Poprawska E., Gajewska E., Kluczyński A., Pietrzak M., Sobieska M. Support is the reliable indicator of global motor performance in a one-month-old child. Issue Rehabil. Orthop. Neurophysiol. Sport Promot. 2016; 16: 7–22.

SUPPORT IS THE RELIABLE INDICATOR OF GLOBAL MOTOR PERFORMANCE IN A ONE-MONTH-OLD CHILD

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SUMMARY

Introduction

Knowledge of proper psychomotor development of a child is a prerequisite for correct diagnosis and introducing the effective therapy. No golden standard method is available for quick and reliable assessment of the motor performance at a given moment of infant's life.

Aim

On the basis of the available literature a self-developed sheet for the assessment of the upper extremity function in one month old children was suggested and its practical application was verified.

Subjects and methods

The assessment included 99 infants, without any concomitant diseases, genetic or metabolic disorders. The neurologic assessment was based on the Denver II Development Screening Test. Physiotherapist assessed all children according to a self-developed assessment sheet.

PODPARCIE JEST WIARYGODNYM WSKAŹNIKIEM ROZWOJU MOTORYCZNEGO DZIECKA W WIEKU 1 MIESIĄCA

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STRESZCZENIE

Wstęp

Znajomość poprawnego rozwoju psychomotorycznego dziecka jest kluczowa dla poprawnej diagnozy i wdrożenia ewentualnej terapii. Brak jednak metody diagnostycznej uznanej za złoty standard, służącej ocenie motoryczności w danym momencie życia małego dziecka.

Cel

Na podstawie dostępnej literatury zaproponowano arkusz oceny funkcji kończyny górnej u dziecka w wieku 1 miesiąca, i pokazano jego praktyczne zastosowanie.

Badani chorzy i metody

Ocena obejmowała 99 dzieci bez chorób towarzyszących, wad genetycznych czy metabolicznych. Badanie neurologiczne oparto na teście Denver II. Fizjoterapeuta oceniał wszystkie dzieci wg zaproponowanego arkusza.

Results
The analysis of the child's behavior in prone position is a better diagnostic criterion than in supine position. High compliance was shown with the neurologist's assessment. Whole assessment was shown to be repeatable and reliable.

Conclusions
The assessment of support should be the basis of screening of one-month old infants. The study showed that the swordsman pattern is not a necessary criterion for the proper assessment of motor development in the upper extremity function.

Keywords: motor performance, upper extremity, assessment of the upper extremity function

Date received: June 30th 2016
Date accepted: July 14th 2016

Wyniki
Wykazano wysoką zgodność oceny neurologicznej i fizjoterapeutycznej. Badanie wg zaproponowanego arkusza okazało się powtarzalne i wiarygodne. Ocena motoryczności dziecka w wieku 1 miesiąca w pozycji pronacyjnej wydaje się bardziej istotna niż w pozycji supinacyjnej.

Wnioski
Ocena podporu powinna stanowić podstawę orzekania o prawidłowym rozwoju motorycznym dziecka w wieku 1 miesiąca. Badanie wykazało, że brak przybierania przez dziecko pozycji szermierza niekoniecznie oznacza zaburzenie motoryki w wieku 1 miesiąca.

Słowa kluczowe: motoryczność, kończyna górna, ocena funkcji motorycznej kończyn górnych

Data otrzymania: 30 Czerwca 2016
Data zaakceptowania: 14 Lipca 2016

Introduction

The knowledge of proper psychomotor development of a child for professionals in pee diatric physiotherapy is a prerequisite for correct diagnosis and an effective therapy. Authors of numerous publications emphasize the significance of the qualitative assessment (based on the functional patterns of muscles and the physiological arrangement of the joints) of the mutual arrangement of individual body parts and not just of the quantitative assessment (global: performs/fails to perform). Qualitative assessment is much more precise and therefore allows detection of all abnormalities and early correction of possible developmental disorders, especially that children with disordered development often perform a given activity, but following an abnormal pattern (Orth 2011; Janssen *et al.* 2012). Moreover, it has been proved that qualitative assessment of spontaneous motor skills has a high predictive value for subsequent neurological and psychological assessment (Hadders-Algra 2007; Butcher *et al.* 2009).

