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Geometrické znalosti a vnímaná vlastní účinnost v geometrii (self-efficacy) mezi zneužívanými a zanedbávanými dětmi z mateřské školy

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Abstrakt

Cílem studie je zkoumat geometrické znalosti a vnímanou vlastní účinnost v geometrii (self-efficacy) u dětí z mateřské školy, včetně dětí zneužívaných a zanedbávaných. Bylo provedeno 141 individuálních rozhovorů s dětmi ve věku 5–6 let, z nichž bylo 69 diagnostikováno místním sociálním odborem jako zneužívané a zanedbávané. Výsledky ukazují, že obě skupiny dětí mají vysokou míru vnímané vlastní účinnosti spojené s identifikováním geometrických obrazců, ale nebyla zjištěna významná souvislost s jejich znalostmi. Navíc byly mezi oběma skupinami nalezeny signifikantní rozdíly ve znalostech.

Klíčová slova: znalosti v geometrii, děti z mateřské školy, self-efficacy (vnímaná vlastní účinnost).

Geometrical Knowledge and Geometrical Self-efficacy Among Abused and Neglected Kindergarten Children

Abstract

The aim of this study is to investigate the geometrical knowledge as well as the geometrical self-efficacy of kindergarten children, including abused and neglected kindergarten children. Individual interviews were conducted with 141 kindergarten children, ages 5–6 years old, of which 69 children were labeled as abused and neglected by the social welfare department of their municipality. Results indicated that both groups of kindergarten children had high self-efficacy beliefs related to identifying geometrical figures which were not significantly related to knowledge. In addition, significant differences in knowledge were found between the two groups.

Key words: geometrical knowledge, kindergarten children, self-efficacy beliefs.

1 Introduction

During the elementary school years, the mathematics achievement scores of abused and neglected students are significantly lower than their peers, even when students are from the same socioeconomic background (Kendall-Tackett, Eckenrode, 1996). Could it be that this difference precedes the beginning of formal schooling? Recently, the importance of learning mathematics in preschool has come to the fore. A joint position paper published in the United States by the National Association for the Education of Young Children (NAEYC) and the National Council for Teachers of Mathematics (NCTM) stated that "high quality, challenging, and accessible mathematics education for 3- to 6-year-old children is a vital foundation for future mathematics learning" (NAEYC, NCTM, 2002, p. 1). Young children with little mathematics knowledge tend to fall further behind their peers each year. Compounding this problem, early knowledge of mathematics is often seen as a predictor of later school success (Jimerson, Egelnad, Teo, 1999). Abused and neglected children[1] are especially at risk, as these children lag behind their peers in cognitive development (Gowen, 1993).

One of the key mathematical domains during the preschool years is geometry. Many national curricula (i.e. NCTM) recommend that kindergarten children learn to identify two-dimensional shapes presented in a variety of ways. Geometry may support the learning of other mathematical topics, such as number and patterns. Developing geometrical reasoning, progressing from visual to descriptive and analytical reasoning may go hand in hand with developing the ability to form well defined concepts in other domains as well. The first aim of this study is to investigate the geometrical knowledge of kindergarten children, including abused and neglected kindergarten children. We investigate children's identifications of different geometrical shapes as well as the reasoning which accompanies these identifications. Can we notice differences between the geometric knowledge exhibited by abused and neglected children and other children even before then enter first grade?

