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## Stereotype threat and stereotype lift : the case of 10 year old girls and boys

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**PSYCHOLOGIA / PSYCHOLOGY**

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**STEREOTYPE THREAT AND STEREOTYPE LIFT:  
THE CASE OF 10 YEAR OLD GIRLS AND BOYS**

The model of stereotype threat, proposed by Claude Steele and his collaborators<sup>1</sup> explains how negative stereotypes attached to an individual's in-group can deteriorate their psychological and social functioning. Research based on this model has provided strong evidence that stereotype activation ascribing a negative trait to a group in a certain domain can impair the performance of that group's members. The explanation of this effect offered by Steel & Aronson<sup>2</sup> is based on the assumption that negative stereotype activation will induce fear of conforming to the stereotype, leading to higher levels of anxiety and arousal in stereotyped group members, which in turn lead to performance deficits in intellectual tasks.

However, recent developments of this theory indicate that there is no single mediator of stereotype threat effects on performance. Schmader, Johns, & Forbes<sup>3</sup> proposed a more complex model, focusing mainly on intrusive thoughts interfering with performance. They described how motivational, affective, physiological, and cognitive processes worked together to cause impairment of performance in the stereotyped domain. In this model psychological processes underlying the experience of stereotype threat are based on three core concepts: one's in-group, the ability domain, and the self-concept. Specific links between these concepts are activated in stereotype threat situations, resulting in a cognitive imbalance. The link activated first concerns a negative relation between one's concept of in-group and domain ability when one's in-group is defined as deficient

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<sup>1</sup> C.M. Steele, C.M., J.Aronson, *Stereotype threat and intellectual test performance of African Americans*, „Journal of Personality and Social Psychology” 1995, n. 69(5), s. 797–811; C.M. Steele, *A threat in the air. How stereotypes shape intellectual identity and performance*, „American Psychologist” 1997, n. 52(6), s. 613–629; S. Spencer, C.M. Steele, C.M. & D.M. Quinn, *Stereotype threat and women's math performance*, „Journal of Experimental Social Psychology” 1999, n. 35, s. 4–28.

<sup>2</sup> C.M. Steele, C.M., J.Aronson, *Stereotype threat...*

<sup>3</sup> T. Schmader, M. Johns, C. Forbes, *An integrated process model of stereotype threat on performance*, „Psychological Review” 2008, n. 115(2), s. 336–356.

in a given domain (e.g. *Girls are not good at mathematics*). Situational cues making group membership salient then activate a link between one's concept of self and the group (e.g. *I am a girl, I belong to the negatively assessed group*). The third link is between one's concept of self and a given domain in such a way that the self-concept is associated with doing well. This is possible due to high motivation to excel, as the theory in its classical version stated, or high ego involvement (e.g. *I am good at mathematics*). The resulting conflict between one's concept of self along with an expectation for success and a negative group stereotype implying failure creates a state of cognitive imbalance. It might be said that stereotype threat is in fact a threat to the sense of oneself as a coherent, valued person. In other words, it poses a threat to self-integrity<sup>4</sup>. In this situation an individual struggles to inhibit unwanted thoughts and feelings counterproductive to the current goal while simultaneously processing the information required for task completion. Schmader et al.<sup>5</sup> referred to several pieces of empirical evidence in the literature suggesting that stereotype threat reduces working memory capacity. A study by Cadinu, Maas, Rosabianca & Kiesner<sup>6</sup> also provided evidence for the detrimental role of negative thinking in women under stereotype threat.

The model of stereotype threat effects can be applied to various groups, mostly to those who are traditionally devalued in society, and to different domains. These effects were found in African Americans<sup>7</sup> in Latinos and low socioeconomic status groups that are viewed as less intelligent<sup>8</sup> in women who are stereotyped as not having math skills<sup>9</sup> or driving ability<sup>10</sup> and in older adults perceived as intellectually inferior<sup>11</sup>. Stereotype threat can also deteriorate performance in groups that are typically advantaged in society when confronted with unfavorable stereotypes. For example, White men underperform on math tests if told that Asians are better at mathematics<sup>12</sup> and perform poorly on sensomotoric tasks,

<sup>4</sup> T. Schmader, A. Croft, *How stereotype stifle performance potential*, „Social and Personality Psychology Compass” 2011, n. 5(10), s. 792–806.