Many researchers emphasize that the analysis of the quality of movement is essential for the proper diagnosis, assessment and predicting further development of the child. They also point out that there are many methods of the overall assessment of development. However, experts do not quite agree what elements for this assessment should be included in the battery of tests (Knudson and Morrison 2002; Johnson and Marlow 2006; Heineman 2008; Janssen *et al.* 2009). The available tools are mostly intended for the global assessment of children's motor skills (such as Campbell *et al.* 1993; Persson and Stromberg 1995; Folio and Fewell 2000; Bayley 2007; Henderson *et al.* 2007; Brown and Lalor 2009). There are few qualitative tools for a detailed asł sessment of the upper extremity function, particularly there are no tools that could be used as screening tests for healthy children. The existing measuring instruments are typically intended for older children and those with developmental disorders and not for newborns or infants. Examples of such undoubtedly valuable tools include MACS and GMFM scales (Palisano *et al.* 1997; Eliasson *et al.* 2006; Carnahan *et al.* 2007; Gunel *et al.* 2009; Hidecker *et al.* 2012;).

Motor development in the first months of life is essential to the development of specific patterns related to the function of the grip. This is preceded first by the proper formation of the axial organ (head and the spine), through the support function of the upper extremities, until the development of the grip function, which is necessary for the acquisition and improvement of further skills. Undisturbed function of the upper extremities in the first months of a child's life determines the correct support, and in subsequent stages of development affects the development of skills such as creeping, walking on all fours, oblique or straight sitting, which determine the increasing autonomy of a child (Orth 2011).

Generally, on the basis of literature one can point out the elements of the postural and motor skills assessment, which should be taken into account when examining a child at the age of one month, and which are the first stages of the development of the upper extremity function considered separately.

One month old child in the prone position does not use any base of support, but rather the contact surface. In time, due to the shift of the center of gravity caudally the child begins to move the upper extremities more towards the front in the cephalic direction. A one month old child achieves support (and this is a quantitative, global pattern) on the front parts of the forearms (in the area close to wrist joints) – and this is an element of the qualitative assessment. At this stage of development shoulder joints are protracted. The arms are adducted to the trunk and still set in internal rotation and in retraction, which means that the elbow joints remain at the back of the line joining the shoulders and flexed. Gradually, however, the upper extremities reach towards the sagittal plane. The forearms slightly move forward, but still remain below the shoulder line and in prone position. The hands are slightly clenched in a fist and in ulnarization (facing outward), the thumbs are no longer adducted and hidden inside, but they are outside as the flexion of the fingers is also lesser. In this period the shoulder joints are still hinge joints, not ball and socket joints, which means limited freedom of movement of the arms (absence of complete abduction). The shoulder blades are still positioned distally towards the spine (Cioni and Mercuri 2007; Orth 2011).

It is worth noting that many of the elements are assessed by contrast with the assessment of a newborn baby, and therefore the descriptions contain the repeating phrases "smaller than…" or "less than…"

An infant at the age of one month, in supine position, overloads the facial side of the shoulder joint and the trunk more, and it raises them above the surface at the occipital side. The posture is asymmetrical and unstable. The shoulder joints are raised and extended forwards (still remain protracted). After the age of one month an infant is able to consciously focus its eyesight for a longer period of time. This shows up in the movement pattern referred to using the term: the swordsman's position with an extended upper extremity at the side, towards which the eyesight is focused and with the arm abducted from the trunk and rotated outside. The hand of the extremity is slightly clenched in a fist, with the thumb facing outwards. However, at the side opposite to the direction of the eyesight, the upper extremity is slightly flexed in the shoulder joint, the arm is slightly abducted and the hand is also slightly clenched in a fist (Vojta and Peters 2007; Orth 2011).