Abuse and neglect during the preschool years can have a significant, as well as lasting impact on an individual's self-perception (Waldinger, Toth, Gerber, 2001). One aspect of self-perception related to the promotion of knowledge is self-efficacy (Bandura, 1986). Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute a course of action required to attain designated types of performances" (p. 391) and claimed that, "…beliefs of personal efficacy make an important contribution to the acquisition of the knowledge structures on which skills are founded" (Bandura, 1997, p. 35). Primary caregivers, as they provide feedback of children's performances, play a significant role in developing children's self-efficacy. Thus, abusive parents may contribute to negative self-efficacy. On the other hand, some studies of abused and neglected young children have shown that these young children have an even more inflated self-perception of competence than non-abused children (Barnett, Vondra, Shonk, 1996). It could be that inflated self-efficacy serves as a self-protective role among children who suffer from parental abuse and neglect. In such cases, a high self-efficacy gives the child a false sense of self. The second aim of this study is to investigate kindergarten children's geometric self-efficacy beliefs. We investigate their beliefs regarding their ability to identify different geometrical shapes as well as their beliefs regarding their ability to explain their identifications. Is there a difference between the geometric

[1] Throughout the paper, the term "abused and neglected children" refers to children who have either been abused or neglected or both.

self-efficacy of abused and neglected kindergarten children and other kindergarten children?

When investigating children's knowledge it is important to consider both real achievement and perceived achievement in tandem. One study of elementary school children found that maltreated children, more so than nonmaltreated children, tend to overestimate their level of competence, particularly for arithmetic (Kinard, 2000). The third aim of this study is to investigate the relationship between geometric knowledge and geometric self-efficacy beliefs among abused and neglected kindergarten children and other kindergarten children.

2 Theoretical background

Two major issues are at the heart of this study: kindergarten children's geometric knowledge and their related self-efficacy beliefs. This section begins by relating some background theories and research related to young children's geometrical knowledge and reasoning. It then continues by discussing self-efficacy beliefs, including mathematics self-efficacy, and its relation to knowledge.

2.1 Children's geometrical knowledge

According the van Hiele model (e.g., van Hiele, van Hiele, 1958), geometrical knowledge and reasoning progresses through a hierarchy of five levels, eventually leading up to formal deductive reasoning. As this paper is concerned with young children's knowledge of geometrical concepts, we are mainly concerned with the first three van Hiele levels. At the first level, students use visual reasoning, taking in the whole shape without considering that the shape is made up of separate components. This was discussed by Satlow and NewCombe (1997) who investigated children's identification of four shapes: circles, triangles, rectangles, and pentagons. For each shape they presented children with examples and nonexamples, which they termed valid and invalid instances. Valid instances were further categorized into typical and atypical instances. For example, the regular pentagon with horizontal base was considered a typical pentagon. A tall narrow pentagon was considered atypical. An open pentagon-like figure was invalid. Results indicated that children ages 3–5 rejected more of the atypical figures than the invalid figures. However, by the second grade a shift occurred whereby more of the children correctly rejected the invalid figures than the atypical figures. Similarly, Tsamir, Tirosh, and Levenson (2008a), focusing on nonexamples, found that some nonexamples of triangles are intuitively recognized by kindergarten children as such while others are often mistaken for triangles.

Visual reasoning begins with nonverbal thinking. Children judge figures by their appearances without the words necessary for describing what they see. For example, one study found that when 5-year old children described circles, triangles, and rectangles, only a few children referred to the attributes of these shapes, indicating that most children were operating at the first van Hiele level of geometrical thinking (Clements, Swaminathan, Hannibal, Sarama, 1999).

Students at the first level can name shapes and distinguish between similar looking shapes. Regarding naming, Markman (1989) proposed that when children hear a new name for an object, they assume it refers to the object in its entirety and not to its parts. This coincides with the first van Hiele level in which children first take the whole shape into consideration without regarding its components. Studies have also shown that children assume a given object will have one and only one name (e.g. Markman, Wachtel, 1988). This assumption may cause difficulties in accepting the hierarchal structure of geometric figures where a square is also a rectangle and a quadrilateral.

At the second level students begin to notice that different shapes have different attributes but the attributes are not perceived as being related. For example, a child may notice that a triangle has two sides which are equal and also that it has two angles which are equal, but may not know that one is related to the other. At the third level, relationships between attributes are perceived. Definitions of concepts become meaningful.

