

Cognitive and Learning Performance of Children and Adolescents Cancer Survivors



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Objective: The aim of this study was to compare the sociodemographic and cognitive profile, the learning performance and symptoms of attention deficit hyperactivity disorder (ADHD) of children and adolescents, survivors of pediatric cancer to those of healthy controls.

Methods: Thirty survivors of pediatric cancer and thirty age-matched controls (mean age \pm SD 11.7 \pm 2.7 years, 46.0% boys, 54.0% girls) were evaluated with the Wechsler Intelligence Scale for Children (WISC-III), the validated LAMDA (software for screening for learning abilities, disabilities and weaknesses) and the ADHD Rating Scale. Sociodemographic data were also assessed.

Results: General intelligence of controls (mean \pm SD 107.3 \pm 18.1) was significantly ($p = 0.027$) higher than the average general intelligence of cancer survivors (mean \pm SD 97.5 \pm 21.4). Analysis of the results of the WISC-III subscales revealed statistically significant differences in the verbal scale ($p = 0.041$), with higher scores of the controls (mean \pm SD 53.8 \pm 10.2) compared to the cancer survivors (mean \pm SD 48.3 \pm 14.2). No statistically significant differences between controls and cancer survivors were found in the performance scale. The LAMDA test revealed statistically significant differences in grammar ($p = 0.012$) and syntax ($p < 0.001$), with the controls achieving higher scores in the respective fields. Regarding the ADHD symptomatology, no significant differences were noted between cancer survivors and

Table 1. Differences in cognitive and learning parameters between cancer survivors and controls

	Pediatric cancer survivors (n = 50)	Controls (n = 50)	p
Total ADHD-IV*	8.0 (10.5)	10.0 (12.0)	.221
General Intelligence (WISC-III)	97.5 \pm 21.4	107.3 \pm 18.1	.027
Verbal Scale	48.3 \pm 14.2	53.8 \pm 10.2	.041
Performance Scale	49.2 \pm 10.6	53.4 \pm 10.4	.065
Grammar (accuracy)*	3.0 (2.0)	3.5 (1.0)	.012
Grammar (processing speed) *	3.5 (2.0)	3.5 (1.5)	.279
Syntax (accuracy)*	3.0 (1.5)	3.5 (1.0)	<.001
Syntax (processing speed) *	3.0 (2.5)	3.5 (1.5)	.068

ADHD-IV, Attention-Deficit/Hyperactivity Disorder Forth Edition; Wechsler Intelligence Scale for Children Third Edition (WISC-III). Values for WISC-III i.e. general intelligence are indicated to scaled scores. Values are expressed as mean \pm standard deviation (SD) or *median (interquartile range). p -value calculated using t -test after the assumption of homogeneity of variance or *using Mann-Whitney U test. Statistically significant differences are noted in bold.

controls. Furthermore, for the total study sample, the subscales of the ADHD questionnaire demonstrated no correlation with either the subscales of the WISC-III test, or the subscales of the LAMDA test. Finally, children and adolescents whose parents had higher levels of education, demonstrated significantly higher general intelligence scores in WISC-III ($p = 0.026$). More specifically, higher scores were observed in the verbal scale ($p = 0.024$) and also in the information ($p = 0.001$), similarities ($p = 0.014$) and vocabulary ($p = 0.019$) subscales. In the LAMDA learning test, in the category of stimuli identification accuracy, higher ($p = 0.016$) scores were achieved by children and adolescents who had at least one parent of higher educational background.

Conclusion: In this small study sample, children and adolescents with a history of pediatric cancer demonstrated lower intelligence quotient and lower performance in some learning domains (grammar, syntax) than controls. Higher intelligence and learning scores were detected in the participants with parents of higher educational level. Larger studies are needed to confirm these findings.

Declarations of interest: none

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