Aim

On the basis of the available literature a self-developed sheet for the assessment of the upper extremity function in one month old infants was suggested and its practical application was verified.

Subjects and methods

The investigated group included 99 one month old infants, 45 females, admitted to the clinic of neurology. The reason for the visit to a neurologist could be a referral from a pediatrician, and the most common was prematurity and the positive medical history. In the case of 13 children the parents visited the neurologist due to their disturbing concerns. On average children in the investigated group were born at week 38 ± 3, the mean body weight was 3200 ± 715 g, the mean body length was 54 ± 4 cm, the mean head circumference was 33 ± 2 cm, the mean chest circumference was 33 ± 3 cm. The infants subjected to functional assessment were healthy, without any concomitant diseases, while children with genetic and metabolic disorders were excluded from the study. There were 74 children born at term (the mean week of pregnancy was 39 ± 1), and 25 children born prematurely (the mean week of pregnancy was 34 ± 3). The corrected age was calculated in the case of the latter group. The majority of infants (47) were born vaginally, 35 by caesarean section, 13 with the use of a vacuum and 4 by forceps delivery. During the visit to the neurologist, all children were subjected to trans-fontanel ultrasonography. In 64 children the ultrasound image was normal and in 35 abnormal. Among 35 children with an abnormal image, three children suffered intraventricular haemorrhage due to perinatal complications, each with IVH of a different grade (1, 2, 3 grade).

Procedure

A neurologist was the examining and diagnosing physician. Two neurologists with 20-years of clinical experience participated in the study. A neurologist assessed all children at 1 month, basing on the Denver Development Screening Test II (DDST II) (Ślenzak and Michałowicz 1973; Drachler *et al.* 2007) and the assessment of the reflexes, hypotonia/hypertonia, and symmetry, as suggested by Touven (Touven 1976). One of the assessed elements is the assessment of the development of fine motor skills. It takes into account the assessment of individual functions of the upper extremity in relation to the age of the child, including bringing arms together in the center line of the body. After conducting the examination neurologists classified a child into one of three groups: normal (no neurological abnormalities), suspected (not requiring rehabilitation – for observation) and abnormal. A child was classified as abnormal if it exhibited clear neurological disorders, such as increased (hypertony) or decreased (hypotony) muscle tone accompanied by abnormal reflexes and failure to perform tasks in the area of motor skills for a given age group in the DDST II test. A child was classified into the suspected group – not requiring rehabilitation – for observation if it exhibited mild symptoms of neurological disorders, such as mild muscle tone regulation disorders, slight reflex dysfunction, minor developmental asymmetry and a delay in the area of motor skills in the Denver II Development Screening Test.

The assessment of the functional development was carried out by a physiotherapist, who classified the children into one of two groups: normally developed (correct) or abnormally developed (incorrect). Each child was quantitatively and qualitatively examined in two positions: prone and supine positions. The quantitative assessment (global) included the swordsman's pattern in the supine position (score 0 or 1). In the prone position the quantitative assessment referred to the support on the front part of the forearm (score 0 or 1). The qualitative assessment in the supine position included: abduction with external rotation at the facial side of the shoulder joint, extension of the elbow at the facial side, flexion of the elbow joint at the occipital side, open hand at the facial and occipital sides, thumb facing outward, lesser flexion of fingers; all elements were always assessed on both sides (total maximum score = 12 points).The qualitative assessment in the prone position included: medium protraction of shoulders/lesser than in newborn babies, shoulder blade positioned less distally towards the spine, the arm leaving the front plane (aiming at the sagittal plane) lesser flexion of the elbow joint, forearm extended forwards – but below the line of shoulders, hands with lesser ulnarization, thumb release (thumb outwards), lesser flexion of fingers; all elements were always assessed on both sides (total maximum score = 16 points).

