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THE QUALITY OF LIFE OF CHILDREN AFTER MILD AND MODERATE TRAUMATIC BRAIN INJURY

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SUMMARY

Background:

The aim of the study was to evaluate the quality of life of children after mild and moderate traumatic brain injury (TBI) and an analysis of the specific assessment of individual areas of functioning in these children's perception. This subject is important both in terms of the further education of the children but also in terms of their adapting to life after brain injury.

Material/ Methods:

We tested 20 children after traumatic brain injury treated at the Neurotherapeutic Centre in Bydgoszcz in the period of 2014-2015. Nine of these children had experienced mild brain injury and eleven moderate brain injury, and had returned to school education. An analysis of the documentation (interviews and medical records) as well as the Scale for Quality of Life KIDSCREEN-27 was used in the examination of the children.

Results:

We found that the quality of life of children after mild to moderate traumatic brain injury is significantly reduced in the areas of assessment of physical functioning, general mood and school life. The quality of life of the examined children did not differ from the normative group in the area of family functioning and the assessment of received support and peer relations.

Conclusions:

The results substantiated the validity of including within research children after mild and moderate traumatic brain injury through the assisting of specialist interactions in three key environments.

Key words: TBI, mood, support, KIDSCREEN-27

INTRODUCTION

Brain injury, as research indicates, dramatically changes the course and value of any human's life (Pačalska 2007; Prigatano 2009). The changes concern the functioning of individuals who suffered from the trauma as well as the functioning of the whole family. While, following severe head trauma, certain conditions are visible to the public – such as difficulties in locomotion, limb paralysis, slurred speech often with features of dysarthria, abnormal behaviour, especially if the injury has affected the frontal region, so equally in the case of mild and moderate brain injuries disorders in functioning may be invisible.

Children after brain injuries are a very special group as their brains at the time of the injury are not fully mature. It is difficult to clearly assess, for example, what is normal and what is a disturbed behaviour as some cognitive functions develop along with the development of the frontal lobes, and this development is very individual for each child and may vary especially when we consider young children.

Studies show that even after a brain concussion such disorders may occur in children (Dietrich et al., A.M 1993, Christina L. et al. 2012).

- headache
 - dizziness
 - lack of awareness of one's environment
 - nausea and vomiting
- And consequently (days and weeks after the injury)
- persistent headache of a mild intensity
 - dizziness, lightheadedness
 - impaired ability to concentrate
 - memory problems
 - easy fatigue
 - irritability, a low frustration threshold
 - intolerance of bright light, difficulty in focusing sight
 - intolerance to loud sounds, sometimes ringing in the ears
 - anxiety and (or) depression
 - sleep disorders.

Similar or more severe symptoms can be expected in children after mild traumatic brain injury. Moderate brain injury is considered to be a head injury with a subsequent loss of consciousness, where the period of reduced consciousness does not exceed 2 weeks.

Objectives

The aim of the study was to evaluate the quality of life of children who suffered from mild and moderate brain injury in five areas of social functioning. The aim of the study was to evaluate the quality of life of children after mild and moderate traumatic brain injury (TBI) and an analysis of the specific assessment of individual areas of functioning in these children's perception

MATERIAL AND METHODS

We tested 20 children following traumatic brain injury treated at the Neurotherapeutic Centre in Bydgoszcz in the period of 2014-2015. Nine of these children experienced mild brain injury and eleven moderate brain injury. The characteristics of the examined children is presented in Table 1. One can see that the main damage was located in the frontal lobe and cognitive dysfunctions (we excluded patients with aphasia, due to the inability to assess the verbal scales).

The sociodemographic characteristics of the examined children are presented in Table 1.

The characteristics of the depth of the injury and the time after the injury are presented in Table 2.

The cause of the accident in the examined children is presented in Table 3. In the majority of children the cause of the injury was a traffic accident or accidents during play.

Due to the specific criterion for the selection of the test group, which was mild and moderate brain injury, group size was small.

