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Effect of learning disabilities on academic self-concept in children with epilepsy and on their quality of life

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ABSTRACT

Academic self-concept could significantly affect academic achievement and self-confidence in children with epilepsy. However, limited attention has been devoted to determining factors influencing academic self-concept of children with epilepsy. We aimed to analyze potentially significant variables (gender, frequency of seizures, duration of epilepsy, intellectual disability, learning disability and attention deficit hyperactivity disorder) in relation to academic self-concept in children with epilepsy and to additional domains of their quality of life. The study group consisted of 182 children and adolescents aged 9–14 years who completed the SPAS (Student's Perception of Ability Scale) questionnaire determining their academic self-concept and the modified Czech version of the CHEQOL-25 (Health-Related Quality of Life Measure for Children with Epilepsy) questionnaire evaluating their health-related quality of life. Using regression analysis, we identified learning disability as a key predictor for academic-self concept of children with epilepsy. While children with epilepsy and with no learning disability exhibited results comparable to children without epilepsy, participants with epilepsy and some learning disability scored significantly lower in almost all domains of academic self-concept. We moreover found that children with epilepsy and learning disability have significantly lower quality of life in intrapersonal and interpersonal domains. In contrast to children with epilepsy and with no learning disability, these participants have practically no correlation between their quality of life and academic self-concept. Our findings suggest that considerable attention should be paid to children having both epilepsy and learning disability. It should comprise services of specialized counselors and teaching assistants with an appropriate knowledge of epilepsy and ability to empathize with these children as well as educational interventions focused on their teachers and classmates.

1. Introduction

Epilepsy significantly influences lives of affected children (Sadeghi, Fayed, & Ronen, 2014). Considerable attention has been given to various behavioral consequences of epilepsy (McDermott, Mani, & Krishnawaswani, 1995) and their effect on

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quality of life (Hrabok, Sherman, Bello-Espinosa, & Hader, 2013). The school environment, in which they spend a significant amount of time, and where socialization takes place, plays an important role in lives of children and adolescents with epilepsy (CWE). For this reason, a number of studies (Bannon, Wildig, & Jones, 1992; Bohac & Wodrich, 2013) have focused on how CWE function in a school environment. Attention has been devoted also to knowledge of epilepsy among teachers and their attitudes toward people with epilepsy (Mecarelli et al., 2011).

Recent studies have focused on comorbidity of epilepsy (Asato, Caplan, & Herman, 2014). From the perspective of academic achievement, the effect of epilepsy on cognitive function (Memisevic & Sinanovic, 2009), prevalence of learning disabilities (LD) and attention deficit hyperactivity disorder (ADHD) is especially important. The prevalence of ADHD in children with epilepsy is many times higher than in the total population, reaching a value between 14% (Hesdorffer et al., 2004) and 38% (Dunn, Austin, Harezlak, & Ambrosius, 2003) depending on the diagnostic criterion used. The relationship between epilepsy and ADHD has been studied systematically in surveys (Reilly, 2011). ADHD has also been identified as one of the essential comorbidities influencing academic performance of CWE. Hermann et al. (2008) evaluated cognitive development in children with recent onset of seizures and found that children without comorbidity were similar to controls at baseline and 2-year follow up, whereas those with epilepsy and ADHD exhibited significantly lower scores. A high prevalence of LD such as dyslexia (13–32%), dysgraphia (35–56%) or dyscalculia (20–38%) in the group of CWE represents another important factor (Fastenau, Shen, Dumm, & Austin, 2008).

It is known that epilepsy in children influences their academic achievement, both in terms of their academic self-concept (Austin, Huberty, Huster, & Dunn, 1998) and ability to fulfill societal norms (Feeman & Hagen, 1990). These two aspects of academic achievement are related but distinct. Children who achieved very good results in their ability to fulfill societal norms but their academic self-concept was very low have been reported (Boersma & Chapman, 1979). Attention has also been paid to the objective measuring of academic achievement using standardized tests. Reilly and Neville (2011) summarized findings related to this topic and concluded that CWE obtain on average lower scores in the area of academic achievement than the total population. However, it is unclear whether this could be explained by a greater number of CWE with an associated intellectual disability and/or LD, or whether CWE achieve the same low scores in the area of academic achievement even if they have normal cognitive functions and no LD. Some studies (Oostrom, Smeets-Schouten, Kruitwagen, Peters, & Jennekens-Schinkel, 2003) show that significant differences remain even when effects of cognitive function and LD are taken into consideration. However, others (Williams et al., 1996, 2001) reported comparable academic achievement in the areas of reading, mathematics and grammar between CWE without LD or mental deficits and their peers.