The entire time needed for the assessment was 10–15 minutes of the observation of spontaneous behavior of a child. An element to be considered as completed by a child had to be presented 3–4 times during the observation.

Inter-observer assessment of children at the age of one month was carried out. Two independent physiotherapists carried out simultaneous assessment of the functions of the upper extremities on the whole group of 99 children. They were only informed of the fact whether a child was born prematurely or at term, as corrected age was established for children born prematurely.

Statistical analysis

To compare the number of children who performed or not a given motor activity (0/1), Pearson's Chi² test was used. The overall qualitative variables (in prone and supine positions) were expressed as medians and quartiles, and in the case of the two groups the intergroup differences were analyzed with the U Mann-Whitney test or with the Kruskal-Wallis test, where several groups were compared, assuming the significance level of $p<0.05$. The conformity of neurological and physiotherapeutic assessments was analyzed by non-linear logistic regression, and the comparison of assessments by two independent physiotherapists was performed with the weighted kappa method (MedCalc Statistical Software, version 13.1.0, Ostend, Belgium).

Informed consent was obtained from all of the subjects and the study was approved by the Research Ethics Committee of Poznan University of Medical Sciences and registered under no. 602/13 (13-06-2013). It conformed to all ethical issues included in the Helsinki Declaration.

Results

The analysis covered the impact of prematurity and sex on the development of the upper extremity and no statistically significant differences were found and therefore further investigation was conducted without the division according to sex and whether a child was born at term or prematurely.

Children were divided according to the Apgar scale (following the categories of 0–3, 4–6, 7–10) at 1 minute (median 10, lower quartile Q25 = 8, upper quartile Q75 = 10) and at 3 minute of life (median 10, lower quartile Q25 = 9, upper quartile Q75 = 10). At 5 and 10 minute of life, however, the Apgar score in all investigated children was 10. No impact on the Apgar on the development of a child's hand function was shown.

Having analyzed the impact of risk factors on the development of the hand functions, such as co-occurrence with hyperbilirubinemia, respiratory distress syndrome, type of childbirth and the results of trans-fontanel ultrasonography, no statistically significant differences were found.

The analysis of particular elements of motor performance in the prone position revealed that the majority of children from the group assessed by a physician as normal, were also classified (which includes the assessment of the upper extremity functions) as correct by the physiotherapist (Table 1). On the other hand, children assessed by a neurologist as developing improperly or suspected, were classified by the physiotherapist into the incorrect group. The conformity of neurological and physiotherapeutic assessments, analyzed with the method of non-linear logistic regression proved to be highly significant (Odds ratio = 22.00; $Chi^2(1) = 43.58$, $p<0.001$).

Table 1. Conformity of neurologic and physiotherapeutic assessment.

Physiotherapeutic assessment	Neurologic assessment = normal	Neurologic assessment = suspected	Neurologic assessment = abnormal
correct	80	2	1
incorrect	1	2	13

Specific elements of quantitative and qualitative assessments, the examination results for the whole group and subgroups distinguished due to neurological assessment, the significance of differences between subgroups so divided, as well as the interobserver conformity are shown in Table 2. For both quantitative patterns, respectively in the prone and supine positions, as well as for the individual elements of the qualitative assessment, the number of children not performing or performing a given motor activity was given (0/1).

The conformity of the overall neurological and physiotherapeutic assessments is also confirmed for the individual elements of the assessment; it is possible to indicate highly significant differences in the number of children performing or not an activity when broken down by neurological assessment.

Smaller differences between groups were observed for the swordsman pattern (abduction and external rotation of the upper extremity and with the elbow joint extended or flexed). Although the neurologist classified children as normal, a number of them did not perform this pattern.

It was shown that the inter-observer compliance was high, exact data is provided in the last column of Table 2.

Table 3 shows the results of total qualitative assessment, which consists of 16 elements in the prone position and 12 elements in the supine position. For these assessments the median with quartiles was given for the entire investigated group and subgroups distinguished by the neurologist, the suspected group was described using only quartiles and it was excluded from the statistical analysis due to the low number (n = 4). One can observe highly significant differences between groups classified this way (Mann-Whitney U-test).