Hershkowitz (1990) differentiated between critical and non-critical attributes of a figure. Critical attributes are those that stem from the concept definition. That is, while a mathematical definition may contain only the necessary and sufficient conditions required to identify an example of a concept, other critical attributes may be reasoned out from the definition. For example, if we define a triangle as a "three-sided polygon", we may then reason that the triangle is a closed figure that also has three vertices and three angles. The critical attributes then include (a) closed figure, (b) three, (c) sides, (d) vertices, (e) angles. Non-critical attributes are attributes which are not relevant to the concept definition, such as the color or size of the shape. One of our major aims, as mathematics educators, is to bring our students to use only critical attributes as the deciding factor in identifying examples and forming geometrical concepts. Individuals who base their reasoning on critical attributes may at the very least be operating at the second van Hiele level. If the student points out that a figure is a triangle because it has three sides and therefore it also has three angles and vertices, then that child may be operating at the third van Hiele level. Hershkowitz (1990) also found that reasoning based on critical attributes increases with age.

While the set of all critical attributes of a concept are found in all examples of that concept, non-critical attributes may be found in only some of the concept examples. Burger and Shaughnessy (1986) referred to the orientation of a figure (e.g. horizontal base) as a non-critical or irrelevant attribute. Hannibal (1999) found that many children reverted to the use of non-critical attributes when trying to differentiate between examples and nonexamples among similar shapes. Additional non-critical attributes include skewness and aspect ratio. For example, triangles that lacked symmetry or where the height was not equal to the width were not always identified as triangles.

Burger and Shaughnessy (1986) claimed that an individual's reference to non-critical attributes has an element of visual reasoning. Thus, they further claimed that a child using this reasoning may either be at van Hiele level one or at van Hiele level two, as he is pointing to a specific attribute, and not judging the figure as a whole. In fact, research has suggested that the van Hiele levels may not be discrete and that a child may display different levels of thinking for different contexts or different tasks (Burger, Shaughnessy, 1986).

2.2 Self-efficacy beliefs

The second issue of this study is kindergarten children's self-efficacy beliefs related to performing geometrical tasks. "Mathematics self-efficacy… is a situational or problem-specific assessment of an individual's confidence in her or his ability to successfully perform or accomplish a particular task or problem" (Hackett, Betz, 1989, p. 262). Research related to self-efficacy and mathematics has shown that regardless of mathematical ability, students with a higher self-efficacy tend to expend more effort on difficult mathematics tasks than students with lower self-efficacy (Collins, 1982) and that students' self-efficacy beliefs are related to mathematics performance (Bandura, 1986; Pajares, 1996). Even among six-year old children, mathematics self-efficacy and behavior were found to be related (Davis-Kean, Huesmann, Jager, Collins, Bates, Lansford, 2008).

Few studies have investigated preschool children's self-efficacy. This may be due to children's difficulty in differentiating between what is real and what they desire to be real (Stipek, Roberts, Sanborn, 1984). Research finding are mixed. Some studies have found that young children may have overly high self-efficacy beliefs (Stipek, Roberts, Sanborn, 1984) while others have found that young children are able to understand the process of self-evaluation and may fairly judge their own competence (Anderson, Adams, 1985). Finally, we note that most studies related to mathematics self-efficacy measured a very general belief in mathematics self-efficacy which did not necessarily relate to specific mathematics topics (i.e. Usher, 2009). This study will focus on the child's self-efficacy while engaging in geometrical tasks and will investigate the relationship between kindergarten's children's geometric knowledge and their geometric self-efficacy.

3 Methodology

3.1 Participants

There were 141 kindergarten children, ages 5–6 years old, living in low socio-economic neighborhoods who participated in this study. All of the children attended municipal kindergartens in their local neighborhood in the morning and were scheduled to enter first grade during the following school year. Of the 141 children, 69 children were labeled as abused and neglected by the social welfare department of their municipality. While most children go home after school is over, the 69 abused and neglected children were bussed after school to day-care centers run by their municipality where they received hot meals and enrichment (i.e. they played games and engaged in arts and crafts activities, in a supervised environment).

