GENDER DIFFERENCES IN THE MOTIVATIONAL AND COGNITIVE COMPONENTS OF INTELLECTUAL HELPLESSNESS IN LANGUAGE AND MATHEMATICS

The aim of the research was to examine the differences between female and male students on intellectual helplessness. Our definition of intellectual helplessness addressed two components: (1) motivational, defined as low engagement, lack of internal motivation, inclination to negative emotions; and (2) cognitive, related to attention deficits and difficulties in learning a new material. The results showed that female higher secondary school students tend to present higher scores on the general intellectual helplessness scale as well as on its cognitive component in mathematics. However, there were no gender differences in the motivational component. Interestingly, in a lower secondary schools, there were no gender differences on both subscales. Moreover, the results obtained during Polish language lessons in higher secondary schools showed a higher level of general intellectual helplessness among male students compared to female students. However, the results showed the opposite tendency in a lower secondary school, where students obtained higher scores on the cognitive subscale of intellectual helplessness compared to the motivational one. Results are discussed in terms of gender identity and stereotype threat.

Keywords: intellectual helplessness, gender, mathematical achievement, language achievement

The research into intellectual helplessness is an applied field of studies rooted in the informational model of intellectual helplessness proposed by Sedek and Kofta (Kofta & Sedek, 1989; Sedek & Kofta, 1990). Contrary to the original theory of learned helplessness (Seligman, 1972; Maier & Seligman, 2016), the informational model rests on the assumption that the state of helplessness arises due to an ineffective cognitive effort. As a result, one enters the state of cognitive exhaustion which can be characterized by three types of symptoms: (1) cognitive, visible in the reduction of attention span and working memory, (2) motivational, visible in the decrease of intrinsic motivation and engagement in task-solving, (3) emotional, visible in the rise of negative emotions and a decrease of positive emotions.

Although experimental studies by Sedek and Kofta (Kofta & Sedek, 1989; Sedek & Kofta, 1990) brought much to the research on the conditions necessary and sufficient for intellectual helplessness to appear, it is Sedek’s (1995) applied research into factors leading to intellectual helplessness that seems to be much more interesting for psychological practice. His studies,
conducted in school setting, pointed to the importance of the way the classes are conducted by a teacher, for instance whether a teacher emphasizes the need to understand the material during a class instead of concentrating on memorising. Additionally, the studies pointed to such elements as effective and bilateral communication between the teacher and the student, encouragement of active participation, proper visualization of the material, possibility to ask questions during the classes. The style of teaching promoting material comprehension turned out to be a strong factor decreasing the level of intellectual helplessness both in science subjects such as mathematics or physics as well as humanities like Polish language classes (Sedek, 1995). What is important, longitudinal studies (Sedek & McIntosh, 1998) showed that the level of intellectual helplessness is a good predictor of school achievement, measured both with school grades as well as standardized test results.

Although Sedek’s (1995) intention was to show the universality of intellectual helplessness across various subjects, the results of mediational analyses pointed to certain differences with regard to subjects such as science (e.g. mathematics and physics) and humanities (e.g. Polish language). This asymmetry raised additional questions concerning the moderators (e.g. gender) and mediators of intellectual helplessness (e.g. social processes leading to the activation of intellectual helplessness in various school subjects). The importance of research on these subjects is further justified by a limited number of studies on the role of social factors, such as psychological gender, for learned helplessness (Baucom & Danker-Brown, 1984; Dweck, Davidson, Nelson & Enna, 1978). One of few studies (Baucom & Danker-Brown, 1984) in this area showed that a higher level cognitive and motivational symptoms of intellectual helplessness was displayed by girls with a lower level of masculinity who had problems with solving tasks that were presented as typically masculine. Based on these results, it can be assumed that social factors such as gender roles have important implications for the appearance of intellectual helplessness when analyzed together with the “masculinity” of tasks (Baucom & Danker-Brown, 1979). Hence, the study points to the importance of such variable as the type of subject – perceived as stereotypically masculine sciences and feminine humanities – in the analysis of intellectual helplessness.