Not enough attention has been devoted to academic self-concept in children with epilepsy (Austin et al., 1998; Huberty, Austin, Huster, & Dunn, 2000) as well as different factors influencing their academic self-concept. Following up on our recent paper (Brabcová, Kršek, Kohout, Jošt, & Zárubová, 2015), the main aims of the current study were (1) to determine effects of various factors on academic self-concept in children with epilepsy, (2) having identified LD as the most significant factor in our analysis, to compare academic self-concept in children with epilepsy combined with a learning disability (hereafter denoted CWE + LD) and children with epilepsy but without a learning disability (hereafter denoted CWE − LD), and (3) to analyze possible correlations between academic self-concept and quality of life in both groups of CWE.

2. Methodology

2.1. Instruments

2.1.1. SPAS questionnaire

Academic self-concept was determined using SPAS (Student's Perception of Ability Scale), which was first introduced by Boersma and Chapman (1979). The Czech version of the questionnaire contains a total of 48 dichotomous questions which are divided into 6 scales of 8 questions. Each scale measures academic self-concept in the following areas:

1. General school-related abilities
2. Mathematics
3. Reading
4. Spelling
5. Writing
6. Confidence.

The Czech version of SPAS was validated by Matějček and Vágnerová (1992). It was found that the Czech version had very good psychometric properties. The results for the individual scales, as well as for the total score, were converted to sten scores using tables in the questionnaire manual (Matějček & Vágnerová, 1992). It is recommended to use sten scores in presentation of the results obtained using SPAS because unconverted rough scores may be confusing if the experiment group differs in age and gender from the group on which the standardization study was carried out. The questionnaire is suitable for children aged 9–14 years.

2.1.2. CHEQOL-25 questionnaire

Quality of life was assessed using a modified Czech version of the CHEQOL-25 (Health-Related Quality of Life Measure for Children with Epilepsy) questionnaire created by Ronen, Streiner, and Rosenbaum (2003). The psychometric properties of the modified Czech version were determined in an adaptational study (Brabcová, Kršek, Kohout, & Zárubová, 2014) and are fully satisfactory. The questionnaire consists of a total of 23 questions, with answers on a 4-point scale (1–4 points). Factor analysis revealed the following areas in which the questionnaire measured the quality of life of children with epilepsy:

1. Interpersonal/Social Consequences (5 items);
2. Worries and Concerns (4 items);
3. Intrapersonal/Emotional Issues (4 items);
4. Disclosure and Normality (10 items).

The results are given using the gross scores on each scale, which are in the range of 5–20 points (Scale 1), 4–16 points (Scales 2 and 3) and 10–40 points (Scale 4).

2.2. Procedure and participants

The study was conducted in selected pediatric neurology departments in the Czech Republic from 2010 to 2012. We obtained consent from parents of all children included in the study. The procedure has previously been described in more detail in our previous paper (Brabcová et al., 2015).

The basic characteristics of the sample are shown in Table 1. Children aged 9–14 years with definite diagnosis of epilepsy with either generalized or focal seizures regardless etiology of the condition who have IQ level corresponding to mild intellectual disability (IQ around 70) or higher (according to Diagnostic and Statistical Manual of Mental Disorders-IV; DSM-IV; APA, 2000) were included in the study. Actual seizure frequency was not a limitation for inclusion. All children were treated with one or more antiepileptic drugs. We excluded participants with significant psychiatric comorbidity and psychiatric medication. 35% of participants were diagnosed with LD. All patients with learning disabilities were carefully diagnosed by an experienced counseling psychologist and their diagnosis was based on IQ-achievement discrepancy criterion (Fastenau et al., 2008). In the Czech Republic, discrepancy cut-off for the IQ-achievement discrepancy criterion is in most cases set at 1.5 SD. The final diagnosis is based on the DSM-IV and is made by a counseling psychologist in accordance with recommendations of International Dyslexia Association (Keogh, Major, Omori, & Reid, 1982; Zelinková, 2003). The proportion of ADHD in our epileptic population was 27%. Again, all patients with ADHD were carefully diagnosed by an experienced psychologist and the diagnosis was based on the DSM-IV. 19% of participants had both a learning disability and ADHD.

