Evaluation of Self-Concept and Emotional-Behavioral Functioning of Children with Brachial Plexus Birth Injury

Lori A. Belfiore¹ Carol Rosen² Rachel Sarshalom³ Leslie Grossman⁴ Debra A. Sala⁵
John A. I. Grossman⁴,⁵

¹Department of Occupational Therapy, NYU Hospital for Joint Diseases, New York, New York, United States
²Pediatric Psychology Services, NYU Hospital for Joint Diseases, New York, New York, United States
³Department of Occupational Therapy, Nicklaus Children’s Hospital, Miami, Florida, United States
⁴Brachial Plexus and Peripheral Nerve Program, Nicklaus Children’s Hospital, Miami, Florida, United States
⁵Department of Orthopedics, NYU Hospital for Joint Diseases, New York, New York, United States

Address for correspondence Lori A. Belfiore, MS, OTR/L, Department of Occupational Therapy, NYU Hospital for Joint Diseases, 301 East 17th Street, New York, NY 10003, United States (e-mail: Lori.belfiore@nyumc.org).

Abstract

Background  The reported incidence of brachial plexus birth injury (BPBI) is 0.87 to 2.2 per 1,000 live births. The psychological functioning, including self-concept and emotional-behavioral functioning, of children with BPBI has only been examined to a limited extent.

Objective  The purpose of this study was to describe the self-concept and emotional-behavioral functioning in children with BPBI from both the child’s and parent’s perspective.

Methods  Thirty-one children with BPBI, mean age 11 years 1 month, completed the Draw A Person: Screening Procedure for Emotional Disturbance (DAP:SPED) and Piers Harris Children’s Self-Concept Scale (PHCSCS). The parents answered questions from the Behavior Assessment System for Children, Parent Rating Scales (BASC-2 PRS).

Results  The scores from the DAP:SPED drawings showed further evaluation was not strongly indicated in the majority of the children. The PHCSCS Total score demonstrated that the children had a strongly positive self-concept. The parental responses to the BASC-2 PRS indicated that few children were at risk or in the clinically significant range for the four composite scores and all of the component clinical or adaptive scales. Gender comparison revealed females exhibited greater anxiety than males.

Conclusion  Both children and parents reported a positive psychological well-being for the majority of the children. Parents had greater concerns about their child’s social-emotional functioning, particularly anxiety. An interdisciplinary approach (occupational therapy evaluation, clinical observation, and parental interview) is necessary to determine the need for mental health referral.
Introduction

The estimated incidence of brachial plexus birth injury (BPBI) ranges from 0.87 to 2.2 per 1,000 live births. While spontaneous recovery occurs in the majority of cases, some children still present with residual deficits. The nerve injury results in muscle imbalances of the upper extremity, causing musculoskeletal changes and deformities over time. Despite advances in identifying risk factors, and early treatment and intervention, including primary and secondary surgical techniques, this population still faces upper limb deformity, which influences aesthetics and functionality. The variability in the severity of injury and clinical presentation requires a multidisciplinary, client-centered approach, which addresses not only the physiological but also the psychological status of the child.

Psychological status includes self-esteem, self-concept, self-image, emotional-behavioral functioning, anxiety, and adaptability. Piers and Herzberg defined self-concept as “a relatively stable set of attitudes reflecting both description and evaluation of one’s own behaviors and attributes.” The importance of psychological health as an indicator of outcome has been acknowledged; however, research regarding self-concept and emotional-behavioral functioning of children with BPBI has been limited.

Previous research has examined the psychological functioning in children with various congenital/acquired limb deficiencies other than BPBI. Varni et al reported, in a cohort of 42 children with congenital limb loss and 7 with acquired limb loss, the degree of limb loss was not significantly related to the level of psychological adaptation. Not surprisingly, perception of strong social support among classmates, family, and friends was related to higher self-esteem among 34 children with congenital limb loss and 7 with acquired limb loss. Further investigating the relationship of the degree of deformity and self-concept, ninety-two 9- to 11-year-olds with hand deformities and upper extremity deformities/deficiencies were found to have self-esteem as high as children in an unaffected comparison group. Contrary to the researchers’ hypothesis that the children with severe deformities would show low self-esteem, actually the children with mild deformities showed lower self-esteem than those with more severe deformities. The authors suggested that children with severe deformities received empathy from the beginning, as the deformity was so apparent. It was hypothesized that children in the mild deformity group appear to be more similar to their peers and they and their caregivers may minimize the deformity. Both the lack of extra support and attempts to dismiss the deformity may lead to poorer self-esteem.

In contrast, for a group of adolescents with mild hemiplegia, a negative correlation was found between self-esteem and the amount of elbow flexion posturing in this group with movement deviations in one upper extremity. That is, patients with greater elbow flexion posturing had lower self-esteem.

Few studies have evaluated the psychological status of children with BPBI. Al-Qattan and Al-Khawashi focused on the self-image of a group of Saudi Arabian children whose primary complaint was the impact on social functioning, including peer rejection and school refusal. Improved social interaction was reported following surgical procedures to correct supination contractures and distal extremity weakness. Bellew et al examined developmental and behavioral problems of toddlers with BPBI, finding those with more severe injuries may be at increased risk for problems with independence, peer interaction, and activities of daily living.