In the study the following measuring tools were used:

- psychological observation;
- analysis of medical records;
- structured interview with the parents of the child including questions concerning the parent's perception of changes experienced by the child in selected biopsychological areas persisting throughout the year from the injury's occurrence;

Table 1. Sociodemographic characteristics of the examined children

Sociodemographic characteristics	Number/percentage		Age	
			M	SD
Girls	7	35%	9.41	1.49
Boys	13	65%	9.26	1.06

Source: own research

Table 2. Characteristics of depth of the injury and time after the injury

Sociodemographic characteristics	Depth of the injury		Time after the injury	
	Mild	Moderate	M	SD
Girls	3	4	11.9	1.49
Boys	6	7	11.4	1.06

Source: own research

Table 3. The cause of the accident in the examined children

Sociodemographic characteristics	The cause of the accident					
	Traffic accident		Fall from height		Accident during play	
	n	%	n	%	n	%
Girls	4	57.14	2	28.57	1	14.28
Boys	10	76.92	2	15.38	1	7.69

Source: own research

- the KIDSCREEN-27 questionnaire, which is a shortened version of the 52-items questionnaire to study the quality of life relating to health condition (HRQoL) for children. The concept of quality of life is perceived here as a subjective assessment of the frame of mind carried out in the physical, mental and social aspects of health, including the functional aspect of a child, their emotions and behaviours (Mazur et al., 2008, p.9). The questionnaire consists of 27 questions to assess the child's satisfaction in the following five areas of functioning: physical activity, general mood, independence and family support and friends and school environment. It is a tool of recognized parameters used in psychometric tests both in Poland as well as in research on an international scale. The Polish version of the tool was used in the study (Mazur et al., 2008). The study was carried out in accordance with the guidelines of the methodology of the social sciences and the principles of professional psychological ethics (Brzezinski, 2015).

RESULTS

On the basis of the research data obtained by interviewing the parents we found that 30% of children have problems with speech, with a domination in the disorders of dysarthria and a rapid updating of words affecting the fluency of speech. In the perception of parents, 70% of children after the accident, claim a deterioration at school. Half (50%) of the children remain under psychiatric control due to their depressed mood. About 90% of children complained about the presence of pain which significantly impedes their everyday functioning. The pain most often concerned the head area. More than half of the respondents (75%) also indicated the presence of panic fears occurring mostly in the evening. Data obtained by interviewing a parent is consistent with the conclusions drawn from the psychological observation of the child.

Since the aim of the study was to estimate the level of life satisfaction of children after mild and moderate traumatic brain injury and the search for the specifics of the assessment of individual areas of functioning in the perceptions of these children, we used the questionnaire KIDSCREEN-27. The average results of this questionnaire in the study of children referred to the standards for the relevant category of the children's age (see: Mazur et al., 2008, p.38). The significance of differences between the averages calculated in this way are presented in a tabular statement (see Table 4) and illustrated graphically (see Figure 1).

As may be seen, in accordance with expectations, we observed differences in the average assessment of individual areas of life between the studied children and children of the equivalent age group. Children following traumatic brain injury assessed the quality of life lower in all five areas and in the four areas the difference is characterized by a very high level of statistical significance. These are, respectively, the area of physical activity ($p = .00$), the area concerning the assessment of the overall mood and feelings ($p = .00$), the area of independence and family ($p = .01$) and school environment functioning ($p = .00$). In the area of

Table 4. The significance of differences in the average quality of life of children after mild and moderate traumatic brain injury in relation to standards

Living areas being assessed	TBI	Norm	p
Physical activity and health	60.00*	74.68	0.00
Overall mood and feelings	66.14*	77.78	0.00
Independence and family	60.43*	69.33	0.01
Support and colleagues	63.00	71.69	0.12
School environment	53.50*	70.37	0.00

Source: own research

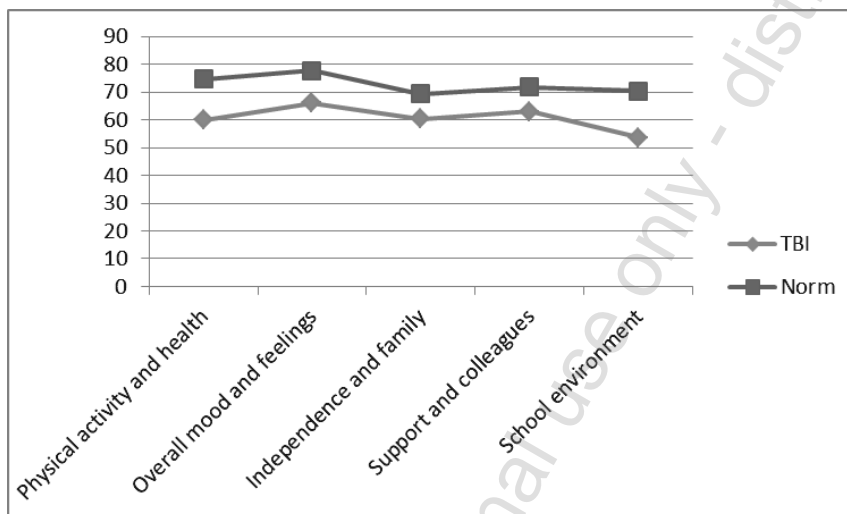


Figure 1. Profile of the results KIDSCREEN-27 for the studied children with TBI relative to the age norm (source: own research)

the evaluation and support of colleagues, although the tendency shows a similarity of difference in direction between the mean (that is, the lower the evaluation of this area in the perception of children with TBI in relation to the total number of children in this age group), there was no statistical significance observed in this area.