The sample of respondents was characterized in terms of seizure type and frequency. Participants with daily or weekly seizures were regarded as having a high seizure frequency. The classification of seizures was reported previously (Brabcová

Table 1
Basic characteristics of participants ($n = 182$).

Characteristic	
Age	11.8 ± 1.7 years[a] (range 9–14 years)
Gender	
Male	84 (46.2%)
Female	98 (53.8%)
Duration of epilepsy	5.3 ± 3.3 years[a] (range 0–14 years)
Age at seizure onset	6.1 ± 3.5 years[a] (range 0–14 years)
Frequency of seizures	
High (weekly and more often)	37 (20.2%)
Low (less than weekly)	145 (79.8%)
Mild intellectual disability	
Yes	32 (17.6%)
No	150 (82.4%)
ADHD (Attention Deficit Hyperactivity Disorder)	
Yes	49 (26.9%)
No	133 (73.1%)
Learning disability	
Yes	64 (35.2%)
No	118 (64.8%)
Learning disability[b]	
Reading disorder	51 (81.0%)
Writing disorder	48 (75.0%)
Math disability	24 (37.5%)

[a] Mean ± standard deviation.
[b] 39 individuals had more than 1 type of learning disability.

et al., 2015). No control group was involved in the study and results of our study group obtained in SPAS were compared with test scores given for the normative sample of Czech children aged 9–14 years (Matějček & Vágnerová, 1992).

2.3. Statistical analysis

In processing the acquired data, we used Microsoft Excel 2003 with the add-on accessory XLSTAT. In addition to the classic descriptive statistics, we used the two-sample Student's *t*-test of mean values and multilinear regression analysis with significance tests of the individual regression coefficients. Before the construction of the regression models, we carried out correlation analysis with the aim to identify independent variables which should be included in these models. As correlation coefficients between independent variables and scores on individual scales of SPAS were very similar to those of the total score, we did not present correlation coefficients for individual scales. Nevertheless the conclusions presented in Section 3.1 and based on the given correlations between independent variables and the total score are fully valid also for the individual scales. With the exception of the duration of epilepsy, which is a continuous variable, all independent variables (i.e. gender, frequency of seizures, intellectual disability, LD and ADHD) are dichotomous, with the number of respondents in each category shown in Table 1. The scores on individual scales of SPAS can be taken as continuous variables. To determine correlation between two dichotomous variables, we used the Phi correlation coefficient. To determine correlation between a dichotomous and a continuous variable, we used the point-biserial correlation coefficient and to determine correlation between two continuous variables we used the Pearson's correlation coefficient. The correlation coefficients were normalized so that their maximum value was equal to 1 (Albatineh, Niewiadomska-Bugaj, & Mihalko, 2006). We used also the chi-squared test to determine possible differences in distribution function between our data and the data valid for the normative sample. The results of all statistical tests are given with the *p*-values of the tests. A test *p*-value of less than 0.05 was considered statistically significant with the exception of the significance tests of the regression coefficients where test *p*-value of less than 0.01 was considered statistically significant.

3. Results

This section is arranged as follows: in Section 3.1 we present regression models analyzing effects of various factors on academic self-concept in CWE. Since these models showed learning disabilities to be the most significant factor here, we then focused on comparing academic self-concept in CWE + LD and CWE − LD in Section 3.2. Finally, in Section 3.3 we compare the quality of life in CWE + LD, and in CWE − LD, and determine how quality of life is related to academic self-concept in both groups.

3.1. Factors influencing academic self-concept in children with epilepsy: Regression models

Table 2 shows mutual correlation between independent variables, and also correlation between the total SPAS score and independent variables. It was clear that correlations between the total SPAS score and the variables gender, frequency and ADHD were very close to 0, which indicated no significant dependence. Thus these variables were excluded from the regression models. In contrast, relatively high (>0.3) and statistically significant correlations were found between the total SPAS score and mild intellectual disability and LD diagnosis. Therefore it was appropriate to incorporate them as independent variables in the regression models and determine exactly how they affected academic self-concept in CWE. For the variable duration of epilepsy, the absolute value of the correlation coefficient was relatively small (0.124) but we decided to include this independent variable in the regression models and to explore its influence on academic self-concept in CWE in more detail.

