing instrument, the position of the sheet in relation to the edge of the desk and the pace of work. For this purpose the authors utilized the results of research carried out using the author-designed diagnostic tools: the “Scale of Assessment of Graphomotor Skills, (Domagała, Mirecka, 2017c) and the “Profile of Graphomotor Skills” (Domagała, Mirecka, 2010 – here: the modified version of the tools, in accordance with the selected developmental stage. At the earliest stage of education, most of the irregularities concerning the way of holding the writing instrument and the pace of work were identified.

Key words: graphomotor skills, course of graphomotor activities, school maturity, one-year pre-school preparation, early education

INTRODUCTION

Difficulties in the sphere of graphomotor skills (in particular, writing difficulties) are a significant barrier in school education. Insufficient preventive measures in this sphere, the lack of accurate identification of abilities and limitations

in children beginning school education cause many people to constantly grapple with graphomotor difficulties in later periods of education, and then in their professional and personal life.

In Poland, studies on the graphomotor skills in children at the earliest stage of education are currently conducted very seldom. They are usually confined to narrow aspects of the phenomenon or are designed as one of many elements in the assessment of school maturity/school readiness (e.g. Buchnat, 2013; Grzesiak et al., 2014; Skibska, 2014). Graphomotor skills (sometimes termed *graphoperception*) are most often diagnosed based on tests of drawing, mainly copying, graphic shapes, simple and complex geometrical figures, or asymmetrical abstract linear arrangements (e.g. Tryzno, 2008; Wilgocka-Okon, 2010; Bogdanowicz, Kalka, 2011; Korendo, Cieszyńska, 2012), with the diagnostician focusing mainly on the products of graphomotor activities. In contrast, the assessment of the course of graphomotor activities is limited. We believe that it should be considerably broadened, taking into account particularly the later development of the ability to write, connected with many spheres of psychomotor development, including the physical aspect of writing by hand (Rief, Heimburge, 2007; St. John, 2013). This can be achieved by presenting graphomotor skills on two complementary levels (the course and product of graphomotor activities) with a multidimensional assessment of each sphere (Domagała, Mirecka, 2017b).

RESEARCH ISSUES

The subject of the paper is graphomotor skills in first-grade primary school children and in children carrying out the one-year pre-school education obligation, with emphasis on difficulties in the course of graphomotor activities.

Our previous empirical studies have revealed a number of undesirable phenomena in this sphere in first-grade primary school pupils (Domagała, Mirecka, 2015a; 2017a). Since the studies were conducted at the end of the school year (i.e. after a year's education at school), it may be feared that the undesirable phenomena are irregularities that tend to become permanent. The causes of this condition are worth investigating, also focusing on the period preceding learning to hand-write because one might think that many wrong behaviors result from the lack of appropriate patterns and effective training at the earliest stage of the development of graphomotor skills. The authors decided to describe the problem in more detail by using the available material from the current research, exemplified by selected categories of phenomena fundamental from the standpoint of the course of graphomotor activities.

The goal of the paper is to determine the range and intensity of undesirable behaviors regarding the course of graphomotor activities, manifesting in children

at the earliest stage of education, with special emphasis on the phenomena classified within such categories as the way of holding the writing instrument, the position of the sheet in relation to the edge of the desk and the pace of work.

METHODS OF RESEARCH

The analysis made for the needs of the present study utilized the results of research carried out using our own diagnostic tools:

- the “Scale of Assessment of Graphomotor Skills” (Domagała, Mirecka, 2017c) – in the group of first-grade primary school pupils,
- the “Profile of Graphomotor Skills” (Domagała, Mirecka, 2010) – in the group of children carrying out the one-year pre-school preparation obligation (here: a modified version of the tool in accordance with the selected developmental stage).

The investigated categories of the description of phenomena regarding the course of graphomotor activities – the way of holding the writing instrument, the position of the sheet in relation to the edge of the table and the pace of work – are present in the foregoing two tools. The “Scale of Assessment of Graphomotor Skill” was standardized, prepared in the Psychological and Pedagogical Tests Laboratory in Gdańsk as a tool for diagnosing first-to-sixth grade primary school pupils (the assessment of graphomotor skills is conducted here based on the tests for reproduction of letter-like designs and tests for copying texts); the Scale is not used for testing pre-school children. However, in the case of children beginning school and only getting ready to learn to write, the procedures defined in the “Profile of Graphomotor Skills” can be used effectively with the appropriate choice of diagnostic tests.¹

With regard to first-grade primary school pupils, we analyzed for the purpose of this study the results from field research underlying the standardization of the “Scale of Assessment of Graphomotor Skills” (the studies covered under 1,000 first-to-sixth grade primary school pupils all over the country, at each level of education trained diagnosticians tested groups with a similar number of pupils).²

¹ The previously conducted empirical studies showed the interrelationship between the kinds of graphomotor activities like writing and drawing letter-like designs – graphomotor skills in children who have not yet begun learning to write or have learned to write to a negligible extent can therefore be assessed in basic terms on the basis of tests for reproduction of letter-like designs (Domagała, Mirecka, 2015a; 2014/2015). Consequently, regarding the “Profile of Graphomotor Skills”, the ways of clinical use of the tool, apart from its standard application, were indicated (Domagała, Mirecka, 2015b).