3.2 Tools and procedure

The research took place in the last three months of the school year. A structured interview was developed for this study interweaving questions related to geometric self-efficacy with questions related to geometric knowledge. Children who were identified by the social welfare department of the city as being abused and neglected were interviewed individually in a quiet corner of the day-care center which they attended in the afternoons. The other children were interviewed individually in a quiet corner of their kindergartens in the morning. The interviewer recorded both utterances and gestures.

The focus of this study was on identifying and reasoning with triangles, pentagons, and circles and associated self-efficacy beliefs. The interview began with the following self-efficacy questions: (1a) If I show you a picture of a shape, will you be able to tell me if the shape is a triangle? (1b) Are you very sure or only a little bit sure? (2a) If I show you a picture of a shape will you be able to explain why that shape is or is not a triangle? (2b) Are you very sure or only a little bit sure? Taken together, the first two questions created a 4-point scale describing children's belief in their ability to identify triangles and the second two questions, taken together, created a 4-point scale describing children's belief in their ability to explain why a shape is or is not a triangle. For example, if a child answered "yes" to question 1a and "a little bit" to the question 1b, his self-efficacy was graded at 3. If he answered "no" to the question 1a and "very sure" to question 1b, his self-efficacy was graded at 1. Children were then presented one at a time with four figures (see Table 1), each figure drawn on a separate card, and asked, "Is this a triangle"? Why?

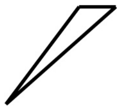
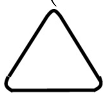
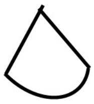
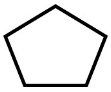
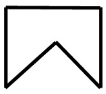
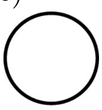
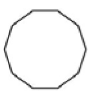
The entire set of questions, including the self-efficacy related questions, was then repeated for a pentagon with a different set of figures (see Table 1). Regarding the circle, children were not asked to explain their identification as the mathematical definition of a circle was considered too complex for young children to handle. Table 1 displays the figures in the order of which they were presented for each set of questions.

In choosing the figures, both mathematical and psycho-didactical dimensions were considered. When considering triangles, the equilateral triangle may be considered a prototypical triangle and thus intuitively recognized as a triangle, accepted immediately without the feeling that justification is required (Hershkowitz, 1990; Fischbein, 1987). The long and narrow scalene triangle may be considered a non-intuitive example because of its "skinniness". Whereas a circle may be considered an intuitive non-example of a triangle, the pizza-like "triangle" may be considered a non-intuitive nonexample because of visual similarity to a prototypical triangle (Tsamir, Tirosh, Levenson, 2008a). Similarly, the regular pentagon was thought to be easily recognized by children who had been introduced to pentagons whereas studies have shown that even among children who had been introduced to pentagons, the concave pentagon is more difficult to identify (Tsamir, Tirosh, Levenson, 2008b). Triangles and pentagons may vary in the degree of their angles providing a wide variety of examples. In contrast, the circle's symmetry limits the variability of its characteristic features. Thus, only one example of a circle was given. The nonexamples of each shape were also chosen in order to negate different critical attributes. Due to the young age of the children, we chose to limit the amount of figures presented to each child and thus did not include in this study intuitive nonexamples. Finally, we hypothesized that, in general, the triangle and circle would be figures known to the children from their surroundings whereas the pentagon is a figure less known but part of the preschool mathematics curriculum.