As is known, not only does the significance of differences between the average results obtained in the study of children to the standards reflect the actual specificities of the distribution of the results. Thus we deepened the analysis of the results, taking into account two more distribution parameters and the results were, respectively, internal diversity assessments of children with TBI within the individual areas of life and a distribution analysis of individual assessments in relation to the mean value and standard growth charts.

Analysis of the internal differences within the ratings assigned, in different areas of the children in the study, leads one to the conclusion that the greatest discrepancy (gap) in terms of ratings among children with TBI was observed in three areas of life: in the area of performance in school environment (RM =

16.87), in the area of assessment of the overall mood and feelings (RM = 14.68) and in the area of physical activity and health (RM = 11.64).

On the other hand, detailed analysis of the distribution of responses of children with TBI within the individual areas of life shows that in all areas the level of satisfaction in the perception of the children in the vast majority falls below average standards, and in about 30% of children it is below the 15 percentile (see Table 5).

Noteworthy is the fact that in the area related to peer relationships, despite the lack of significance difference in terms of standards, up to 45% of children with TBI rated the quality of their functioning below 15 percentile. We can, and should, therefore, treat this result in terms of the trend.

In further analysis it was examined whether there are differences in the assessment of individual areas depending on the severity of the injury (see. Table 6).

It has been shown that children after moderate injury (MoI) assess significantly lower than those following a slight injury (UL) areas such as : mood ($p = .01$), independence and family ($p = .04$) and support and colleagues ($p = .00$). There was no significant difference in the evaluation of satisfaction with functioning in a school environment.

The results of the assessment of quality of life were also analyzed within groups varied by gender. Within the tested group, girls often pointed to a lower assessment of individual areas of functioning, than did boys. According to the normalization procedure for the test age group (8-11 years) there were no significant differences between the results obtained by boys and girls (Mazur et al.,

Table 5. Percentage of surveyed children with TBI, which result in the KIDSCREEN-27 being located below the average and below the 15 percentile

Living areas assessed	<M	<15 percentile
Physical activity and health	90%	30%
Overall mood and feelings	80%	35%
Independence and family	75%	20%
Support and colleagues	60%	45%
School environment	85%	50%

Source: own research

Table 6. The significance of differences in quality of life between children varied due to the depth of injury (MI – a mild injury, MoI – moderate injury)

Living areas assessed:	Test U Mann-Whitney Test : Variable: depth of injury mild (MI) vs moderate (MoI)									
	Sum. rang UL	Sum. rang UU	U	Z	p	Z	p	N _L	N _U	. p
Overall mood and feelings	131	79	13	2.74*	.01	2.76	.01	9	11	0.00
Independence and family	122,5	87,5	21,5	2.09*	.04	2.10	.04	9	11	0.03
Support and colleagues	133	77	11	2.89*	.00	2.90	.00	9	11	0.00
School environment	114	96	30	1,44	.15	1,45	.15	9	11	0,15

Source: own research

2008), in the group of studied children after injuries; equally no significant differences in the assessment of quality of life between boys and girls were noted. However, the relationship between the results obtained by the studied girls and boys and the norm for the appropriate gender was analyzed (see Table 7)

Compared to the standardization group, examined girls presents significantly lower than their counterparts, the level physical activity ($p = .03$), the overall mood ($p = .01$), and coping at school ($p = .01$). On the other hand, analyzed boys compared to their peers significantly lower rated their physical activity ($p = .00$), mood ($p = .00$), family relationships and independence ($p = .03$) and their situation at school ($p = .00$).

According to the theoretical and methodological assumptions adopted during the construction of the questionnaire KIDSCREEN-27, each of the five areas of functioning is assessed through a series of positions in questionnaire (Mazur et al. 2008). This allows one to generate the overall rate of satisfaction with life, and partial indicators regarding the evaluation of satisfaction within the individual areas of life. In order to deepen the analysis and refinement of the proposals for the evaluation of the quality of life in the perception of children with TBI, the distribution of the results within the questionnaire items KIDSCREEN-27 has been reviewed (see Table 8).