Based on the abovementioned facts, we created 7 multilinear regression models taking the duration of epilepsy, mild intellectual disability and diagnosed LD as independent variables, and academic self-concept measured by scores on 6 individual scales and the total score of the SPAS questionnaire as dependent variables. Let us recall the abovementioned similarity of the total score and the individual scales in terms of correlations with the independent variables, which enabled us to construct the regression models for the individual scales in the same way as for the total score. It is evident in Table 2

Table 2
Correlation between individual independent variables, and between independent variables and total SPAS score.

	Gender	Frequency of seizures	Duration of epilepsy	Mild intellectual disability	Learning disability	ADHD	Total SPAS score
Gender	**1.000**	0.002	0.100	0.036	0.103	**0.208**	0.035
Frequency of seizures		**1.000**	0.105	0.089	0.000	0.060	0.061
Duration of epilepsy			**1.000**	0.055	**0.222**	0.122	-0.124
Mild intellectual disability				**1.000**	**0.204**	0.143	**0.324**
Learning disability					**1.000**	**0.435**	**0.366**
ADHD						**1.000**	0.034
Total SPAS score							**1.000**

Note: The correlations in bold denote values with the rejected hypothesis of independence at a significance level of 0.05.

Table 3
P-values for the test of statistical significance of the regression coefficients of the independent variables in multilinear regression models, in which SPAS score is a dependent variable.

	Duration of epilepsy	Mild intellectual disability	Learning disability
Scale 1 – General school-related abilities	0.779	**0.004**	<**0.001**
Scale 2 – Mathematics	0.138	**0.007**	**0.003**
Scale 3 – Reading	0.851	**0.001**	<**0.001**
Scale 4 – Spelling	0.584	0.129	**0.010**
Scale 5 – Writing	0.040	0.056	0.091
Scale 6 – Confidence	0.919	**0.002**	**0.001**
Total score	0.539	<**0.001**	<**0.001**

Note: Values in bold represent cases in which the hypothesis of statistical significance was rejected for a significance level of 0.01.

that cross-correlation between independent variables was relatively small (<0.25 in all cases), which meant that multicolinearity did not arise and it was possible to easily distinguish the influence of independent variables. All other regression assumptions (homoscedasticity, linearity, independence of the errors, and normality of the error distributions) were also tested and none of them were violated. In Table 3, *p*-values were used to test the statistical significance of regression coefficients of the independent variables in all regression models considered. With regards to the variable duration of epilepsy, the *p*-values were always above 0.01, which clearly excluded a statistically significant effect of this variable on academic self-concept in CWE. In contrast, a closer look at the variables mild intellectual disability and diagnosed LD revealed that *p*-values were under 0.01 in most scales as well as in the total score. This indicated that these variables significantly influenced academic self-concept in CWE. More detailed analysis showed that a major influence was diagnosed LD which was statistically significant in all scales except Scale 5 – Writing, and *p*-values were systematically lower here than with mild intellectual disability. We wish to emphasize that correlation between these two variables was not high (see Table 2) and therefore they could not be regarded as different manifestations of the same factor. We concluded that the most important factor affecting academic self-concept in CWE is the presence of LD. Thus, we divided CWE into the two groups defined in the Introduction (namely CWE + LD and CWE – LD) for subsequent analyses.

3.2. Academic self-concept in CWE + LD and CWE – LD

Table 4 compares total SPAS scores measuring academic self-concept in CWE + LD, CWE – LD and in the normative sample (Matějček & Vágnerová, 1992). It is evident that low sten scores of 1–3 corresponding to low academic self-concept were overrepresented in the CWE + LD group (more than 50% compared to 16% in the normative sample). In contrast, individuals with high sten scores of 8–10 were virtually absent in this group. The chi-squared test for the null hypothesis, that CWE + LD had the same distribution function of the total SPAS score as the normative sample, led to the rejection of this hypothesis with the *p*-value of less than 0.001. In contrast, in CWE – LD sten scores were relatively close to those of the normative sample. This was confirmed by the appropriate chi-squared test for the null hypothesis, that CWE – LD had the same distribution function in total SPAS score as the normative sample, which did not reject this hypothesis at the significance level of 0.05 (*p*-value was 0.063).