<sup>5</sup> T. Schmader, M. Johns, C. Forbes, *An integrated process...*; T. Schmader & M. Johns, *Converging evidence that stereotype threat reduces working memory capacity*, „Journal of Personality and Social Psychology” 2003, n. 85(3), s. 440–452.

<sup>6</sup> M. Cadinu, A. Maass, A. Rosabianca, & J. Kiesner, *Why do women underperform under stereotype threat? Evidence for the role of negative thinking*, „Psychological Science” 2005, n. 16(7), s. 572–578.

<sup>7</sup> C.M. Steele, C.M., J. Aronson, *Stereotype threat and intellectual test performance of African Americans*, „Journal of Personality and Social Psychology” 1995, n. 69(5), s. 797–811.

<sup>8</sup> J.C. Croizet, T. Claire, *Extending the concept of stereotype threat to social class: The intellectual underperformance of students from low socioeconomic backgrounds*, „Personality and Social Psychology Bulletin” 1998, n. 24, s. 588–594.

<sup>9</sup> J. Aronson, M.J. Lustina, C. Good, K. Keough, K., C.M. Steele, J. Brown, *When white men can't do math: Necessary and sufficient factors in stereotype threat*, „Journal of Experimental Social Psychology” 1999, n. 35(1), s. 29–46.

<sup>10</sup> N.C. Yeung, C. von Hippel, *Stereotype threat increases the likelihood that female drivers in a simulator run over jaywalkers*, „Accident Analysis & Prevention” 2008, n. 40(2), s. 667–674.

<sup>11</sup> B. Levy, *Improving memory in old age through implicit self-stereotyping*, „Journal of Personality and Social Psychology” 1996, n. 71(6), s. 1092–1107.

<sup>12</sup> J. Aronson, M.J. Lustina, C. Good, K. Keough, C.M. Steele, J. Brown, *When white men can't...*

indicative of their athletic ability when reminded of stereotypes suggesting that Black men are better at this task<sup>13</sup>.

Interestingly, the activation of stereotypes can also have a beneficial impact on performance. This might happen when a positive stereotype concerning one's in-group becomes salient, a negative stereotype concerning one's out-group is activated, or a counter-stereotypical message is provided. Shih, Pittinsky & Ambady<sup>14</sup> showed that in accordance with the popular stereotypical belief that Asian people are skilled in mathematics, Asian-American women performed better at such tasks when their ethnic identity was salient. Good, Woodzicka, & Winfield<sup>15</sup> examined the role of stereotypical and counter-stereotypical images in the scientific knowledge test performance of men and women. They found that female students exposed to images counter to the negative stereotype about their in-group can experience stereotype lift, resulting in better performance.

One of the most researched issues in this area is the effect of the stereotype, still vivid and widespread in society, that women are less talented at mathematics and science than men<sup>16</sup>. Stereotype threat induced by these beliefs decreases the mathematical task performance of women and girls in both laboratory and ordinary school settings<sup>17</sup> and may influence educational and vocational choices made by women. Although career choice is determined by many factors, sociocultural context must not be underestimated. A distinct gender gap can be observed in science and engineering occupations in the USA and Western and Central Europe. The proportion of women in engineering in post-communist countries is almost the same as in Western countries: about 25% of employed engineers in Poland are female<sup>18</sup> versus 23% in the USA<sup>19</sup> and about 20% engineering graduates in the EU overall in 2003<sup>20</sup>.