Table 2. The group under examination according to the neurological assessment. The number of children who failed to perform or who performed a given element of motor development.

Individual elements of physiotherapeutic assessment (0/1 not performing/performing)	The entire group, n = 99	Neurological assessment: Normal, n = 81	Neurological assessment: Suspected, n = 4	Neurological assessment: Abnormal, n = 14	The difference between subgroups, Pearson's Chi^2 test	Interobserver assessment
Global pattern in prone position (support)	15/84	6/75	0/4	9/5	**30.78** ***p* = 0.000**	1.000
Right shoulder in medium protraction	16/83	7/74	0/4	9/5	**28.08** ***p* = 0.000**	1.000
Left shoulder in medium protraction	17/82	7/74	0/4	10/4	**33.95** ***p* = 0.000**	1.000
Right shoulder blade positioned less distally from the spine	18/81	9/72	0/4	9/5	**23.62** ***p* = 0.000**	0.875
Left shoulder blade positioned less distally from the spine	18/81	8/73	0/4	10/4	**31.33** ***p* = 0.000**	0.886
Right arm reaching towards the sagittal plane	18/81	9/72	0/4	9/5	23.62 *p* = 0.000	0.875

Table 2. (cont.) The group under examination according to the neurological assessment. The number of children who failed to perform or who performed a given element of motor development.

Individual elements of physiotherapeutic assessment (0/1 not performing/performing)	The entire group, n = 99	Neurological assessment			The difference between subgroups, Pearson's Chi² test	Interobserver assessment
		Normal, n = 81	Suspected, n = 4	Abnormal, n = 14		
Left arm reaching towards the sagittal plane	19/80	8/73	0/4	10/4	31.33 *p* = 0.000	0.886
Right elbow joint at lesser flexion	19/80	10/71	0/4	9/5	21.75 *p* = 0.000	1.000
Left elbow joint at lesser flexion	19/80	9/72	0/4	10/4	28.99 *p* = 0.000	1.000
Right forearm extended forwards – but below the shoulder line	18/81	9/72	0/4	9/5	23.62 *p* = 0.000	0.875
Left forearm extended forwards – but below the shoulder line	18/81	8/73	0/4	10/4	31.33 *p* = 0.000	0.886
Lesser ulnarization of the right hand	16/83	7/74	0/4	9/5	28.08 *p* = 0.000	1.000
Lesser ulnarization of the left hand	16/83	7/74	0/4	9/5	28.08 *p* = 0.000	1.000
Right thumb outwards	7/92	7/74	0/4	9/5	11.55 *p* = 0.003	1.000
Left thumb outwards	7/92	7/74	0/4	9/5	11.55 *p* = 0.003	1.000
Fingers of the right hand with lesser flexion	14/85	5/76	0/4	9/5	33.89 *p* = 0.000	1.000
Fingers of the left hand with lesser flexion	14/85	5/76	0/4	9/5	33.89 *p* = 0.000	0.733
Global pattern in the supine position (swordsman's pattern)	31/68	21/60	2/2	8/6	6.09 *p* = 0.048	1.000
Abduction of the right arm with external rotation in the shoulder joint at the facial side	29/70	19/62	2/2	8/6	7.40 *p* = 0.025	1.000
Abduction of the left arm with external rotation in the shoulder joint at the facial side	32/67	22/59	2/2	8/6	5.50 *p* = 0.064	1.000
Extension of the right elbow joint at the facial side	30/69	20/61	2/2	8/6	6.72 *p* = 0.035	1.000
Extension of the left elbow joint at the facial side	33/66	23/58	2/2	8/6	4.96 *p* = 0.084	1.000
Flexion in the right elbow joint at the occipital side	31/68	21/60	2/2	8/6	6.09 *p* = 0.048	1.000
Flexion in the left elbow joint at the occipital side	27/72	17/64	2/2	8/6	8.95 *p* = 0.011	1.000
Hand loosely clenched in a fist at the facial side	17/82	9/72	1/3	7/7	12.87 *p* = 0.002	1.000
Hand loosely clenched in a fist at the occipital side	17/82	9/72	1/3	7/7	12.87 *p* = 0.002	1.000
Right thumb outwards	13/86	6/75	0/4	7/7	**19.61** ***p* = 0.000**	1.000
Left thumb outwards	13/86	6/75	0/4	7/7	**19.61** ***p* = 0.000**	1.000
Fingers of the right hand with lesser flexion	12/87	5/76	0/4	7/7	**22.10** ***p* = 0.000**	1.000
Fingers of the left hand with lesser flexion	12/87	5/76	0/4	7/7	**22.10** ***p* = 0.000**	1.000