Using the above quoted studies as a stepping stone for new hypotheses, it can be suggested that in such subjects as mathematics and Polish language which were analyzed by Sedek, stereotypical beliefs about the performance of two genders in that particular domains, may be of crucial importance. It is commonly believed that boys and men fare better in mathematics, whereas humanities are the field of expertise of girls and women (Garbula, 2009; Nosek, Banaji & Greenwald, 2002). Such assumptions are not without an influence on attitudes and behavior manifested by teachers as well as attitudes and performance of students. In the case of teachers, attitudes can to a large extent modify their teaching methods depending on whether they address boys or girls. Such an effect, based on the self-fulfilling prophecy phenomenon, has been well described in psychological literature (Jusim, Eccles & Madon, 1999; Babiuch, 1994). Additionally, studies on stereotype threat show that the activation of a negative stereotype during classes may modify performance in a given subject in both genders (Owens & Massey, 2011; Bedyńska & Rycielski, 2016). Other research shows that stereotypes may negatively influence an interest in the subject (Davies, Spencer, Quinn & Gerhardstein, 2002), domain identification (Woodcock, Hernandez, Estrada & Schultz, 2012) as well as one’s self-evaluation in a particular domain (Cadinu, Maass, Rosabianca & Kiesner, 2005).
The mechanisms can appear simultaneously or synergically and modify the level of intellectual helplessness in both genders.

The research on stereotype threat shows that in the case of solving mathematical tasks by girls and language tasks by boys, the cognitive activation of stereotype leads to negative thoughts about oneself and one’s group which in turn result in the difficulties in processing of complex information (for review see Schmader, Johns & Forbes, 2008). Based on these findings, we believe that it is important to differentiate two types of symptoms measured by the Intellectual Helplessness Scale (Sedek, 1995): a motivational and cognitive one. The cognitive component of intellectual helplessness can be characterized by such symptoms as a feeling of an “empty head”, understanding deficits, difficulties in information processing and problems with attention focus. The motivational component is manifested by apathy, listlessness and the lack of intrinsic motivation. Such a differentiation, *implicite* suggested by the author (Sedek, 1995, p. 30), has not been empirically tested and it seems that it could bring new information to the knowledge on mechanisms leading to intellectual helplessness.

Based on theoretical premises and empirical evidence described above, we took the Intellectual Helplessness Scale (Sędek, 1995, Sędek & McIntosh, 1998) and differentiated its items using inter-rater agreement method into statements measuring cognitive and motivational components of the construct. Although previous studies showed that the scale is unidimensional, it is worth investigating whether the differentiation into these two factors, postulated in theoretical assumptions of intellectual helplessness, leads to interesting results for two genders with regard to mathematics and language classes. Based on these premises, we conducted analyses which aimed at showing gender differences in two components of intellectual helplessness investigated separately for two subjects: in Polish language and mathematics in lower and higher secondary schools.

**METHOD**

**Participants**

Five hundred eighty six students from ten higher secondary schools from various regions in Poland took part in the study (324 girls and 262 boys). Additionally, 531 students from ten lower secondary schools across Poland were investigated (272 girls and 259 boys). Students’ age ranged from 12 to 19 years ($M = 15.25$; $SD = 1.79$). Only one person did not answer the question about the age (0.2% of the sample).

**Materials**

The Intellectual Helplessness Scale (IHS; Sędek, 1995) comprised of 20 questions pertaining to one’s feelings and attitudes about two subjects: mathematics and Polish language. The answers were given on a 5-point scale ranging from 1 – “never” to 5 “always”. The reliability of the entire scale, measured with internal validity, was satisfactory with Cronbach’s $\alpha = 0.93$ for Polish classes in lower secondary schools, $\alpha = 0.95$ for mathematics in lower secondary schools, $\alpha = 0.96$ for Polish classes in higher secondary schools and $\alpha = 0.93$ for mathematics in higher secondary schools. The overall score for intellectual helplessness was measured separately for two subjects and was the sum of 20 answers to IHS’s items, taking values between 20 to 100 points (Sędek, 1995).