Stereotype threat effects in mathematics are well recognized in adult women (college and university samples), but less research has addressed the presence of this phenomenon in children. Several conditions are required for occurrence of stereotype threat effects. Namely, children should identify with their gender category, be aware of existing gender stereotypes in the specific domain, and should value that domain. Research shows that children become aware of gender category at a very young age, and are able to discriminate accurately between

<sup>13</sup> J. Stone, *Battling doubt by avoiding practice: The effects of stereotype threat on self-handicapping in White athletes*, „Personality and Social Psychology Bulletin” 2002, n. 28(12), s. 1213–1227.

<sup>14</sup> M. Shih, T. Pittinsky & N. Ambady, *Stereotype susceptibility: Identity salience and shift in quantitative performance*, „Psychological Science” 1999, n. 10(1), s. 80–83.

<sup>15</sup> J.J. Good, J.A. Woodzicka, L.C. Wingfield, *The effects of gender stereotypic and counter-stereotypic textbook images on science performance*, „Journal of Social Psychology” 2010, n. 150(2), s. 132–147.

<sup>16</sup> For example: S. Spencer, C.M. Steele, C. M., D.M. Quinn, *Stereotype threat and women's math...*; M. Cadinu, A. Maass, A. Rosabianca, & J. Kiesner, *Why do women...*; P.Huguet, I. Regner, *Stereotype threat among school-girls in quasi-ordinary classroom circumstances*, „Journal of Educational Psychology” 2007, n. 99(3), s. 545–560.

<sup>17</sup> P.Huguet, I. Regner, *Stereotype threat among school-girls...*

<sup>18</sup> General Statistical Office of Poland (GUS), Information 2010.

<sup>19</sup> J.J. Good, J.A. Woodzicka, L.C. Wingfield, *The effects of gender stereotypic...*

<sup>20</sup> P.Huguet, I. Regner, *Stereotype threat among school-girls...*

males and females by two years of age<sup>21</sup>. Lummis & Stevenson's<sup>22</sup> research spanning three cultures (American, Japanese, and Chinese) found that children as young as seven believed that there were differences in mathematics abilities between boys and girls, namely that boys are better at mathematics but girls are better at reading. The authors suggested that the children's beliefs were related to their mothers' biased expectations by attributing different abilities according to gender stereotypes. Ambady et al.<sup>23</sup> demonstrated that five-year-old children were susceptible to the activation of identities (gender or ethnic) associated with stereotypes, resulting in improvement or degradation of performance. Huguet & Regner<sup>24</sup> tested the ecological validity of stereotype threat effects in 10–12 year old schoolgirls. Their research was carried out in circumstances designed as close to ordinary classroom settings as possible. The results confirmed that the impact of stereotype threat also persisted outside of laboratory settings.

However, as Ganley, Leigh, Ryan, Ryan, Vasilyeva, & Perry<sup>25</sup> demonstrated, the results of research on stereotype threat effects in children (from elementary to high school) are inconsistent. They presented a summary of findings from published articles and unpublished dissertations showing that the occurrence of stereotype threat effects largely depended on sampling, activation methods, and mathematics assessment. Across age groups, only 25% out of 36 analyzed studies found significant stereotype threat effects.

## Research questions

The main purpose of our study was to examine how stereotypical and counter-stereotypical messages operate in children in terms of self-esteem levels and cognitive performance. Accordingly, our first research question was whether these messages affect the self-esteem of boys and girls. We assumed that boys and girls at this age have already developed a strong identification with their gender category. Negative information about one's in-group can therefore pose a threat to self-integrity and lower self-esteem. Conversely, positive information about the in-group would lift self-esteem.

We predicted that the stereotypical information that *boys are better than girls at mathematics* would enhance self-esteem in boys and lower self-esteem in girls, while the counter-stereotypical information that *girls are better than boys at mathematics* would lower self-esteem in boys and enhance self-esteem in girls.

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<sup>21</sup> N. Ambady, M. Shih, A. Kim, T.L. Pittinsky, *Stereotype susceptibility in children: Effects of identity activation on quantitative performance*, „Psychological Science” 2001, n. 12(5), s. 385–390.

<sup>22</sup> M. Lummis, H. W. Stevenson, *Gender differences in beliefs and achievement: A cross-cultural study*, „Developmental Psychology” 1990, n. 26(2), s. 254–263.