² See the detailed description of standardization tests in the diagnostic manual (Domagała, Mirecka, 2017c), prepared by Marta Formela, MA of the Psychological and Pedagogical Tests Laboratory in Gdańsk.

The diagnosticians assessed the course of graphomotor activities in accordance with the diagnostic procedures defined for the tool in the “Observation Protocol”, taking into account the most significant phenomena within such assessment categories as: I. The dominant hand; II. The way of holding the writing instrument; III. The position of the sheet (in relation to the edge of the desk); IV. The sitting position; V. The pace of work. The ample empirical material paved the way to the detailed assessment of diverse aspects of the course of graphomotor activities.

In the case of the group of children carrying out the one-year pre-school obligation, the field research using the “Profile of Graphomotor Skills” was conducted by M. Majcher (who was working on her MA dissertation in Logopedics with Audiology at Maria Curie-Skłodowska University of Lublin [UMCS], supervisors: Dr hab. A. Domagała and Dr hab. U. Mirecka, UMCS Associate Professor). The study group consisted of 20 six-year-olds (10 girls and 10 boys) who went to the kindergarten in a small town. The research was carried out at the end of the one-year pre-school preparation. In this group, diagnostic tests designed by the MA supervisors, comprised the following experimental-clinical tests: reproduction of a single letter-like design that has to be completed (here: on the sheet there is a fragment of the design and the child draws the design as far as the end of the line); reproduction of a single letter-like design that requires copying the design presented to the child on a separate sheet; reproduction of letter-like designs that requires copying the designs presented to the child on a separate sheet. During the final conversation, each child additionally provided information about the tasks executed (whether they were easy, or about possible difficulties that occurred during the work). Moreover, the teacher was interviewed about the implementation of the program regarding preparation for learning to write and about the achievements of the pupils. The drawings by children were archived, and the course of the tests was also documented (they were partly recorded with a camera, at the end, pictures were taken to illustrate selected phenomena observed in the studies). The assessment of the course of graphomotor activities was carried out in accordance with the diagnostic procedure defined in the “Profile of Graphomotor Skills” (Domagała, Mirecka, 2010), in the “Observation Protocol” – taking into consideration the most essential phenomena within such assessment categories as: I. The dominant hand; II. The way of holding the writing instrument; III. The dominant hand arrangement; IV. The non-dominant (auxiliary) hand; V. The position of the sheet; VI. The sitting position (body posture); VII. The pace of work. The present study has also used the results of research by M. Majcher (2018), regarding selected categories of phenomena embracing the course of graphomotor activities, and the archived field work materials (common for the “Scale of Assessment of Graphomotor Skills” and the “Profile of Graphomotor Skills”).

RESEARCH RESULTS

1. Research Results in the Group of First-Grade Primary School Children

With regard to the categories that are the object of description in the present article, in the “Profile of Graphomotor Skills” (Domagała, Mirecka, 2010), as well as in the “Scale of Assessment of Graphomotor Skills” (Domagała, Mirecka, 2017c) the following normative behaviors were determined:

- 1) regarding the way of holding the writing instrument:
 - the kind of grip – the instrument resting on the middle finger, held by the thumb and the index finger
 - distance of the fingers from the writing tip – between 1.5 and 2.5 cm
- 2) regarding the position of the sheet in relation to the edge of the desk:

In the case of the right hand as the dominant (guiding) one – the sheet placed perpendicularly in relation to the edge of the desk or at a slight angle (up to 10 degrees) or the correct, changing positioning of the sheet (here “changing”: the sheet placed at the right angle/at a slight angle).

In the case of the left hand as the dominant one – the positioning of the sheet slanted to the right, optimal for the arrangement of the dominant (guiding) hand, body posture and visual control.