As is shown above, differences in the average scores of each indicators were observed within each of the five areas of quality of life. Analyzing the average assessment of the questionnaire items it can be stated that post-injury children assessed their health the lowest ($M = 2.35$, $SD = 0.99$), energy ($M = 2.90$, $SD = 0.64$), time for themselves ($M = 2.55$, $SD = 0.89$), freedom ($M = 2.95$, $SD = 1$), finance ($M = 2.30$, $SD = 0.98$), the amount of time spent with colleagues ($M = 2.85$, $SD = 0.99$), satisfaction with school ($M = 2.45$, $SD = 0.89$), coping at school ($M = 2.50$, $SD = 0.89$) and the ability to maintain attention during class ($M = 2.55$, $SD = 0.83$). Thus, the lowest ratings for children was health, family economic status, satisfaction with school and coping at school.

However, the distribution of the results obtained deviates from the normal one. detailed reviews the median (Me) were researched within the questionnaire items belonging to the respective areas of quality of life (see Table 6). The aim of this analysis was to identify those elements of the operation (as reflected in the form of individual test items) that within each of the areas of the operation are as-

Table 7. Comparison of average scores KIDSCREEN-27 between boys and girls and the appropriate standard for sex

	TBI ♀	Norm ♀	p	TBI ♂	Norm ♂	p
Physical activity and health	58.85*	73.12	0.03	60.62*	76.48	0.00
Overall mood and feelings	64.28*	77.30	0.01	67.38*	78.48	0.00
Independence and family	59.18	68.76	0.11	61.09*	69.98	0.03
Support and colleagues	56.43	71.74	0.16	66.53	71.63	0.43
School environment	46.43*	72.44	0.01	57.30*	72.44	0.00

Source: own research

Table 8. Distribution of results in terms of the questionnaire items KIDSCREEN-27 in the group of children with TBI

Areas of quality of life	Components of the areas of quality of life (items)	M	SD	Me	X _{min}	X _{max}
Physical activity and health	Health	2.35	0.99	2	1	4
	Physical fitness	3.25	1.25	3	1	5
	Physical activity	3.25	1.25	3	1	5
	The ability to run	3.25	1.25	3	1	5
	Energy	2.90	0.64	2	2	4
The overall mood and feelings	Joy	3.10	0.79	3	2	4
	Good mood	3.05	0.76	3	2	4
	Fun	3.15	0.99	3	1	5
	Sadness	3.35	0.75	3.5	2	4
	lack of desire	3.45	0.89	4	2	5
	Loneliness	3.80	0.77	4	2	5
	Smugness	3.25	0.79	3	2	5
Independence and family	Time for self	2.55	0.89	2	2	5
	Freedom	2.95	1.00	3	2	5
	time for parents	3.75	0.91	4	2	5
	Fair treatment	3.55	0.69	4	2	5
	Talking with parents	3.80	1.01	4	2	5
	Finances	2.30	0.98	2	1	4
	Finance for child's expenses	2.25	1.07	2	1	4
Independence and family	Time with colleagues	2.85	0.99	3	1	5
	Fun with colleagues	3.05	1.10	3	1	5
	mutual assistance	3.40	1.43	3	1	5
	Relying on colleagues	3.30	1.53	3	1	5
Support and colleagues	School - satisfaction	2.45	0.89	3	1	4
	The school - coping	2.50	0.89	3	1	4
	warning	2.55	0.83	2	2	5
	Relationships with teachers	3.20	0.89	3	2	5

Source: own research

essed higher or lower than the others. The size of the study makes it impossible to use measures of the significance of differences between median values, therefore only reviews of the median ratings of individual questionnaire items within the five key areas of functioning were carried out.

In the research we observed differences in the median values in four out of the five key areas of functioning and these are the area of physical activity and health, the area of general mood and feeling, the area of independence and functioning of the family and the school environment. In the area of support and peer relations the assessment of individual items questionnaire remained on an average level (median in all positions questionnaire amounted to Me = 3). Later on we examined the remaining four functional areas within which diversity assessments allow for the formulation of preliminary conclusions regarding the potential stimulators and blockers of quality of life in children with TBI.

In the area of the evaluation of satisfaction within physical activity and physical health the children with TBI evaluated the lowest their health condition (Me = 2, M = 2.35, SD = 0.98), and their energy, but here the rating remained at an average level (Me = 3, M = 2.90, SD = 0.64). Evaluated at quite a high level were such areas as: fitness and physical activity and the ability to run (in all three po-

sitions the median value was $Me = 4$).