3.3 Analyzing the data

As related above, the self-efficacy questions were given a score from 1–4, 1 being a low self-efficacy and 4 being a high self-efficacy. Regarding children's knowledge of geometrical figures, two sets of data resulted from the two questions asked. The first set of data consisted of children's responses to the question of identification. These responses were either correct or incorrect as a figure is either an example of a geometrical shape or it is not an example of that shape. The second set of data resulted from children's explanations which accompanied their identifications. Two aspects of this data were analyzed: mention of critical attributes and use of mathematical language. As discussed in the background section, use or nonuse of critical attributes in an explanation may be an indication of the level of geometric reasoning at which the child is operating. Thus, it was important to note if a child claimed

Table 1: Frequencies (in %) of correct identifications per figure per group

Figure name	Abused and neglected children ($N = 69$)	Other children ($N = 72$)
Equilateral triangle (Intuitive example) 	100	100
Scalene triangle (Non-intuitive example) 	20	35
Rounded-corner "triangle" (Non-intuitive non-example) 	19	22
Pizza (Non-intuitive non-example) 	46	56
Regular pentagon (Intuitive example) 	71	71
Concave pentagon (Non-intuitive example) 	29	24
Curved-sides "pentagon" (Non-intuitive non-example) 	57	70
Hexagon (Non-intuitive non-example) 	26	32
Circle (Intuitive example) 	100	100
Spiral (Non-intuitive non-example) 	51	61
Decagon (Non-intuitive non-example) 	83	85

that a figure was a triangle because it looked like the roof of house, or because it had three sides. The first explanation is an example of visual reasoning. The second is an example of critical attribute reasoning. In addition to noting the use of critical attributes, we also noted the use of mathematical language. Did the child refer to the vertices of a triangle as vertices or as points or corners? According to the NCTM (2000), "Instructional programs from prekindergarten through grade 12 should enable all students to. . . .use the language of mathematics to express mathematical ideas precisely." (p. 60). Use of critical attributes and use of mathematical language were only analyzed for those children who correctly identified the figure. Critical attribute reasoning and mathematical language were coded separately as a child may relate to the critical attributes of a shape but may not use mathematical language to express the idea. For example, a child may claim correctly that a shape is a triangle because it has three corners. This child is referring to the critical attribute of three vertices but uses the word corner instead of vertex.

4 Results

This section begins by describing children's geometrical knowledge and continues by describing children's geometric self-efficacy. Finally, it analyzes the relationship between self-efficacy and knowledge.

4.1 Geometric knowledge – identifications

We begin by describing children's identifications of the individual figures presented to them. Results, summarized in Table 1 indicated that all of the children correctly identified the equilateral triangle. This coincides with studies which have found that the equilateral triangle with a horizontal base may be considered a prototypical triangle and is thus intuitively identified as such (e.g. Tsamir, Tirosh, Levenson, 2008a).

The rounded-corner "triangle" was the most frequently misidentified figure. As one child claimed, "It has the shape of a triangle". Interestingly, the equilateral pentagon was identified correctly by less than three-quarters of the children in both groups, though learning to identify pentagons is part of the kindergarten curriculum. As expected, few children in both groups identified correctly the concave pentagon. One child explained, "It looks like a bridge and has only four points." Regarding the circle, although all of the children correctly identified the circle, approximately half of the children incorrectly claimed that the spiral was a circle. Perhaps, the children focused on the roundness of the spiral and the absence of sides. One child claimed it was a circle and added "it continues to roll." Finally, although few children correctly identified the scalene triangle, when comparing the groups of children, this was the only figure for which a significant difference was found χ^2 $(1, N = 138) = 4.33$, $p < 0.05$.

After reviewing the results of children's responses to the individual figures, we grouped together the figures according to the shape they were intended to investigate. For each shape, triangles, pentagons, and circles, the mean score was configured resulting in a grade for each child ranging from 0–100 % for each shape. Results, presented in Table 2, indicated that abused and neglected children had a significantly lower triangle grade than other children, $p < 0.05$. No significant differences were found between the two groups of children for the other shapes. Finally, averaging

Table 2: Children's geometric knowledge per shape per group

Children	Abused and neglected children ($N = 69$)		Other children ($N = 72$)	
	M	SD	M	SD
Triangle	0.46	0.20	0.54	0.20
Pentagon	0.46	0.18	0.50	0.19
circle	0.78	0.24	0.82	0.24