Table 3. The investigated group divided according to the neurological assessment, with the exclusion of the suspected group (n = 4). The median and the quartile was given Me (Q25–Q75) for the total qualitative assessment in the prone and supine positions.

Physiotherapeutic assessment	Neurological assessment			Mann–Whitney U–test
	entire group, n = 99 Me (Q25–Q75)	normal n = 81 Me (Q25–Q75)	abnormal n = 14 Me (Q25–Q75)	
Total quality – prone position	16 (16–16)	16 (16–16)	2 (0–16)	$p = 0.000$
Total quality supine position	12 (6–12)	9 (5–12)	3 (0–12)	$p = 0.007$

It was observed that the global pattern in prone position (support) showed very high value of Chi² test, thus it was one of the main differences between children assesses as "normal" by the neurologist and those who were assessed "suspected" or "abnormal". Therefore one more comparison was conducted: all particular elements analyzed in prone and supine positions were compared between children who performed support and those who did not. The results are shown in the Table 4.

When the investigated group was divided according to the presence or absence of support, the sum of the qualitative characteristics achieved by children is noticeably different: children who performed support properly reached at least the total assessment score of 10 in the prone position, while children who failed to perform support did not exceed the total assessment of 4. Most children in the supine position, who failed to perform support, also failed to perform any of the elements of motor

Table 4. The entire investigated group, divided in terms of the support performance; the number of children, who failed to perform or performed (0/1) individual elements of the qualitative assessment in the prone and supine positions, was given.

Position	Individual elements of the qualitative assessment	Children who failed to perform support	Children who performed support	The difference between subgroups, Pearson's Chi² test
Prone	Medium protraction of the right shoulder	16/0	2/82	84.56; $p = 0.000$
	Medium protraction of the left shoulder	16/0	3/81	78.55; $p = 0.000$
	Right shoulder blade positioned less distally from the spine	16/0	3/81	73.20; $p = 0.000$
	Left shoulder blade positioned less distally from the spine	16/0	3/81	73.20; $p = 0.000$
	Right arm reaching towards the sagittal plane	16/0	3/81	73.20; $p = 0.000$
	Left arm reaching towards the sagittal plane	16/0	3/81	73.20; $p = 0.000$
	Right elbow joint at lesser flexion	16/0	4/80	68.42; $p = 0.000$
	Left elbow joint at lesser flexion	16/0	4/80	68.42; $p = 0.000$
	Right forearm extended forwards –but below the shoulder line	16/0	3/81	73.20; $p = 0.000$
	Left forearm extended forwards –but below the shoulder line	16/0	3/81	73.20; $p = 0.000$
	Lesser ulnarization of the right hand	16/0	1/83	84.56; $p = 0.000$
	Lesser ulnarization of the left hand	16/0	1/83	84.56; $p = 0.000$
	Right thumb release (right thumb outwards)	6/10	1/83	23.57; $p = 0.000$
	Left thumb release (right thumb outwards)	6/10	1/83	23.57; $p = 0.000$
	Fingers of the right hand with lesser flexion	14/2	1/83	69.71; $p = 0.000$

Table 4. (cont). The entire investigated group, divided in terms of the support performance; the number of children, who failed to perform or performed (0/1) individual elements of the qualitative assessment in the prone and supine positions, was given.