<sup>23</sup> N. Ambady, M. Shih, A. Kim, T.L. Pittinsky, *Stereotype susceptibility in children...*

<sup>24</sup> P. Huguet, I. Regner, *Stereotype threat among school-girls in quasi-ordinary classroom circumstances*, „Journal of Educational Psychology” 2007, n. 99(3), s. 545–560.

<sup>25</sup> C.M. Ganley, M.A. Leigh, A.M. Ryan, K. Ryan, M. Vasilyeva, M. Perry, *An examination of stereotype threat effects on girls' mathematic performance*, „Developmental Psychology” 2013, n. 49(10), s. 1886–1897.

The second research question concerned the impact of stereotypical and counter-stereotypical messages on the performance of mathematical puzzles. A similar pattern of effects as in the case of self-esteem was predicted: increased performance in boys and decreased performance in girls in the stereotypical condition, and decreased performance in boys and increased performance in girls in the counter-stereotypical condition.

## Method

### Participants

Seventy four elementary school children (37 boys and 37 girls) participated in the study. The children were recruited from two public schools in Warsaw, were attending fourth grade, and had a mean age 10.3 years. No information regarding family socioeconomic status or education was collected. The second author contacted teachers of relevant classes and asked them to inform children and their parents about the study which would be carried out by university researchers in a few days. Children were told that they could help in preparation of textbooks, whereas parents were informed that the aim of the study was to explore some cognitive phenomena present in children of about ten years old. In the study participated only those children who accepted invitation and brought from their parents an written agreement. When experiment was ended up, teachers were asked to organize a parents' meeting to explain to them true aim of the study.

### Materials

**Self-esteem.** A non-verbal task developed by Long, Henderson, & Ziller<sup>26</sup> was used to measure self-esteem. This task involves presenting a vertical array of five circles and asking the participant to indicate the circle that would best represent him/herself. Although Ziller et al.<sup>27</sup> originally proposed a set of circles placed horizontally from left to right, he also suggested a vertical setting to measure the self-esteem of younger children<sup>28</sup>. It is assumed that the position of the chosen circle is associated with the level of self-esteem: higher positions indicate

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<sup>26</sup> B.H. Long & E.M. Henderson, *Self-social concepts of disadvantaged school beginners*, „Journal of Genetic Psychology” 1968, n. 113, s. 41–51; B.H. Long, E.H. Henderson, R.C. Ziller, *Manual for the self-social symbol tasks and the children's self-social constructs tests*. Baltimore, Goucher College, MD 1970; R.C. Wylie, *The Self-Concept*, Vol. I: *A review of methodological considerations and measuring instruments*, University of Nebraska Press, Lincoln & London 1974.

<sup>27</sup> R.C. Ziller, J. Hagey, M.D. Smith, B.H. Long, *Self-esteem: a self-social construct*, „Journal of Consulting and Clinical Psychology” 1969, n. 33(1), s. 84–95.

<sup>28</sup> R.C. Ziller, B.H. Long, *Self-social constructs: Theory and instruments*, 1966 [Unpublished manuscript].

higher self-esteem. The rationale behind this is supported by the work of DeSoto, London, & Handel<sup>29</sup> who found an association between the high-low physical dimension and the “good-bad” semantic dimension. According to Long et al.<sup>30</sup>, test-retest reliability of the vertical form of self-esteem measure was 0.74. Also Long et al.<sup>31</sup> quoted a few studies supporting claim for construct validity of vertical self-esteem measure. The findings<sup>32</sup> suggested that for young children a higher placement of the self on this task reflected both higher status in the community, home, or school and more mature behavior in school.