Based on the decisions of independent raters, IHS’s items were divided into two subscales that measured motivational and cognitive components of intellectual helplessness. The motivational component described the lack of energy and motivation on classes in particular subjects, e.g. “I feel sleepy during mathematics classes”, whereas the cognitive...
component was characterized by the ability to focus attention and learn new material during the classes, e.g. “I understand very well the teacher, when he/ she teaches new material in mathematics”. The inter-rater agreement was measured with Kendall’s $W$; the results showed that the judges were very consistent in their decisions pertaining to two subscales. Kendall’s $W$ equaled 0.875 and was statistically significant, $\chi^2(19) = 6650; p < 0.001$. The Confirmatory Factor Analysis using Structural Equation Modelling with class membership as a cluster variable showed that a two-factorial structure fits the data as well as the one-factor solutions (Bedyńska & Zabłocka, in preparation). Each scale consisted of ten items, thus the indices calculated by summing all items ranged from 10 to 50 points. The reliability of two subscales was evaluated based on internal validity assessed with Cronbach’s $\alpha$. The results were satisfactory (see Table 2).

**Procedure**

The invitation to take part in the study was sent to schools participating in “Innovative Programme for Teaching Mathematics in Lower Secondary Schools”\(^1\) and “Innovative Programme for Teaching Mathematics in Higher Secondary Schools”\(^2\) projects, financed by “Human Capital” Operational Programme conducted in years 2012-2015. Schools volunteered to participate in the study. For the study, we selected schools that had an average level of school achievements, measured with lower-secondary school leaving exams and Matura exams in mathematics. An additional criterion was school engagement in other educational-social activities (the participation in various research projects, organization of events in schools and presence of student clubs). Furthermore, schools which took part in the research were obliged to implement an innovative programme for teaching mathematics using GeoGebra free-ware during the course of an entire school year as well as agree to participate in the evaluation of project effectiveness and psychological tests conducted on students who participated in the study. Prior to the conduction of the study, we obtained consents from the headmasters of each of the schools, parents and students. The examination took place during a form period, with a teacher present in the classroom. The teachers were instructed not to pass through the room in order to provide comfortable conditions for students answering the forms. Students and parents were assured that the results would remain anonymous.

The described study was a part of a more extensive research project which comprised of two parts. In the first one-hour-long part, students were answering a series of questionnaires concerning their global self-esteem, self-esteem in mathematics and language, attitudes towards gender stereotypes, social approval, teacher behavior on classes in mathematics and Polish language as well as socio-demographic information such as age, gender, school class, parental education. In this section, students also answered items from the Intellectual Helplessness Scale for Polish and mathematics. In the second part of the study (also one-hour long), students took tests that measured crystallized intelligence: lower-secondary-school students answered APIS-P Inventory (Ciechanowicz, Jaworowska, Matczak & Szustrowa, 2005), whereas students from higher secondary school took APIS-Z version (Matczak, Jaworowska, Ciechanowicz & Stańczak 2000).

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\(^2\) The research leading to these results has received funding from European Social Funds under grant agreement no UDA-POKL.03.03.04-00-062/12-00
RESULTS

Descriptive statistics
As presented in Table 1, the level of general intellectual helplessness in mathematics and language measured at both levels of schools was close to the middle point of the scale. Skewness and kurtosis values also show that distributions of the components of intellectual helplessness were close to the normal distribution. Therefore, all analyses were conducted using parametric tests, namely the analysis of variance.