Position	Individual elements of the qualitative assessment	Children who failed to perform support	Children who performed support	The difference between subgroups, Pearson's Chi² test
Supine	Fingers of the left hand with lesser flexion	14/2	1/83	69.71; $p = 0.000$
	Global: swordsman's pattern	12/4	19/65	16.91; $p = 0.000$
	Abduction of the right arm with external rotation in the shoulder joint at the facial side	12/4	17/67	19.16; $p = 0.000$
	Abduction of the left arm with external rotation in the shoulder joint at the facial side	12/4	20/64	15.89; $p = 0.000$
	Extension of the right elbow joint at the facial side	12/4	18/66	17.99; $p = 0.000$
	Extension of the left elbow joint at the facial side	12/4	21/63	14.94; $p = 0.000$
	Flexion in the right elbow joint at the occipital side	12/4	19/65	16.91; $p = 0.000$
	Flexion in the left elbow joint at the occipital side	12/4	15/84	21.75; $p = 0.000$
	Hand loosely clenched in a fist at the facial side	12/4	5/79	43.99; $p = 0.000$
	Hand loosely clenched in a fist at the occipital side	12/4	5/79	43.99; $p = 0.000$
	Right thumb outwards	12/4	1/83	62.56; $p = 0.000$
	Left thumb outwards	12/4	1/83	62.56; $p = 0.000$
	Fingers of the right hand with lesser flexion	12/4	0/84	69.14; $p = 0.000$
	Fingers of the left hand with lesser flexion	12/4	0/84	69.14; $p = 0.000$

skills (Figure 1 and Figure 2). The significance of differences for total variables between groups divided in terms of the performance of support, investigated using the U Mann-Whitney test, was for the sum of quality and prone position $U = -8.43$; for $p<0.001$ and the sum of quality and supine position $U = -5.06$; $p<0.001$ respectively.

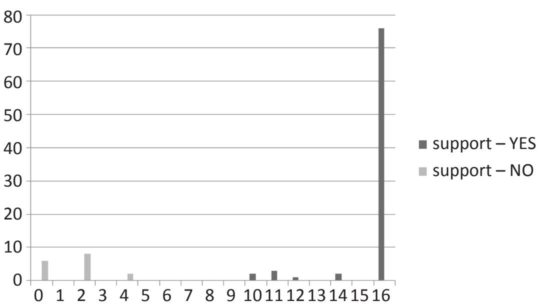

Figure 1. The total quality in prone position.

performance of a child, without specifying the upper extremity function, so they may not detect the function which is absent or performed incorrectly. They are mainly used in the global assessment or are intended for children with damage to the central nervous system, and from the point of view of a physiotherapist the global assessment is not sufficient. Therefore on the basis of

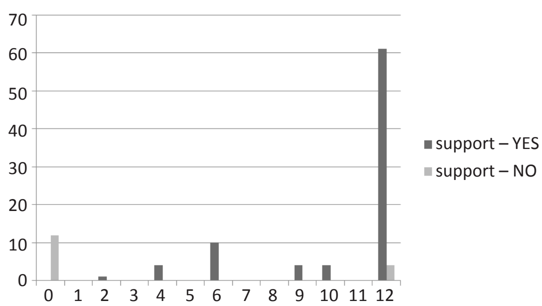

Figure 2. The total quality in supine position.

Discussion

There is little literature information about the function of the upper extremity in infants, particularly regarding the early period of life. The above-mentioned tools often show only the general image of the the available literature and experience of the pediatric physiotherapists, a self-developed sheet was suggested that could help in a detailed, functional assessment of the upper extremity in a child. It could be used in the screening assessment of children, also in case of doubts expressed by parents or the general practitioner, and not only in cases of positive medical history or known neurological disorders. Such assessment could also serve as a starting point for an appropriate therapy.