- 3) regarding the pace of work (graphomotor activities) – the child works steadily.³

In the population of first-grade primary school students, exceptions to the abovementioned behaviors (in points 1–3) were frequently reported. Table 1 presents the results of quantitative analysis taking account of the distinguished categories of phenomena description in regard of the course of graphomotor activities (here: with a partial use of data from standardization studies, collated in the “Scale of Assessment of Graphomotor Skills” as required by the diagnostic manual – Domagała, Mirecka, 2017c).

³ In this respect the researcher takes observation data into consideration. However, the time of reproducing letter-like designs and copying texts is additionally measured (here: data from the measurements made in the course of performing diagnostic tests). In the “Scale of Assessment of Graphomotor Skills”, depending on the duration of diagnostic tests, the results concerning the pace of work may in individual cases reach the low/average/high level.

Table 1. "Observation Protocol" – results of first-grade pupils in the categories: the way of holding the writing instrument; positioning of the sheet in relation to the edge of the desk; the pace of work (here: A – normative behaviors, B – undesirable behaviors)

Category		Total		Girls		Boys	
		A	B	A	B	A	B
The way of holding the writing instrument	Kind of grip	51.2%	48.85%	50.7%	49.3%	51.6%	48.4%
	Distance between the fingers and the writing tip	53.9%	46.1%	61.2%	38.8%	46.6%	53.4%
The positioning of the sheet in relation to the edge of the table:							
- the dominant hand – right		98%	2%	98.4%	1.6%	97.5%	2.5%
- the dominant hand – left		23.7%	76.3%	20%	80%	27.3%	72.7%
The pace of work		48.5%	51.5%	55.1%	44.9%	41.8%	58.2%

When characterizing the abilities and limitations regarding the course of graphomotor activities in first-grade primary school students, it is necessary to draw attention to the records of undesirable behaviors found at this level of education (additionally taking the gender factor into account):

1) The way of holding the writing instrument

As shown by the figures in Table 1, in the course of performing graphomotor activities almost half the children hold the writing instrument in an incorrect way (they have an incorrect kind of grip and/or place fingers at an incorrect distance from the writing tip).

Using the additional detailed data, it should be stressed that in the girls' group the following undesirable behaviors were reported regarding the grip of the writing instrument: holding the instrument with three fingers, with an improper arrangement of the thumb, the index and middle fingers or with some other choice of fingers (42% of the girl population); holding the instrument with four fingers (5.8%) and the grip with the whole hand (1.4%). In the boy population, the following behaviors were reported: holding the instrument with three fingers, with an improper arrangement of the thumb, the index and middle fingers or with some other choice of fingers (42.9% of the boy population), holding the instrument with two fingers (1.1%), and holding the writing instrument with four fingers (4.4%). In both groups, the dominant irregularity was, therefore, the holding of the instrument with three fingers characterized by their improper arrangement/choice (as has been said above, the percentage of such behaviors was almost the same in the populations of boys and girls); other kinds of undesirable behaviors were diversified in both groups, being, however, reported comparatively rarely.

The distance between the fingers and the writing tip was too short in 34.3% of girls and too long in 4.5%. On the whole, there were far fewer irregularities in this category of phenomena in girls than in boys. In the boy population, a too short distance between the fingers and the writing tip was reported in 51.1% of cases, and a too long distance in 2.3% of the subjects.

2) The positioning of the sheet in relation to the edge of the desk

As shown by the general data in Table 1, difficulties with positioning the sheet optimally for the course of graphomotor activities were seldom experienced by first-grade pupils using the right hand, but very often by the children using the left hand (here: in the investigated population the left hand was used by 7.2% of girls and by 12.1% of boys).

On the basis of the additional detailed data, in the case of the right hand as the dominant one, it should be pointed out with regard to normative behaviors that although on the whole the percentage of these behaviors was almost the same in the populations of boys and girls, it was the girls who, more often than boys, kept the perpendicular arrangement of the sheet (90.6% of the girl population, and 80% of the boy population) – the boys were more often observed to place the sheet at a slight angle or to show correct changing behaviors (here: perpendicular sheet/ placed at a slight angle).

With regard to undesirable behaviors in the case of the right hand as the dominant one, in the girl population there were cases of placing the sheet slanting to the left – more than 10 degrees (1.6% of the subjects), while in the boy population there were cases of placing the sheet slanting to the right at more than 10 degrees (1.3% of the subjects) and of the incorrect changing arrangement of the sheet (here – changing: slanting to the right/left, at more than 10 degrees – 1.3%).

In the case of the left hand as the dominant one in children, the perpendicular positioning of the sheet was most often observed which was undesirable in relation to the arrangement of the dominant hand, body posture, and visual control. The behavior was characteristic of 80.00% of girls (in this population no other kinds of undesirable behaviors in this aspect were recorded) and of 63.6% of boys (in this population the slanting position of the sheet to the right, at a too small angle, i.e. up to 10 degrees, was reported in 9.1% of the subjects).