Descriptive statistics calculated separately for proposed components of intellectual helplessness presented in Table 2 show that the level of motivational and cognitive symptoms is also close to the middle point. The lowest mean was observed for the motivational component of intellectual helplessness in mathematics for lower-secondary-school students \((M = 23.04, SD = 7.87)\), while the highest level was obtained for motivational component in language for higher-secondary-school students \((M = 28.43, SD = 10.27)\). Similarly to general intellectual helplessness, skewness and kurtosis were close to zero and showed that empirical distributions of the variables were close to the normal distribution.

The inspection of Pearson’s \(r\) coefficients presented in Table 3 showed that the correlation between cognitive an motivational components is strong at both levels of school. In the sample of lower secondary school students, relations

<table>
<thead>
<tr>
<th>School level</th>
<th>Subject</th>
<th>Component</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher secondary school</td>
<td>Mathematics</td>
<td>motivational</td>
<td>23.04</td>
<td>7.87</td>
<td>0.61</td>
<td>-0.11</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cognitive</td>
<td>23.77</td>
<td>6.84</td>
<td>0.37</td>
<td>-0.37</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Language</td>
<td>motivational</td>
<td>28.43</td>
<td>10.27</td>
<td>0.29</td>
<td>-0.71</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cognitive</td>
<td>26.76</td>
<td>8.18</td>
<td>0.22</td>
<td>-0.45</td>
<td>0.89</td>
</tr>
<tr>
<td>Lower secondary school</td>
<td>Mathematics</td>
<td>motivational</td>
<td>25.32</td>
<td>8.52</td>
<td>0.28</td>
<td>-0.37</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cognitive</td>
<td>25.67</td>
<td>7.18</td>
<td>-0.14</td>
<td>-0.18</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Language</td>
<td>motivational</td>
<td>24.25</td>
<td>8.35</td>
<td>0.37</td>
<td>-0.23</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cognitive</td>
<td>24.86</td>
<td>7.05</td>
<td>-0.19</td>
<td>-0.03</td>
<td>0.84</td>
</tr>
</tbody>
</table>
between both components were strong both in language $r = 0.71; p < 0.001$ and mathematics $r = 0.72; p < 0.001$. Similarly strong associations were obtained in the sample of higher secondary school students: in mathematics $r = 0.73; p < 0.001$ and in language $r = 0.83; p < 0.001$. Importantly, the correlations in the level of intellectual helplessness between language and mathematics were much weaker. The latter confirms Sedek's (1995) suggestion that intellectual helplessness is context-embedded and intellectual helplessness in mathematics might be uncorrelated with intellectual helplessness in Polish language.

### Table 3. Pearson's r correlation coefficients between motivational and cognitive symptoms subscales of Intellectual Helplessness Scale (IHS) in mathematics and Polish language for lower secondary school and higher secondary school.

<table>
<thead>
<tr>
<th>School level</th>
<th>Component</th>
<th>Cognitive in Mathematics</th>
<th>Cognitive in Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher secondary school</td>
<td>Motivational in Mathematics</td>
<td>0.732**</td>
<td>0.145**</td>
</tr>
<tr>
<td></td>
<td>Motivational in Polish Language</td>
<td>–0.200**</td>
<td>0.825**</td>
</tr>
<tr>
<td>Lower secondary school</td>
<td>Motivational in Mathematics</td>
<td>0.720**</td>
<td>0.279**</td>
</tr>
<tr>
<td></td>
<td>Motivational in Polish Language</td>
<td>0.297**</td>
<td>0.705**</td>
</tr>
</tbody>
</table>