Authors point out that since the middle of the first trimester, when an infant develops visual orientation and it starts to raise its head and chest for a short period of time, the development of the supporting function of the forearm plays a crucial role. This is a very important change at this stage of development as along with the raising of the head the upper extremities are for the first time used as supporting organs, which is a new global, postural pattern (Vojta and Peters 2007).

On the basis of the available literature (Vojta and Peters 2007; Orth 2011) a self-developed sheet for the assessment of the function of the upper extremity in one month old children was suggested. It presents, in a very detailed way, subsequent skills, which a child acquires with the progressive development. The already described individual movement patterns constitute the development plan, which is widely accepted in the literature, and the rate of implementation of this plan in the first months of life appears to be strongly differentiated. However, it should be noted that the delay or non-occurrence of one of the permanent elements may indicate abnormal development, and the proposed sheet is to become the basis for screening and assessment of children with a history of perinatal disorders or disorders of the nervous system. It could also contribute to the standardization of observations carried out by doctors and therapists to correctly plan a therapy and assess its effects.

The study shows that the swordsman pattern, described in the literature and presented as one of the elements occurring in the child's development at the age of one month is not a necessary feature in the proper development of the upper extremity function. Although this pattern is always mentioned in the literature on physiotherapy, many children classified by a neurologist as healthy, do not manifest this element. Children who failed to perform support (n = 16), in their majority also failed to manifest the swordsman pattern (n = 12), while among those who performed support (n = 84), and were thus regarded as completely healthy, still some (n = 19) failed to manifest this pattern.

It turns out that the analysis of the child's behavior in prone position is a better diagnostic criterion. High compliance in this respect was shown with the neurologist's assessment. In case of support on the belly, a child is forced to overcome the force of gravity, the center of gravity is at that time in the area of the sternum, so the position on the belly seems to be (at least initially) less comfortable than the back for a child at the age of one month. The proportions of the body and the absence of the base of support do not allow free raising and isolated movements of the head in this period. However, it is precisely this position that constitutes a good diagnostic criterion: the children who performed support also show correct motor elements in the supine position.

It can therefore be suggested that the assessment of support, taking into account qualitative elements, should be the basis of screening. A child showing any abnormalities should be carefully supervised, diagnosed in detail and depending on the degree of the abnormality, subjected to appropriate early treatment.

Position of the thumbs do not seem to be such an important feature differentiating children as assessed by the neurologist, although it often concerns general practitioners and parents. However, the release of other fingers both in the supine and prone position seems to be an initial symptom of the further correct support function (Gajewska *et al.* 2013; Gajewska *et al.* 2015) and it has proven to be highly significant both for the classification according to the neurological assessment and according to the performance of support.

Therefore, it seems that the global analysis of the upper extremity functions is not sufficient. Only a detailed qualitative assessment plays a significant role as it enables the detection of possible abnormalities in the development and implementation of an adequate plan of therapy.

The study showed following features: physiotherapeutic assessment is in good agreement with neurologic assessment; detailed analysis of elements combining into global function may reveal abnormalities; prone position seems more important in assessment, even in very small children. Suggested assessment sheet allows for quick and complex motor assessment of a child.

Conclusions

1. The assessment of support, taking into account qualitative elements, should be the basis of screening for newborns and infants.
2. The study shows that the swordsman pattern, described in the literature and presented as one of the elements present in the child's development at the age of one month is not a necessary feature for the proper performance of the upper extremity function.

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Informed consent was obtained from all of the subjects and the study was approved by the Research Ethics Committee of Poznan University of Medical Sciences and registered under no. 602/13 (13-06-2013). It conformed to all ethical issues included in the Helsinki declaration.

Authors reported no source of funding.
Authors declared no conflict of interest.

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Autorzy nie zgłosili źródła finansowania.
Autorzy nie deklarowali konfliktu interesów.

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