The second area of operation, within which the observed differences in the preferred assessment of components was the area concerning general mood and feelings.

As can be observed, the three components in the overall assessment of the emotional state of the children deserve attention and these are, respectively, the high indifference towards any activity ($Me = 4$, $M = 3.45$, $SD = 0.89$), the high sense of loneliness ($Me = 4$, $M = 3.80$, $SD = 0.77$) and the slightly higher than the average declared frequency of feeling sadness ($Me = 3.5$, $M = 3.35$, $SD = 0.75$). On the other hand, the frequency of experiencing joy, good mood, fun and satisfaction in themselves remained at an average of medians amounting to $Me = 3$ in the group of studied children.

Another area of the analyzed data was the sense of independence and satisfaction with family life and here we observed the following differences in the ratings amongst the children.

As can be observed, in this area those studied children with TBI evaluated the lowest their own free time ($Me = 2$, $M = 2.25$, $SD = 0.88$), the material status of the family in relation to one's peer family ($Me = 2$, $M = 2.30$, $SD = 0.98$) and finance on their spending ($Me = 2$, $M = 2.25$, $SD = 1.07$). Assessed at a fairly high level in their perception was the time parents devote to them ($Me = 4$, $M = 3.75$, $SD = 0.91$), the feeling of being treated by their parents in a fair way ($Me = 4$, $M = 3.55$, $SD = 0.69$) and the frequency of talking time with parents ($Me = 4$, $M = 3.80$, $SD = 1.01$). On the other hand, a sense of freedom that expresses the possibility of spending free time in a manner consistent with their own needs and plans was valued in the perception of the children tested at the level of average ($Me = 3$, $M = 2.95$, $SD = 1$).

The fourth area of life, within which were observed differences in the level of partial assessments of quality of life among the children studied was the area concerning satisfaction with functioning in the school environment (see Figure 5).

As can be seen, among the children studied the lowest score was observed in terms of the ability to concentrate during school hours ($Me = 2$, $M = 2.55$, $SD = 0.83$). The rating of the other three partial indicators in this area indicates the average level of satisfaction among the studied children, which means that children feels an average level of satisfaction with their functioning ($Me = 3$, $M = 2.45$, $SD = 0.89$), coping in school ($Me = 3$, $M = 2.5$, $SD = 0.89$) and relationships with teachers ($Me = 3$, $M = 3.20$, $SD = 0.89$).

DISCUSSION

In interpreting the results of the subjective assessment of the quality of life of children after traumatic brain injury it should be stated at the beginning that children after trauma make their assessment in comparison to the situation before the accident. In many sources it is emphasized that brain trauma divides life into two parts: the „life before the injury” and „life after injury” (Pačhalska M. 2007).

After mild traumatic brain injury changes are not so important and are often not visible to people in surrounding environment, but the children themselves showed that „now is something else.” Some children also showed concern that now they cannot deal with life activities but did not connect the difficulties with injury itself.

In Polish society, there is a lack of knowledge about the consequences of moderate and mild injuries to the brain, and there are little objective sources of knowledge in this area. Therefore, the results obtained in research can relate primarily to knowledge in the area of neuropsychology, health psychology and the psychology of the quality of life, and more specifically to data on assessments of quality of life related to health in children and adolescents experiencing other chronic diseases. Among the reports of research on the HRQoL in children and adolescents, as a reference point can be regarded study groups of children with cerebral palsy (Dabrowska, 2007, 2010; Michalska et al., 2012, 2012b, 2012c; ax, Kulak, 2010) or children with type 1 diabetes (Gawłowicz, 2010, 2012; Kubicz et al., 2008; Kwissa, 2006; Pashkevich-Mes, 2015; Przybyszewski et al., 2008).

On the basis of our analysis of the results one can draw the following four key conclusions regarding the quality of life for children after mild and moderate traumatic brain injury. The first two proposals relate to differences in the overall evaluation of life satisfaction in children with TBI compared to healthy children and to the specific assessments made in the various areas of the analyzed children. Two further conclusions from the study relate to the role of some factors: these are the depth of the history of trauma and the sex of the child in their perception of life satisfaction.

First, the declared level of quality of life relating to health is significantly lower in the group of children with TBI in relation to the normative reference group of healthy children. This conclusion is consistent with the expectations arising from the research theory (Camfield, 2004; Kowalik, 2007; Oles, 2002, 2005). The observed differences in the study of the greatest impact, in turn, were: the evaluation of functioning in the area of the school environment, in the area of physical health and physical activity, then in that of psychological well-being and in the area of family life. There was no significant difference in the assessment of the operation in the area of peer relations between the children studied and the norm group.