* $p < 0.001$

### Differences in intellectual helplessness between girls and boys from high school in mathematics lessons

There was a significant interaction of gender and the type of helplessness component in a sample of higher secondary school students $F(1, 582) = 11.259, p = 0.001, \eta^2_p = 0.019$. Gender differences were not present in the motivational component $t(582) = 1.24, p = 0.213$, but appeared in the cognitive component $t(582) = 4.148, p < 0.001$. Girls had a significantly higher level of cognitive symptoms of intellectual helplessness ($M = 24.81, SD = 6.68$) than boys ($M = 22.48, SD = 6.84$). Additionally, only girls displayed a difference between the level of both components of intellectual helplessness $t(323) = 4.995, p < 0.001$. Girls had a higher level of cognitive symptoms ($M = 24.81, SD = 6.68$) than motivational symptoms ($M = 23.40, SD = 7.69$). Means are presented in Figure 1. There were no such differences in boys $t(29) = 0.307, p = 0.759$. Apart from gender and the type of component interaction, there were also both main effects: of gender $F(1, 582) = 7.703, p = 0.006, \eta^2_p = 0.013$ and the type of component $F(1, 582) = 8.189, p = 0.004, \eta^2_p = 0.014$. 

### Testing research questions

To answer research questions a two-factor mixed design analysis of variance was conducted. To compare the levels of motivational and cognitive components in gender groups, gender was entered as a between-subject variable and the type of helplessness as a within-factor into the analysis of variance. Therefore, four analyses of variance in mixed design 2 (gender: girls vs boys) by 2 (helplessness component: motivational vs cognitive) were conducted, separately for the samples of lower and higher secondary school students.
Differences in intellectual helplessness between girls and boys from lower secondary school in mathematics

There were no differences between the motivational and cognitive components in mathematics $F(1, 513) = 1.762, p = 0.185, \eta_p^2 = 0.003$ as well as no gender differences $F(1, 513) = 0.593, p = 0.441, \eta_p^2 = 0.001$ present in the sample of students from lower secondary schools. There was also no significant interaction of both factors $F(1, 513) = 1.971, p = 0.161, \eta_p^2 = 0.004$.

Differences in intellectual helplessness between girls and boys from higher secondary school in Polish language

Students of higher secondary schools had a significantly higher level of motivational symptoms of intellectual helplessness ($M = 28.43, SD = 10.27$) than cognitive symptoms ($M = 26.76, SD = 8.18$) in the language lessons $F(1, 582) = 50.772, p < 0.001, \eta_p^2 = 0.08$. Boys had also a higher level of global score in intellectual helplessness ($M = 29.19, SD = 9.18$) than girls ($M = 26.31, SD = 8.29$) and this effect was significant but rather weak $F(1, 582) = 15.796, p < 0.001; \eta_p^2 = 0.026$. There was no significant gender effect in the level of both components $F(1, 582) = 3.507, p = 0.062, \eta_p^2 = 0.006$.

Differences in intellectual helplessness between girls and boys from lower secondary schools in Polish language

Generally, students form lower secondary schools obtained higher levels of cognitive symptoms ($M = 24.86, SD = 7.05$) in comparison to motivational ones ($M = 24.24, SD = 8.35$) in Polish language $F(1, 507) = 8.681, p = 0.003, \eta^2 = 0.017$. The main effect of gender was not significant $F(1, 507) = 0.004, p = 0.951, \eta_p^2 = 0.001$ similarly to the interaction of type of component and gender $F(1, 507) = 1.338, p = 0.248, \eta_p^2 = 0.003$. 

Figure 1. Level of motivational and cognitive component of intellectual helplessness in mathematics and Polish language for boys and girls in higher secondary schools.
DISCUSSION

The conducted analyses aimed at showing gender differences in two components, motivational and cognitive, of intellectual helplessness in mathematics and Polish language. The research was conducted in two types of schools: in lower and higher secondary schools. Previous studies on learned helplessness (Baucom & Danker-Brown, 1984) pointed to a significant influence of gender and gender orientation on motivational and cognitive deficits; however, no effect on emotional deficits was observed. Polish studies conducted in higher secondary schools found also an interesting mediating mechanism between intellectual helplessness and school performance in science and humanities (Sedek, 1995). However, it seems unclear whether there is a relationship between intellectual helplessness and gender. Research that has been so far conducted (Sedek, 1995) analyzed intellectual helplessness as a uniform construct and did not differentiate its two components (i.e. cognitive and motivational one), which in our opinion, could bring new insight into the matter.