**Performance.** Although the presented tasks were perceptual ones, they had a face validity of mathematical puzzles. They all involved numbers, digits, computation, and measurement (e.g. time measurement), which are important cues of mathematical skills. They were selected from popular children puzzle books in a pilot study with help of 10 children who assessed tasks as interesting and moderately easy. In this study participants were required to solve 10 tasks presented in the form of a book or read by the experimenter. All instructions were presented orally by the experimenter. Each task had to be solved in a prescribed period of time, and scores could range from 0 (if there was no correct answer in the allotted time) to a maximum 12 depending on the task. There were perceptual tasks (*Mirror* – compare two pictures and count missing details; time – 180 sec.; maximum score – 12; *Chickens* – count chickens that overlap each other; 60 sec.; max. – 12; *Zero* – count the zeros hidden in the picture as parts of some items; 15 sec.; max. – 5; *Birds* – count birds hidden among tree branches and leaves; 120 sec; max. – 8; *Labyrinth* – draw a line through the maze as fast as possible in one or two trials; 120 sec.; max. – 2), memory tasks (*Play* – reproduce as many briefly memorized items as possible; 180 sec; max. – 10; *Fish* – respond to two questions relating to a short story with emphasis on mathematical skills of children; 10 sec.; max. – 2), verbal tasks (*How many a’s?* – count the occurrence of the letter “a” in a short text read by the experimenter; 30 sec; max. – 10; *Sto* – a Polish word for *hundred* – generate as many words as possible starting with “sto”; 120 sec.; max. – 10), and an arithmetic task (*Matches* – solve and illustrate two division tasks correctly using matches; 240 sec; max. – 2).

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<sup>29</sup> C.B. DeSoto, M. London, S. Handel, *Social reasoning and spacial paralogic*, „Journal of Personality and Social Psychology” 1965, n. 2, s. 513–521.

<sup>30</sup> B.H. Long, E. H. Henderson, R.C. Ziller, *Manual for the self-social...*

<sup>31</sup> *Ibidem*.

<sup>32</sup> For example: B.H. Long, E.M. Henderson, *Self-social concepts...*; R.C. Ziller, S.A. Grossman, *A developmental study of the self-social constructs of the normals and the neurotic personality*, „Journal of Clinical Psychology” 1967, n. 1, s. 15–21; Van Arsdell, Roghman, Nader, 1970 – as cited, in: B.H. Long, E. H. Henderson, R.C. Ziller, *Manual for the self-social symbol tasks...*

## Procedure

Children were tested individually in a room provided by their school. They were told that a team of scholars was working on a book with mathematical puzzles for children about their age, and were asked to help prepare the book to make it the most interesting for children. They were randomly assigned to one of three (two experimental or one control) conditions. In the stereotypical condition children were told that *People say that boys are better than girls at mathematics*, in the counter-stereotypical condition that *People say that girls are better than boys at mathematics*, and were provided with no statements in the control condition. Then, they completed the self-esteem task, and performed mathematical puzzles in the following order: *Fish, Matches, Mirror, How many a's?, Sto, Zero, Labirynth, Chickens, Birds, Play*. Upon conclusion the researcher thanked the child for his/her help and – in the experimental conditions – said that *actually, scientists discovered that there was no difference in mathematical skills of boys and girls*.

## Results

Responses to the set of 10 “mathematical” puzzles were converted into z-scores. Reliability analysis for all 10 items suggested that two items (Labyrinth and Birds) be removed. Cronbach’s Alpha for the final 8 items was  $\alpha = .80$ . We computed a Performance Index based on averaged z-scores for these items. Variables descriptives are presented in table 1.

**Table 1.** Means, standard deviations, and correlations for performance and self-esteem

		Mean	SD	Correlations
Girls ( $n=37$ )	Performance	.03	.64	.83
	Self-esteem	3.32	1.23	
Boys ( $n=37$ )	Performance	-.03	.66	.84
	Self-esteem	3.27	1.33	
Total ( $N=74$ )	Performance	.00	.65	.83
	Self-esteem	3.30	1.27	

A 3 (conditions) x 2 (gender) analysis of variance was conducted on self-esteem scores. A significant main effect of condition was found ( $F(2,68) = 3.08$ ,  $p < .05$ ), such that participants showed higher self-esteem in the stereotypical (*ST*) condition than in the counter-stereotypical condition (*C-ST*). An interaction effect for condition and sex was also found ( $F(2,68) = 34.59$ ,  $p < .00$ , eta squared = .50). Boys and girls did not differ significantly in the control condition, but boys showed higher self-esteem in the stereotypical condition ( $p < .00$ ) while girls showed higher self-esteem in the counter-stereotypical condition ( $p < .00$ ).