It may be concluded that despite the trauma children evaluate in a similar way the received social support from peers, but in-depth qualitative analyzes clearly show the trend of discrepancy ratings consistent with the differences in other areas of operation. This means that children with TBI significantly estimate lower than healthy children their level of satisfaction with peer relationships and the support received from them. An important factor in a lower assessment in this area is the time spent with colleagues. Children after traumatic brain injury spend less time with their peers compared to the period before the injury. In the interview the causes listed by children were faster fatigue, headaches that shaped their preference to spend the time at home resting. The results are also consistent with the studies of social isolation in people after traumatic brain injury (Buliński, 2009).

Secondly, in addition to the proposals concerning overall satisfaction with life relating to health in key performance areas, the analyzes conducted also allow one to formulate preliminary conclusions regarding the partial ratings of life satisfaction declared by the studied children. These conclusions should be considered very carefully, because as a result of the pilot nature of the research and the specifics of the test group they derive from the review of the frequency of assessments within the various elements including five key areas of functioning. The purpose of the study was an attempt to identify resources and shortages in specific areas of life, that is, the factors for which it can be assumed that they can act as stimulants vs. blockers of the level of life satisfaction in the studied children. The results of this study can be placed in the context of the above-described main conclusion of the research, concerning a lower level in the assessment of life satisfaction in children after injury with respect to healthy children and the importance of individual areas of functioning within any global assessment.

Thus, starting from deepening the proposals on operation in the area of the school environment it can be said that one factor was the lowest estimated by the studied children, and therefore potentially was the most threatening for their the level of satisfaction in life. This factor was the ability to sustain attention during a lesson. Research (Christina L. et al. 2012) has shown that difficulties in mind and memory may occur even after a mild concussion injury. While such difficulties following concussion may have a transient character, after mild and moderate traumatic brain injury their character is usually permanent. The study of the cognitive functioning of children after traumatic brain injury (Pačalska, Bułiński) indicate that the level of cognitive functioning is significantly lower. Within the physical activity and health potential factors that may greatly lower the level of life satisfaction among the studied children were those of health and life energy. Brain injury is associated with severe headaches. After brain injury, there is a tendency for a greater sensitivity to changes in weather and consequently the feeling of physical discomfort.

In general mood and feelings we observed three factors potentially threatening the life satisfaction and they are: a reduced willingness to take activities, a fairly high sense of loneliness and a fairly high frequency of feeling sadness. Consequently, in the area of independence and family relationships we observed a decreased level of satisfaction in the amount of time children have for themselves, the possibility of financing their own initiatives or initiatives made together with their peers. It should also be noted that in this area we observed a relatively high satisfaction with the relationship with their parents. More specifically, the studied children declared satisfaction with the amount of time devoted by their parents and the ways of being treated by parents (a sense of fair treatment) and the ability to communicate with parents in a situation of need. Analysis of the functioning of the parents of children with chronic diseases show that there is a clear connection between the functioning of the parents and the satisfaction of life felt by their children, which indicates the important role of the quality of life of parents in the context of building a sense of security and – consequently – satisfaction

within the lives of children (cf.. Dabrowska, 2007; Dabrowska, 2010). It is worth noting that in a possible continuation of the initiated studies one should control the level of parents' education, because there was a significant relationship between the level of parental education and the quality of life of children with diabetes (Przybyszewska et al., 2008). As is known, parents' knowledge and awareness of building a relationship with the child and encouraging their development is important for every guardian – child relationship. It can therefore be assumed that the special circumstances of the child with a history of brain injury will require more parental' expertise and a readiness to consciously shape the child's quality of life (cf.. Twardowski, 2003, 2014).

The third key conclusion from the study refers to the dependence of the depth of injury in the assessment of life satisfaction made by children. It was found that the level of injury depth is a significantly differentiating factor in the assessment of satisfaction of key areas of children's functioning. Generally speaking, the children following moderate trauma declare a lower level of life satisfaction in relation to children after mild trauma. Similar results were observed in the study of the quality of life of children with CP (Michalska et al., 2012b) and in patients with diabetes (Kubicz et al., 2008). This difference is especially revealed in the assessment of emotional functioning, functioning in the family environment and in the area of peer relations and support. There was no significant difference in the evaluation of satisfaction with the functioning in school environment among children with a varied depth of a past trauma.