Based on the body of research on gender stereotypes in school setting and stereotype threat (Bedyńska & Rycielski, 2016; Bedyńska, 2013), it was assumed that there might be gender differences in particular components of intellectual helplessness for girls in mathematics and for boys in Polish language. The findings pointed to a much more complex relationship. Firstly, gender differences were present only in higher secondary schools and not at the lower level. Female participants in higher secondary schools displayed a higher level of intellectual helplessness in mathematics in the cognitive component which suggests that they experienced more cognitive symptoms of helplessness such as the feeling of an “empty head” or problems in information processing. Gender differences did not manifest themselves in the motivational component, which means that girls do not display greater difficulties in getting down to study or lacking interest in the subject. In Polish language classes, boys obtained higher results on a global scale of intellectual helplessness; however, no differentiation into specific components was noticed. Male participants displayed a similar level of both cognitive and motivational symptoms. In light of the findings, it is important to further investigate the mechanism which leads to high cognitive symptoms with simultaneous low motivational deficits. It remains unclear what keeps motivation on a high level despite a decrease in cognitive resources resulting from helplessness training at school.

Secondly, intriguing is the fact that gender differences are present only among older students – in higher secondary schools – but not among the younger population. It remains unknown whether this difference results from characteristics of two types of schools (higher teaching competences of teachers and better relations with students in lower secondary schools compared to higher secondary schools, PISA 2012 in: Przewłocka, 2015) or developmental processes in students who start to shape their gender identity in lower secondary students (Bussey, 2011; Bem 2000).

Summing up, it should be noted that the present study opens new pathways for interesting research into causes and consequences of intellectual helplessness in school setting which fits the context of social psychology and stereotype mechanisms from both the perspective of an observer (student stereotyping by a teacher and gender stereotypes transmission) and an actor (stereotype threat experienced by a student in a particular subject). It seems also worth to investigate developmental processes of gender identity or, more general, group identity.
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RÓŻNICE PŁCIOWE W BEZRADNOŚCI INTELEKTUALNEJ NA MATEMATYCE I JĘZYKU POLSKIM – KOMPONENT MOTYWACYJNY I POZNAWczy

STRESZCZENIE

Celem prowadzonych analiz była próba odpowiedzi na pytania dotyczące różnic płciowych w zakresie dwóch komponentów bezradności intelektualnej na lekcjach języka polskiego i matematyki – komponentu motywacyjnego i komponentu poznawczego. Komponent motywacyjny to brak zaangażowania i motywacji wewnętrznej jak również pojawienie się negatywnych emocji. Komponentem poznawczym natomiast jest zakłócenie uwagi oraz trudność w zapamiętywaniu nowego materiału. W badaniu kwestionariuszowym wzięło udział 586 uczniów liceów ogólnokształcących i 531 uczniów gimnazjów, którzy między innymi wypełniali Skalę Bezradności Intelektualnej, mierzącą objawy bezradności na języku polskim i matematyce. Wyniki analiz pokazały, że na lekcjach matematyki w liceum dziewczęta deklarowały wyższy niż chłopcy poziom bezradności intelektualnej w komponentie poznawczym. Wśród licealistów różnice płciowe nie ujawniły się w komponentie motywacyjnym z matematyki. W tej grupie nie było także różnic płciowych w zakresie komponentów motywacyjnych i poznawczych z języka polskiego. W gimnazjum nie zaobserwowano różnic płciowych w zakresie komponentów bezradności intelektualnej ani z matematyki, ani z języka polskiego. Uzyskane wyniki są porównywane z wcześniejszymi badaniami nad bezradnością intelektualną oraz są odnoszone do zjawiska zagrożenia stereotypem.

Słowa kluczowe: bezradność intelektualna, płeć, matematyka, język polski