Table 3: Frequencies of the use of critical attributes and mathematical language for correct identifications

	Use of critical attributes		Use of mathematical language	
Shape	Abused and neglected children	Other children	Abused and neglected children	Other children
Triangle	39	51	10	26
pentagon	23	31	3	18

all 11 figures and creating a general geometric knowledge grade, we noted that the neglected and abused children scored significantly lower ($M = 0.57$, $SD = 0.11$) than the other children ($M = 0.62$, $SD = 0.14$), $t(117) = 241$, $p < 0.05$).

4.2 Children's explanations

As mentioned above, explanations which accompanied correct identifications were analyzed further regarding mention of critical attributes and use of mathematical language. These results are summarized in Table 3. No significant difference was found between the two groups regarding their use of critical attribute reasoning for either shape. We also note that for both groups, among those children who did refer to a critical attribute, approximately half referred to critical attributes for only one of the four shapes presented to them, not necessarily the same shape. This was true for triangles as well as pentagons.

Regarding the use of mathematical language, significantly less abused and neglected children than other children used mathematical language when explaining why some figure was or was not a triangle χ^2 $(1, N = 104) = 6.04$, $p < 0.05$. Likewise, significantly less abused and neglected children than other children used mathematical language when explaining why some figure was or was not a pentagon χ^2 $(1, N = 114) = 8.94$, $p < 0.05$. In other words, abused and neglected children lagged behind their peers in their ability to express their mathematical thinking in a more accurate and appropriate manner. Furthermore, among the children who did use mathematical language, the abused and neglected children tended to use mathematical language for only one example per shape whereas the some of the other children used mathematical language for more of the examples.

4.3 Geometric self-efficacy

Recall that a scale of 1–4 was used to grade children's self-efficacy, 4 being very high and 1 being very low. Results, presented in Table 4, indicated that, in general, the

Table 4: Children's geometric self-efficacy per shape per group

	Identification				Explanation			
Children	Abused and neglected children		Other children		Abused and neglected children		Other children	
	M	SD	M	SD	M	SD	M	SD
Triangle	3.7	0.62	3.7	0.67	2.9	1.18	3.2	1.00
Pentagon	3.1	1.1	3.5	0.75	2.9	1.15	3.2	1.06
Circle	3.7	0.75	3.9	0.46	–	–	–	–

children had a relatively high self-efficacy related to identifying the different shapes but a lower self-efficacy related to explaining their identifications. Paired-samples T tests were performed in order to compare each child's self-efficacy for identifying shapes with their self-efficacy for explaining these identifications. These differences were significant in both groups for both shapes. (Regarding the triangles, $t = -5.54$, $\mathrm{d}f = 59$, $p < 0.01$ for the abused and neglected children and $t = -3.46$, $\mathrm{d}f = 63$, $p < 0.01$ for the other children. For the pentagons, $t = -4.35$, $\mathrm{d}f = 44$, $p < 0.01$ for the abused and neglected children and $t = -2.16$, $\mathrm{d}f = 57$, $p < 0.05$ for the other children.) No significant difference between the self-efficacy of the two groups of children was found for any of the shapes on either of the tasks.

4.4 Relating geometric knowledge and geometric self-efficacy

The third aim of the study was to investigate if children's geometric knowledge was related to their geometric self-efficacy. Nonparametric correlations were configured for each geometric shape per group of students. Results for both groups of children indicated that no significant relationship was found between children's ability to identify triangles, pentagons, and circles and their respective self-efficacy beliefs.

5 Summary and discussion

This paper describes an investigation of geometric knowledge and geometric self-efficacy among kindergarten children, including children who were abused and neglected. It extends and deepens the presentation by Tsamir, Tirosh, Levenson, Tabach, and Barkai (2010). In that presentation, general trends were discussed. This study offered a more in depth look at the difference and similarities in geometric knowledge, including an analysis of students' explanations and their use of geometrical language, as well as geometric self-efficacy beliefs between abused and neglected children and other children. In this section we discuss first the similarities and then the differences between the two groups.