Table 5 compared the mean values for each of the SPAS scales in CWE + LD, CWE – LD and in the normative sample. With the exception of Scale 5 (Writing), CWE + LD had on average statistically lower results than the normative sample. In contrast, statistically lower outcomes in CWE – LD were observed in Scales 1 and 2 only, while other scales and the total score were not affected.

3.3. Quality of life in CWE + LD, and CWE – LD, and its correlations to academic self-concept

Table 6 compared the mean values for each of the scales of the CHEQOL-25 questionnaire in both CWE + LD and CWE – LD groups. The results of Student's *t*-test comparing the mean values in CWE + LD with values in CWE – LD showed that CWE + LD achieved statistically lower results in Scale 1 – Interpersonal & Social Consequences, and Scale 3 – Intrapersonal & Emotional Issues. However, in Scale 2 – Worries & Concerns and Scale 4 – Disclosure & Normality, no statistically significant differences between the two groups were found at the significance level of 0.05.

Table 7 shows a correlation between the SPAS scales measuring academic self-concept and CHEQOL-25 scales determining quality of life in CWE. These correlations were determined both for the group of CWE + LD, and for the group of

Table 4
Comparison of the total SPAS questionnaire sten scores obtained from CWE + LD, CWE – LD, and the normative sample.

Sten score	1	2	3	4	5	6	7	8	9	10
Percentage in the group of CWE + LD ($n = 64$)	10.9	27.4	14.5	21.0	11.3	6.5	9.7	0.0	1.6	0.0
Percentage in the group of CWE – LD ($n = 118$)	4.1	8.2	11.5	13.9	13.1	18.0	7.4	9.0	2.5	9.0
Percentage in the normative sample (%)	2.3	4.4	9.2	15.0	19.2	19.2	15.0	9.2	4.4	2.3

Table 5
Comparison of the results obtained from CWE + LD, CWE – LD and the normative sample for each individual scale of the SPAS questionnaire.

	Group 1 ($n = 64$) – CWE + LD	Group 2 ($n = 118$) – CWE – LD	Normative sample	*P*-value of the Student's *t*-test for the Group 1 and normative sample	*P*-value of the Student's *t*-test for the Group 2 and normative sample
Scale 1 – General school-related abilities	3.10 ± 2.10*	4.90 ± 2.70	5.5 ± 2	<**0.001**	**0.015**
Scale 2 – Mathematics	4.62 ± 2.29	5.98 ± 2.52	5.5 ± 2	**0.002**	**0.038**
Scale 3 – Reading	3.36 ± 1.88	5.07 ± 2.56	5.5 ± 2	<**0.001**	0.069
Scale 4 – Spelling	4.24 ± 2.41	5.42 ± 2.75	5.5 ± 2	<**0.001**	0.787
Scale 5 – Writing	5.21 ± 2.35	5.93 ± 2.38	5.5 ± 2	0.326	0.051
Scale 6 – Confidence	4.44 ± 2.08	5.79 ± 2.38	5.5 ± 2	<**0.001**	0.181
Total score	3.59 ± 1.93	5.38 ± 2.46	5.5 ± 2	<**0.001**	0.600

* Mean ± standard deviation. The *P*-values in bold denote cases when the corresponding null hypothesis was rejected at a significance level of 0.05.

Table 6
Comparison of the results obtained from CWE + LD and CWE – LD for each individual scale of the CHEQOL-25 questionnaire.

	Group 1 ($n = 64$) – CWE + LD	Group 2 ($n = 118$) – CWE – LD	*P*-value of the Student's *t*-test for the Group 1 and the Group 2
Scale 1 – Interpersonal and Social Consequences	14.02 ± 3.95*	16.69 ± 3.02	<**0.001**
Scale 2 – Worries and Concerns	10.64 ± 3.15	10.56 ± 3.44	0.105
Scale 3 – Intrapersonal and Emotional Issues	7.42 ± 2.94	9.77 ± 3.70	<**0.001**
Scale 4 – Disclosure and Normality	31.06 ± 5.76	32.54 ± 5.91	0.880

* Mean ± standard deviation.

Table 7
Correlation between the quality of life (CHEQOL-25) and academic self-concept (SPAS) for CWE + LD ($n_1 = 64$) and CWD – LD ($n_2 = 118$).