**Table 2.** Self-esteem means and standard deviations by sex and condition

Conditions	Control M (SD)	ST: Boys are better M (SD)	C-ST: Girls are better M (SD)
Girls	3.25 (.26)	2.58 (.26)	4.08 (.25)
Boys	3.50 (.26)	4.58 (.26)	1.18 (.25)
Total	3.37 (.18)	3.58 (.18)	2.96 (.18)

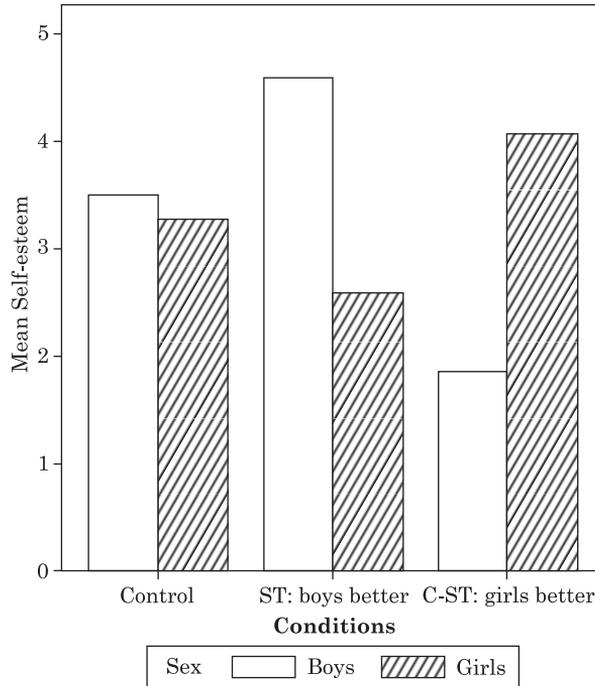


Figure 1. Self-esteem means by sex and condition

Bonferroni corrected post-hoc tests conducted separately for each gender across conditions showed that boys' self-esteem was highest in the stereotypical condition when compared with the counter-stereotypical ( $p < .00$ ) and control ( $p < .00$ ) conditions. Girls' self-esteem was significantly higher in the counter-stereotypical condition as compared to the stereotypical condition ( $p = .005$ ), but there was no difference between the control condition and either stereotypical ( $p = .43$ ) or counter-stereotypical conditions ( $p = .20$ ).

Next, a 3 (conditions)  $\times$  2 (gender) analysis of variance was conducted on performance scores. A significant interaction effect was found for condition and sex ( $F(2,68) = 33.19, p < .00, \eta^2 = .49$ ), but no main effect of condition or sex was found (condition:  $F = 1.63, n.s.$ ; sex:  $F < 1$ ), as presented in Table 3. and Figure 2. The results revealed no significant differences in performance between boys and girls in the control condition, but in experimental conditions

**Table 3.** Performance means and standard deviations by sex and condition

Condition	Control M (SD)	ST: Boys are better M (SD)	C-ST: Girls are better M (SD)
Girls	.08 (.58)	-.44 (.51)	.42 (.56)
Boys	.02 (.41)	.63 (.22)	-.69 (.45)
Total	.05 (.49)	.09 (.67)	-.14 (.75)