Regarding children's identifications of geometric shapes, if we focus on the first example of each shape presented to the children, the equilateral triangle, the equilateral pentagon, and the circle, we note that the frequencies of correct identifications were exactly the same for each group of children. That is, figures which are symmetrical and possibly prototypical of their shape in general, may be easily identified by all kindergarten children regardless of their home backgrounds. In addition, there were no significant differences between the two groups of children in their general knowledge of pentagons and circles. Regarding pentagons, this finding may not be surprising. The pentagon is less common in children's everyday experiences and is usually first introduced in kindergarten. On the other hand, knowledge of circles was also similar between the two groups. It was thought that knowledge which might stem from the child's everyday experiences might produce different results for the different groups. A similarity between the two groups of children was also found in their use of critical attributes when explaining their identifications.

Both groups of children reported a high self-efficacy to identify shapes which did not correlate with their actual identifications. On the other hand, the self-efficacy of both groups of children regarding their ability to explain identifications was lower. This difference indicates that children do not necessarily respond in a positive manner or to the high end of any question or scale posed to them. Although young children may sometimes have a naïve belief in their own capabilities, it may not be so for all tasks. Recall that Usher (2009) suggested investigating mathematics self-efficacy related to specific topics. This study suggests that even within the same mathematical topic, geometry, children's self-efficacy may vary with what children are requested to do — identifying versus explaining.

When looking at the differences between the two groups, we first acknowledge that it is possible that the differences noted may not be solely due to the children's neglect. Yet, this study did find significant differences between the two groups of children. Less correct identifications were noted among the abused and neglected children than among the other children for the non-intuitive scalene triangle, as well as for each of the nonexamples of triangles, and a significant difference between the two groups of children was found in their general knowledge of triangles. Finally, when the results of the other shapes were also taken into consideration, abused and neglected children exhibited significantly less knowledge than other children. A significance difference was also found between the two groups in their use of mathematical language with the abused and neglected children using significantly less mathematical language than the other children. Language is an essential element of thinking and of developing concepts. As Vygotsky (1978) stated "...the word maintains its guiding function in formation of genuine concepts" (p. 145). Thus, children whose mathematical language is deprived may have greater difficulties developing mathematical concepts in the future. These findings indicate that even before children begin first grade, differences are detectable between the two groups of children. Knowledge and language of geometric shapes most often begins before formal presentation in school. As such, these differences may possibly stem from the home environment.

Abused and neglected children learn in the same kindergartens as other children. Thus, in order to plan lessons and interventions, it is important to note both the similarities and differences among these children. A high self-efficacy which is not realistic is common to both groups of children. On the one hand, we want to encourage children to have a high self-efficacy. On the other hand, an unrealistic self-efficacy may lead to unwanted frustration. This is an issue which needs to be addressed. In addition, the non-intuitive examples of triangles and pentagons were incorrectly identified by most of the children in both groups. Thus, it is important to actively promote this knowledge among all kindergarten children. And yet, differences do exist. In the beginning of this paper we asked if a difference between the geometric knowledge of abused and neglected children and their peers may be noted even before formal schooling begins. The answer, according to this study, is yes. Equity is not only about giving a fair chance to children from different socio-economic backgrounds or minority students. It is about providing "high expectations and strong support for all students" (NCTM, 2000, p. 12). Children who have been abused and neglected have special needs. Schmid (2007), in his report on children at risk in Israel, suggested that identification of risk factors in early childhood may prevent or minimize problems which develop later on. This study considers the mathematics educational needs of children at risk. Additional research is needed to address possible interventions which take into consideration both similarities and differences in knowledge, self-efficacy, and possibly affective issues when promoting mathematics for all children, including children at risk.

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