As regards the perpendicularly situated sheet, it should be observed that girls maintain this position of the sheet more often than boys do: both when they use the right hand (here: this kind of behavior is identified as normative) and when they use the left hand (here: this kind of behavior is identified as undesirable). Boys, more often than girls, give up this arrangement of the sheet and are more changeable in their behavior.

3) The pace of work

As shown by the data in Table 1, first-grade primary school children have considerable difficulties in achieving a steady pace of work – in particular, this applies to boys (here: in comparison with the girl population the difference is more than 13% to the boys' disadvantage).

Using the additional data, it should be specified that the following undesirable behaviors were recorded in the girls' group (starting from the most frequent ones): the girl pupil works with frequent breaks (20.3% of the subjects), slows down (11.6%), works with clear signs of fatigue (5.8%), works with long breaks (4.3%), speeds up (2.9%). In the boy group the ranking of undesirable behaviors remained the same as in the girls but the percentage of particular behaviors was usually higher (here: lower only in the case of speeding up): the boy pupil works with frequent breaks (28.6% of the subjects), slows down (12.1%), works with clear signs of fatigue (9.9%), works with long breaks (6.6%), speeds up (1.1%).

The assessment of phenomena in the category areas: the way of holding the writing instrument; the position of the sheet in relation to the edge of the desk; the pace of work, leads to the conclusion that many first-grade pupils have various difficulties pertaining to the course of graphomotor activities; they require support at the stage of learning to write.

2. Difficulties Manifesting Themselves at the Stage of Carrying Out the One-Year Preschool Preparation Obligation. Exemplification of Phenomena

Children are gradually prepared for learning to write before they start school during the obligatory one-year classes at the preschool unit: they are guided towards acquiring basic graphomotor skills. The empirical studies conducted in the group of 20 six-year-olds will allow us to show significant difficulties regarding the course of graphomotor activities manifesting in children at this stage, which might adversely affect the further course of their education. Regarding the category of the phenomena in question, the following findings were made:

1) The way of holding the writing instrument

Irregularities in the way of holding the writing instrument were observed in all the studied six-year-olds. A vast majority of children (75%) were characterized by the incorrect kind of grip of the writing instrument. In terms of gender, the problem was experienced by 80% of girls and 70% of boys. The instrument was most often held with three fingers (with an improper arrangement of the thumb, the index and middle fingers with some other choice of fingers) or with four fingers. Furthermore, reservations were made to all children in respect of the dis-

tance between the fingers and the writing tip – it was too short, sometimes even very slight (see Case no. 3, described further down in the text and illustrated with photo 3).

2) The positioning of the sheet in relation to the edge of the table

The proper arrangement of the sheet, optimal for the course of graphomotor activities, was maintained by the children who used the right hand (here: in the studied group of six-year-olds, 18 subjects used the right hand, and two – the left hand). Problems in this area were, however, reported in one left-handed child.

On the whole, it can be said that the children maintained the arrangement of the sheet presented to them typically in various situations (here: usually perpendicular to the edge of the desk as was the case with the book or exercise manual placed in front of the child at the desk during class).

3) The pace of work

The subjects had difficulties achieving the steady pace of work – most of them (55%) were characterized by the changing pace of performance of graphomotor activities. In particular, this pertained to boys – they worked irregularly far more often than girls (here: 80% of boys, and girls – 30%). It should be added that the girls not only worked steadily far more often but also – in view of the duration of execution of particular tasks and the general time to reproduce all letter-like designs – they generally worked faster than the boys, who were clearly slower.

In children there were co-occurrent multiple difficulties in the course of graphomotor activities, which can be illustrated by the following cases:

1) Girl aged 6, right-handed – incorrect grip of the writing instrument (see photo 1); moving the sheet (including damage to it), *inter alia*, because of the too strong pressure of the instrument; the movement of the dominant hand often interrupted; a changing pace of work. The child reports that she feels tired while performing graphomotor activities.

2) Boy aged 6, left handed – incorrect grip of the writing instrument (with four fingers – see photo 2a); a too small distance between the fingers and the writing tip; inharmonious movements of the dominant hand; the movement of the hand often interrupted; incorrect cooperation between the dominant hand and the auxiliary (non-dominant) hand (growing complications in the course of drawing letter-like designs because of the unfavorable position of the dominant and non-dominant hand – see photo 2b); the trunk leaning against the desk, excessive bending of the trunk and the head; a changing pace of performing graphomotor activities.