	Scale 1 –Interpersonal and Social Consequences	Scale 2 – Worries and concerns	Scale 3 – Intrapersonal and emotional issues	Scale 4 – Disclosure and normality
Scale 1 – General school-related abilities	−0.005[a]/**0.481**[b]	−0.052/**0.314**	**0.289/0.608**	0.031/**0.185**
Scale 2 – Mathematics	−0.060/**0.361**	−0.207/0.138	**0.290/0.266**	−0.022/0.178
Scale 3 – Reading	−0.036/**0.287**	−0.033/**0.349**	**0.332/0.372**	−0.122/0.023
Scale 4 – Grammar	0.020/**0.236**	0.008/**0.184**	**0.324/0.395**	0.041/0.113
Scale 5 – Writing	0.011/**0.265**	−0.031/0.023	0.141/**0.394**	0.081/0.006
Scale 6 – Confidence	0.113/**0.491**	−0.054/**0.274**	0.128/**0.546**	0.076/0.139
Total score	−0.041/**0.489**	−0.096/**0.337**	**0.376/0.612**	0.003/0.155

Note: The correlations in bold denote values with the rejected hypothesis of independence at a significance level of 0.05.
[a] Correlation for CWE + LD.
[b] Correlation for CWE – LD.

CWE – LD. It was apparent that there were relatively large and statistically significant correlations in CWE – LD in Scales 1, 2 and 3 of the CHEQOL-25 questionnaire. A completely different result occurred in the CWE + LD group, in which most correlations were very close to 0 with one exception in the Scale 3, which is closely connected to school issues (Brabcová et al., 2014).

4. Discussion

We found significant correlation (0.435 – see Table 2; *p*-value of the corresponding test for the significance of the correlation coefficient is lower than 0.001) between diagnosed LD and ADHD in children with epilepsy (CWE). This is consistent with previous findings (Biedermann, Newcorn, & Sprich, 1991) of high comorbidity between these two disorders. It is also worth noting considerable positive correlation between the duration of epilepsy and the presence of LD. This suggests that LD occurs most often in CWE with earlier onset of epilepsy. Recent studies have shown that the onset of seizures at an early age correlates negatively with intelligence (Park et al., 2013). It was also reported that the early onset of seizures was a significant predictor of the need for special education (Zelnik, Saadi, Silman-Stolar & Goikhman, 2001). We further identified decreased intelligence and diagnosed LD as significant predictors of academic self-concept in CWE. It is

important to mention that there was not a high correlation between the two variables due to the diagnostic method for LD used (IQ-achievement discrepancy with 1.5 SD cut-off). The presence of LD affects academic self-concept more than intellectual disability. The fundamental role of LD as a predictor for impaired academic self-concept in CWE was also clearly confirmed for the case when CWE with intellectual disability ($n = 32$, see Table 1) were excluded and only data obtained from CWE without intellectual disability ($n = 150$) were taken into account (not shown here). In further research, it will be necessary to focus in more detail on both variables as well as their mutual relationship.

It was found (see Table 4) that the distribution function describing overall academic self-concept in CWE + LD significantly differs from the corresponding function for the normative sample. Stens 1–3 corresponding to low academic self-concept were strongly represented, with the virtual absence of individuals with high academic self-concept in this group. These results suggest that CWE + LD are a high risk group with regards to academic achievement and require special attention. In contrast, in CWE − LD the distribution function is similar to the normative sample, with extreme values more strongly represented than the average. There is higher percentage of individuals with low academic self-concept (stens 1–3) in this group (24% compared with 16% in the normative sample). More detailed analysis showed that it is associated mainly with higher proportion of individuals with mild intellectual disability in this group (approximately 15% compared to less than 5% reported for the normative sample). It should be noted that according to our results, mild intellectual disability is one of the predictors which significantly negatively influenced academic self-concept in CWE. In contrast, a higher proportion of CWE − LD with high academic self-concept represented by sten scores of 8–10 (21% compared to 16% in the normative sample) suggests that some CWE have strong motivation to fight against their limitations and to overcome their peers in the important area of academic achievement.