The fourth main conclusion of the research concerns the observed difference in the pattern of life satisfaction evaluation within sex groups in relation to standards. The TBI girls studied significantly assessed satisfaction with physical health, emotional state and functioning in school environment lower than their counterparts. Boys after trauma estimated lower than their peers the same areas, and also assessed lower satisfaction with family relationships and their sense of independence. In the research there were not observed differences at the level of life satisfaction between girls and boys. Similar results were observed in the study of life satisfaction in children with CP (Michalska et al., 2012).

Concluding, the research data obtained indicate the validity of taking children after mild and moderate traumatic brain injury into specialist care assisting in three key environments. The first is the family environment, where interaction programmes should include both the work of a psychoeducational area with the child's parents, but also that of direct work with the child. Other environmental impacts should include the school environment within the context of both cooperation with the teachers of the child, as well as the peer group with a focus on creating suitable working conditions in the classroom for the child after the injury. One should also take into account the special educational needs of a child with a history of brain injury, including particular problems with attention and memory.

As is known, one of the key areas of development in the early school age is the area of development of peer relations and the building of authority (Brzezińska, Appelt, Ziółkowska, 2015). This underlines the great potential lying in the

school environment, and enabling the design and implementation of impacts focused on improving the quality of life of children after trauma. The postulated effects are part of the model assumptions supporting development referred to as a model of animation, support and a model of emergency service actions (Brzezińska, 2005), or the impact of supporting indirect activities vs. direct ones (Kaja, 2010).

Concluding, it should be emphasized that the pilot studies are part of the area of discussion around the importance of measuring the life quality of sick children. Life satisfaction is a very important indicator of the effectiveness of the treatment and a vital factor in the planning of supporting interactions (see Paszkiewicz-Mes, 2015). In the light of the study the initial assumptions about the relevance of the quality of life in children after moderate and mild injuries to the brain were clearly confirmed. There is, therefore, legitimacy in continuing research into this area.

REFERENCES

- Brzezińska, A. (2005). *Psychologiczne portrety człowieka*. Sopot: GWP.
- Buliński L. (2009) Izolacja społeczna rodzin dzieci niepełnosprawnych po urazach mózgu. *Fizjoterapia Polska*, 2009; 4(4); Vol. 9, 340-358.
- Brzezińska, A., Appelt, K., Ziółkowska, B. (2015). *Psychologia rozwoju człowieka*. Sopot: GWP.
- Buliński L. (2009) Izolacja społeczna rodzin dzieci niepełnosprawnych po urazach mózgu. *Fizjoterapia Polska* © MEDSPORTPRESS, 2009; 4(4); Vol. 9, 340-358
- Christina L. Master, Matthew F. Grady (2012) Office-based management of pediatric and adolescent concussion *Pediatric Annals*, 2012; 41 (9): 1–6
- Camfield, L. (2004). Subjective Measures of Well-being in Developing Countries. W: W. Glatzer, S. Von Below, M. Stoffregen (red.), *Challenges for Quality of Life in the Contemporary World* (s. 45-61). Dordrecht: Kluwer Academic Publishers.
- Dietrich A.M., Bowman M.J., Ginn-Pease M.E., Kosnik E., King D.R.: Pediatric head injuries: can clinical factors reliably predict an abnormality on computed tomography? *Ann. Emerg. Med.*, 1993; 22: 1535-1540
- Dąbrowska, A. (2007). Poczucie koherencji u rodziców dzieci z mózgowym porażeniem dziecięcym. *Psychiatria Polska*, *XLI*(2): 189-201.
- Dąbrowska, A. (2010). Stres u rodziców dzieci z mózgowym porażeniem dziecięcym. Pobrane z: http://www.porazenie.nazwa.pl/arttykul_numer_22.html.
- Gawłowicz, K. (2010). Jakość życia dzieci i młodzieży z cukrzycą typu 1. Rozprawa doktorska. Pobrane z: <http://www.wbc.poznan.pl/Content/168943/index.pdf>.
- Gawłowicz, K. (2012). Ocena jakości życia dzieci i młodzieży z cukrzycą typu 1. *Hygeia Public Health*, 47(2): 145-150.
- Kaja, B.M. (2010). *Psychologia wspomaganie rozwoju*. Sopot: GWP.
- Kowalik, S. (2007). Jakość życia związana ze stanem zdrowia. W: S. Kowalik (red.), *Spoleczne konteksty jakości życia* (s. 147-173). Bydgoszcz: Wydawnictwo WSG.
- Kubicz, A., Lisowicz, L., Surdej, B., Korczowski, B. (2008). Wpływ insulinoterapii na jakość życia młodzieży chorującej na cukrzycę typu I. *Przegląd Medyczny Uniwersytetu Rzeszowskiego*, 2: 170-174.
- Kwissa, Z. (2006). Jakość życia uwarunkowana stanem zdrowia u osób chorych na cukrzycę. *Psychologia Jakości życia*, 5(1): 119-132.
- Michalska, A., Boksa, E., Wendorff, J., Wiktor, P.J. (2012a). Jakość życia dzieci i młodzieży z mózgowym porażeniem dziecięcym i niepełnosprawnością intelektualną. Wybrane uwarunkowania społeczno-demograficzne. *Neurologia dziecięca*, 21(43): 35-44.
- Michalska, A., Boksa, E., Wendorff, J., Wiktor, P.J. Raport z badań dotyczących problemu jakości życia dzieci i młodzieży z mózgowym porażeniem dziecięcym uczęszczających do placówek