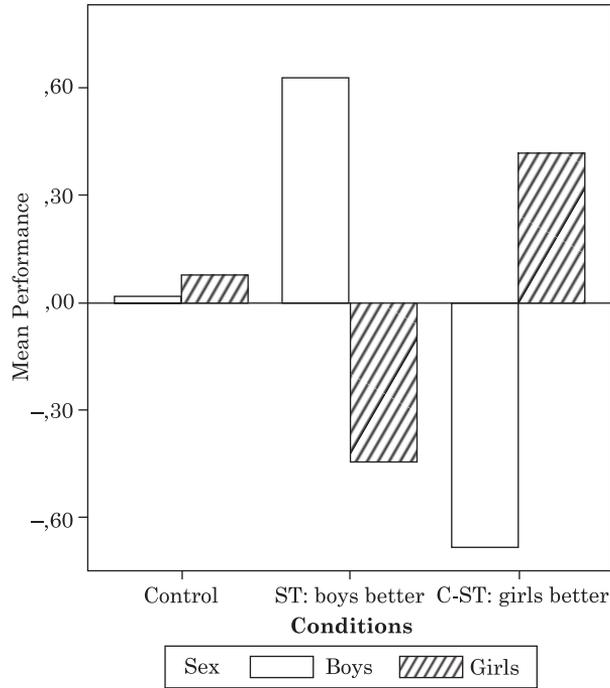


Figure 2. Performance means by sex and condition

the differences between genders remained significant ( $p < .00$ ). Boys outperformed girls in the stereotypical condition ( $p < .00$ ), but girls outperformed boys in the counter-stereotypical condition ( $p < .00$ ).

Further Bonferroni corrected post-hoc tests conducted separately for each gender across conditions showed that boys' performance varied significantly by condition, demonstrating higher scores in the stereotypical condition than in the counter stereotypical condition ( $p < .00$ ) and the control condition ( $p < .00$ ). Girls performed significantly better in the counter-stereotypical condition than in the stereotypical condition ( $p < .002$ ), but there was no significant difference between the counter-stereotypical condition and the control condition ( $p = .22$ ) or between the stereotypical and control condition ( $p = .23$ ).

## Additional analysis

A linear regression analysis was conducted, separately for boys and girls, on performance scores with experimental conditions (the control condition was excluded) and self-esteem as predictors. Both models explained large portions of the variance in performance: 76% in girls and 81% in boys. However, different patterns occurred in regard to the importance of predictors. Performance could be predicted solely by the self-esteem of girls, meaning that the higher self-esteem was the higher the performance, regardless of what kind of messages girls received. In case of boys, self-esteem was not a significant predictor of their performance but of the type of experimental manipulation.

**Table 4.** Results of linear regression analysis of condition and self-esteem on performance

	Predictors	<u>B</u>	<u>SE</u>	<u>Beta</u>	<u>R<sup>2</sup></u>
Girls	Condition	.28	.17	.21	.76
	Self-esteem	.39	.07	.73***	
Boys	Condition	-.78	.35	-.53*	.81
	Self-esteem	.19	.12	.39	

## Discussion

The results of this study confirmed our hypotheses concerning the impact of stereotypical and counter-stereotypical information on children's self-esteem and performance. However, the obtained effects were much stronger for boys than for girls. A stronger effect on boys' self-esteem may be explained by higher gender identification of boys than girls at the age of 10. Although, as Ambady et al. noted<sup>33</sup>, at this stage of personal and social development children are "extremely chauvinistic about their gender identity and feel that their own sex is superior", the case of Polish children may be slightly different. Recent studies suggest that Polish boys are under much stronger pressure to learn a traditional gender role than girls are<sup>34</sup>. In traditional Polish families a boy's upbringing is restricted by rules governing masculine role fulfillment, while expectations for girls allow them to become rather androgenic than strictly feminine, which may weaken their gender identification.

Girls' reaction to manipulation by stereotypical and counter-stereotypical information about mathematical skills showed a tendency to lower or enhance performance in accordance with the model of stereotype threat. Even so,

<sup>33</sup> N. Ambady, M. Shih, A. Kim & T.L. Pittinsky, *Stereotype susceptibility in children...*, s. 389.