The above trends were also confirmed for each of the scales of academic self-concept, where CWE + LD showed statistically lower results in most areas when compared with the normative sample. The only exception was Scale 5 – Writing, where we found no statistically significant difference. This was at first surprising, as previous studies often identified writing as an area in which CWE achieved significantly lower results than the total population (Reilly & Neville, 2011). It should be noted that Scale 5 in SPAS questionnaire is focused mainly on the tidiness of writing, while accuracy of expression is reflected in Scale 4 – Spelling. What may have played a role here is the fact that since 1992, when norms for SPAS were established in the Czech Republic (Matějček & Vágnerová, 1992), there was a significant decrease in emphasis on tidy handwriting in schools. This may have given CWE + LD the impression that they were achieving good results in writing which in turn led to their academic self-concept being similar to the normative sample. In the group of CWE − LD, there were statistically significant, though not great, differences from the normative sample in Scales 1 (General school-related abilities) and 2 (Mathematics). Total academic self-concept in this group was similar to the normative sample.

Since we found that for children without LD the presence of epilepsy does not significantly influence their academic self-concept, it is useful to check for influence of epilepsy on academic self-concept for children with LD. A recent study from the Czech Republic (Jošt, Petrášková, Bílá, & Krajícová, 2013) showed that children with dyslexia (diagnosed in the same way as in our study) aged 9–14 years having IQ >90 and not having any neurological disorder exhibit a significantly higher total scores of the SPAS questionnaire than the CWE + LD group presented in our study (4.79 compared with 3.59) but significantly lower mean values than the CWD − LD group (5.38). Although children with mild intellectual disability were not included in the Jost et al. study, these combined results suggest that lower academic self-concept of CWE + LD can not be simply explained by presence of LD only. More probably, simultaneous impact of both epilepsy and LD is responsible for the very low academic self-concept observed in this specific group.

CWE + LD achieved significantly lower results in quality of life with regards to Scale 1 – Interpersonal/Social Consequences and Scale 3 – Intrapersonal/Emotional Issues. A lower quality of life in CWE with severe LD was also observed in a study by Buck, Smith, Appleton, Baker, and Jakoby (2007). With regards to Scales 1 and 3 (Interpersonal/Social Consequences and Intrapersonal/Emotional Issues), the observed difference may be related to emotional imbalance which is more frequently expected in CWE + LD due to the relatively high correlation between LD and ADHD (Table 2) than in CWE − LD. Differences in the interpersonal area may be related to the fact that learning disorders may have a negative impact on a child's position in their peer group. For example, learning disorders can be a source of ridicule which results in lower self-esteem and subsequently a lower quality of life in the interpersonal and social areas.

Table 7 shows that although CWE + LD achieved in comparison with CWE − LD significantly lower results with regards to quality of life (Table 6) and academic self-concept (Tables 4 and 5), only negligible correlation was found between both variables in most scales. Somewhat higher values found in Scale 3 of CHEQOL-25 can be explained by the fact that 2 of the 4 questions in this scale are focused on school. In contrast, the CWE − LD group showed relatively strong correlation, especially in the areas of academic achievement, interpersonal and intrapersonal impacts of epilepsy. So, it seems that in CWE + LD, academic achievement played virtually no role in terms of social status, interpersonal relationships, etc. which was very different from the CWE − LD group. This could be explained by the resignation which may be felt by individuals due to two unfavorable conditions (epilepsy and LD). In our opinion, this is an especially important issue because these children may develop socially inappropriate behavior. Therefore considerable attention should be paid to these children. It should comprise services of specialized counselors and teaching assistants with an appropriate knowledge of epilepsy and ability to empathize with these children as well as educational interventions focused on their teachers and classmates.

The presented study has some limitations resulting from its design. In particular, correlation of academic self-concept with seizure types was not examined. Inclusion of this variable would have complicated the study considerably because it is a nominal variable with several different categories which would complicate the construction of a regression model. In addition, it has been shown that in the majority of cases (e.g. Aldenkamp, Weber, Overweg-Plandsoen, & Reijs, 2005), seizure type is not a statistically significant predictor of academic achievement (Reilly & Neville, 2011). Although diagnosis of LD was conducted by experienced professionals using standardized criteria in the Czech Republic based on IQ-achievement discrepancy, it should be noted that different procedures can be used in the diagnosis of LD and none of them have been accepted universally (Fastenau et al., 2008). The question remains, to what extent the differences between CWE + LD and CWE – LD presented in this study depend on particular methods used in the diagnosis of LD. Despite these limitations, our study clearly indicates the crucial importance of the presence of LD in relation to academic self-concept in CWE.

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