- Polskiego Stowarzyszenia na Rzecz Osób z Upośledzeniem Umysłowym. Pobrane z: http://www.psouu.org.pl/sites/default/files/publikacje/raport_badania_jakosc_zycia.pdf.
- Michalska, A., Wendorff, J., Boksa, E., Wiktor, P.J. (2012b). Jakość życia dzieci i młodzieży z mózgowym porażeniem dziecięcym i niepełnosprawnością intelektualną. Wybrane uwarunkowania kliniczne. *Neurologia dziecięca*, 21(43): 39-48.
- Michalska, A., Wendorff, J., Boksa, E., Wiktor, P.J. (2012c). Jakość życia dzieci i młodzieży z mózgowym porażeniem dziecięcym i niepełnosprawnością intelektualną. Rodzinne uwarunkowania społeczno-demograficzne. *Neurologia dziecięca*, 21(43): 49-58.
- Oleś, P. (2002). Jakość życia w zdrowiu i chorobie. W: P. Oleś, S. Steuden, J. Toczółowski, (red.), *Jak świata mniej widzę: zaburzenia widzenia a jakość życia* (s.37-45). Lublin: Towarzystwo Naukowe KUL.
- Oleś, P. (2005). Oddziaływania zwiększające poczucie jakości życia u pacjentów z zaburzeniami widzenia. W: A. Bańka (red.), *Psychologia jakości życia* (s. 219-238). Poznań: Stowarzyszenie Psychologia i Architektura.
- Pąchalska M. (2007) Neuropsychologia kliniczna: Urazy mózgu. T. II. Procesy językowe i integracja ze społeczeństwem. Warszawa: PWN. ISBN 978 83 01 14978-9 t.2
- Pąchalska M. (2008) Rehabilitacja neuropsychologiczna: Procesy poznawcze i emocjonalne. Wydawnictwo Naukowe UMCS. ISBN 978-83-227-2741-6
- Pąchalska M., Jastrzębowska G., Gryglińska K., Mirska N., Zarańska B., MacQueen B.D. Disturbances of communication in persons with traumatic brain injury. *Acta Neuropsychologica* 2015; 13(2):105-125
- Paszkiwicz-Mes, E. (2015). Jakość życia u dzieci i młodzieży z cukrzycą I. *Pielęgniarstwo XXI wieku*, 50(1): 50-55. Pobrano z: <http://www.piel21w.umlub.pl/vol/r2015/no50/a09/>.
- Prigatano G.P. (2009). *Rehabilitacja neuropsychologiczna*. Tłum. Łucja Domańska. Warszawa: WN PWN.
- Przybyszewski, B., Czerwionka-Szaflarska, M., Żbikowska-Bojko, M. (2008). Analiza jakości życia dzieci i młodzieży chorych na cukrzycę typu 1 leczonych za pomocą ciągłego podskórnego wlewu insuliny. *Pediatrics Polska*, 83(1): 54-62. Pobrane z: <http://www.sciencedirect.com/science/article/pii/S0031393908702907>.
- Topór, E., Kułak, W. (2010). Jakość życia dzieci z mózgowym porażeniem dziecięcym. *Neurologia dziecięca*, 19(37): 61-66.
- Twardowski, A. (2003). Rodzice jako partnerzy nauczycieli w procesie edukacji uczniów niepełnosprawnych intelektualnie. W: Jankowski D. (red.), *Szkoła w społeczności lokalnej*. Kalisz: Wydawnictwo WP-A UAM, s. 192-200.
- Twardowski, A. (2014). Wczesne wspomaganie rozwoju dziecka z niepełnosprawnościami w środowisku rodzinnym. Poznań: Wydawnictwo Naukowe UAM.

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