3) Girl aged 6, right-handed – incorrect way of holding the writing instrument (a too small /here: slight/ distance between the fingers and the writing tip –



Photo 1. Girl aged 6. Incorrect way of holding the writing instrument – the instrument is essentially held by the thumb and the middle finger (with the index finger resting on them), resting on the ring finger.

Source: archives of the authors (Photo by M. Majcher).



Photo 2a. Boy aged 6 – at the early stage of drawing letter-like designs. Incorrect way of holding the writing instrument – grip with four fingers: with the thumb covered by the index and middle fingers.

Source: archives of the authors (Photo by M. Majcher).

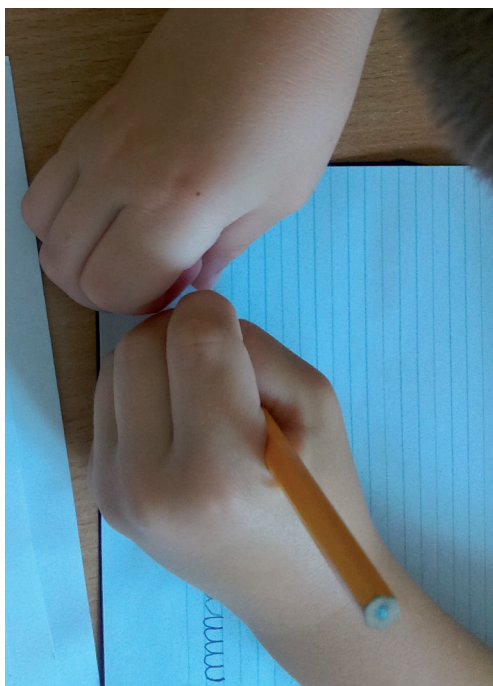


Photo 2b. Boy aged 6 – in the course of drawing letter-like designs. An increase in complications in the course of graphomotor activities because of the unfavorable position of the dominant and non-dominant hands; limited opportunity of visual control of the product and line organization.

Source: archives of the authors (Photo by M. Majcher).



Photo 3. Girl aged 6. Incorrect way of holding the writing instrument – distance between the finger and the writing tip too small (negligible). Additionally, excessive bending of the head (right over the sheet) is seen.

Source: archives of the authors (Photo by M. Majcher).

see photo 3); incorrect dominant hand arrangement; the trunk leaning against the desk, excessive bending of the trunk and the head (right over the sheet). The child assesses that she feels no difficulties while performing graphomotor activities.

With regard to the selected class of six-year-olds it should be stressed that during the one-year preschool preparation, their institution successively carried out the obligatory educational program, taking into account the curriculum requirements for the preparation for learning to write. However, it follows from the interview with the teacher (conducted after the completion of education) that some children are not coping well in the field of graphomotor skills. The teacher emphasizes that not all children like drawing, and, if not encouraged, they avoid drawing. Similarly, they show a dislike of making constructions out of building blocks or doing jigsaw puzzle, or performing various activities that require precision (in this context the teacher points out the disorders in visual-motor coordination in children and heightened muscle tension). While working with the group, the teacher pays special attention to the correct grip of the drawing instrument and the correct position of the children in the course of drawing – he notices the problems in children that were recorded during the investigation. The children are taught to manage the sheet space although it is difficult because of the number of children in the group and the lack of room to freely do exercises, e.g. on paper of different formats. The teacher introduces exercises consisting in drawing letter-like bands, starting from larger surfaces and gradually passing on to drawing on ruled sheets (for those willing). Not all children are interested in such exercises, the teacher emphasizes. Some children have persistent, serious difficulties in fine and gross motor skills, including those connected with performing daily self-service activities by the children themselves (e.g. doing up their laces).

CONCLUSIONS

The assessment of the course of graphomotor activities in children who are at the earliest stage of education requires stepping up efforts aimed to develop desirable behaviors in the field of graphomotor skills on the threshold of school education. Preventive/therapeutic measures in this sphere should be based on the findings concerning the development of graphomotor skills during this extremely important period if we take into account the risk of writing disorders in the course of further school education (and more broadly: in learning difficulties).

On account of the scale of difficulties found in first-grade primary school pupils and the distinctive problems manifested in children already before starting school education, it is necessary to conduct further empirical research in an appropriately numerous group of children starting school. Additionally, one has to take into consideration new system solutions in education regarding the age

of the child subject to the one-year preschool preparation obligation/compulsory education; the place where the one-year pre-school preparation is carried out; the core curriculum of pre-school education: the task of the kindergarten, the child's achievements shown at the end of preschool education, and the conditions and ways of task completion (Kwaśniewska et al., 2018).

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