<sup>34</sup> A. Nowakowska, *Czynniki warunkujące postawy mężczyzn wobec tradycyjnego modelu ról płciowych w rodzinie. [Determinants of males' attitudes to traditional gender role]*. Unpublished doctoral dissertation, Szkoła Wyższa Psychologii Społecznej, Warszawa 2013; J. Roszak, *Rola czynników podmiotowych i społecznych w kształtowaniu ocen dysydyntek i dysydyntów ról płciowych [Personal and social factors in evaluation of gender roles' dissidents]*. Unpublished doctoral dissertation, Szkoła Wyższa Psychologii Społecznej, Warszawa 2011.

differences between performance scores in both experimental conditions in comparison to the control condition were not significant.

These findings cast doubts on the assumption that girls were under any threat. There are at least three explanations possible. Firstly, their identification with gender category (i.e. gender identity) was not strong enough to compete with personal identity, so girls' behavior was regulated mostly by personal standards (*Girls are bad at math, but I am not*). In this study girls displayed more resistance to stereotype and counter-stereotype manipulation both in terms of self-esteem and performance scores. As the regression analysis shows, performance was highly dependent on girls' self-esteem, which suggests that self-esteem might provide resources to confront negative influences. Boys' self-esteem was unrelated to their performance, and they appeared to be more vulnerable to manipulation by stereotypical and counter-stereotypical information.

Secondly, girls may not have been fully aware of the stereotype in question. Again, we would like focus on specific sociocultural context in this study. Most research concerning stereotype threat in women has been confined to Western countries or cultures, primarily from North America and Western Europe. Poland may be different from Western countries in terms of the education system and sociocultural climate. Firstly, Polish children enter primary school later than children in other European countries (at age seven). Taking into account the scarcity of kindergartens in Poland, children spend most of their time in family homes with members of their extended family or a paid caretaker. Assuming that dissemination of stereotypes operates mostly through public institutions (schools, kindergartens, public media) peer influence, Polish children have fewer opportunities to learn about negative stereotypes attached to mathematic skills in girls. They would become aware of it later in the process of schooling and through participation in popular culture. On the contrary, they can observe in their immediate environment competent, skillful women such as their mothers, grandmothers, and caretakers managing all kind of daily tasks including finances<sup>35</sup>. The third explanation might be that social beliefs that women (and girls) are less talented in mathematics are not as strong as is suggested by the literature. It is a well-known fact that during the communism period Polish women were an important part of labor force (i.e. generation of grand-mothers) and were better educated than Polish men, so perhaps this stereotype is less salient and widespread than in the West.

In conclusion, our study seem to indicate that sociocultural factors might modify the pattern of reaction to stereotype threat in children. It suggests that future research should take into consideration cultural specificity of that how gender stereotypes, general and in a given domain, are learnt and shared by adults and children. Thus cross-cultural research are highly needed.

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<sup>35</sup> E. Trzebińska, *Obecność wymiaru Męskość – Kobiecość w psychoterapii. Jak seksizm ingeruje w proces terapeutyczny? [Masculinity – Femininity dimension in psychotherapy: How sexism interferes with psychotherapeutic process?]*, in: *Męskość – kobiecość w perspektywie indywidualnej i kulturowej? [Masculinity – femininity from individual and cultural perspectives]*, ed. J. Miluska & P. Boski, Warszawa 1999, s. 237–257.

## SUMMARY

The aim of this study was to examine the effects of stereotypical and counter-stereotypical information on the self-esteem and cognitive performance of 10-year-old children. Our sample consisted of 37 girls and 37 boys. Children were presented with 10 “mathematical” puzzles in three experimental conditions: stereotypical (*boys are better*), counter-stereotypical (*girls are better*), and the control condition (no particular information). Self-esteem was measured using a non-verbal task. The results showed a significant interaction effect of “condition x sex” on self-esteem and performance. Girls revealed no significant differences between control and experimental conditions, while boys showed a significant drop in self-esteem and performance in the counter-stereotypical condition as compared to the control condition and a significant lift in self-esteem and performance in the stereotypical condition as compared to the control condition.

**KEY WORDS:** stereotype threat, stereotype lift, schoolchildren, self-esteem