For health professionals in a pediatric setting, a variety of tools are available to evaluate children’s psychological status. Human figure drawings have been used frequently to assess emotional functioning in children and adolescents. In a large brachial plexus clinic, Ramos and colleagues observed asymmetries in pediatric patients’ self-portraits. As a result of these preliminary findings, the present study was designed to further explore self-concept and emotional-behavioral functioning in this population. The purpose of this study was to describe the self-concept and emotional-behavioral functioning in children with BPBI from both the child’s and parent’s perspective through the use of standardized assessments.

Methods

Thirty-one children with diagnosis of BPBI participated in this institutional review board–approved study. All children and their parents have given informed assent and consent, respectively. The level of brachial plexus injury was classified as C5/C6, C5/C6/C7, or C5–T1 (global). From May 2012 to January 2013, each patient was evaluated at the Brachial Plexus Clinic at one of two hospitals using the following instruments: Draw A Person: Screening Procedure for Emotional Disturbance (DAP:SPED), Piers Harris Children’s Self-Concept Scale, Second Edition (PHCSCS), and Behavior Assessment System for Children, Parent Rating Scales, Second Edition (BASC-2 PRS). The DAP:SPED is a screening instrument to identify children and adolescents, aged 6 to 17 years, who may have emotional and behavioral difficulties. Each examinee draws a picture of a man, woman, and self on three separate pages and is allotted 5 minutes per drawing. Each drawing is scored according to 55 items. A total raw score for each drawing is derived and converted to a T-score (mean = 50, standard deviation = 10), with higher scores suggesting more emotional disturbance. The reliability coefficients for the DAP:SPED have been found to be good to excellent. The DAP:SPED is the most psychometrically sound human figure drawing instrument currently available.

The PHCSCS, which has the subtitle “The Way I Feel About Myself,” is a 60-item self-report instrument developed for children and adolescents, aged 7 to 18 years. It usually takes 10 to 15 minutes for the child to complete. The PHCSCS includes a Total score, measuring overall self-concept, and six domain scales, measuring specific components of self-concept. The six domain scales are: Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, and Happiness and Satisfaction. Results are based on T-scores, with higher scores indicating a more positive self-evaluation. For the Total score, scores ≥ 60T are classified as high range, 40T to 59T as average range, and ≤ 39T as low range. For the domain scales, ≥ 56T is
classified as above average range, 40T to 55T as average range, and ≤ 39 as low average range.

The BASC-2 PRS,17 widely used to aid in clinical diagnosis and in treatment planning, is a comprehensive questionnaire completed by the caregiver that measures aspects of a child’s or adolescent’s behavior and adaptive functioning in community and home settings. The BASC-2 PRS uses a four choice response format, indicating frequency of occurrence, and can be completed in 10 to 20 minutes. Depending on the child’s age, the caregiver completes the Child (ages 6–11 years) or Adolescent (ages 12–21 years) Form. Raw scores are converted to T-scores. For three of the four composite scores (Externalizing Problems, Internalizing Problems, and Behavioral Symptoms Index) and their component clinical scales (Hyperactivity, Aggression, Conduct Problems, Anxiety, Depression, Somatization, Atypicality, Withdrawal, and Attention Problems), T-scores between 60 and 69 fall in the “at-risk” range and T-scores of ≥ 70 fall in the clinically significant range. For the fourth composite score (Adaptive Skills composite score) and its component adaptive scales (Adaptability, Social Skills, Leadership, Activities of Daily Living, and Functional Communication), T-scores between 31 and 40 indicate “at-risk” of adaptive impairment and scores of ≤ 30 indicate clinically significant adaptive impairment. The BASC-2 PRS demonstrated high reliability, stability over time, and validity.

Data Analysis

For all three instruments, T-scores, which have a mean of 50 and standard deviation of 10, were determined. The frequency and percentage of clinical classifications were calculated for the instruments. The ages and T-scores for males and females were compared using the t-test for independent samples. p-value of < 0.05 was considered statistically significant.

Results

The 31 children, 17 females and 14 males, had a mean age of 11 years 1 month (range, 7 years 4 months to 17 years 10 months). The level of injury was C5/C6 in 19 patients (61%), C5/C6/C7 in 7 (23%), and global in 5 (16%).

The mean, standard deviation, and range of the T-scores for the three tests are reported in –Table 1. All of the means of the test scores were within 1 standard deviation, that is, within 40 to 60 points.

– Table 2 contains the division of the cases on the basis of the clinical classifications of the test scores for each of the instruments. For the DAP/SPED,16 further evaluation was strongly indicated for three children (10%) (–Fig. 1).

On the basis of the self-evaluation PHCSCS6 Total score, all of the children scored themselves at least in the average range, with 10 (32%) children scoring in the high range (≥ 60), indicating strongly positive self-concept. None of the children scored in the low range (≤ 39) (–Fig. 2). For all of the domains, the majority of the children’s scores were average. Scores were in the low range (≤ 39) for four children for Freedom from Anxiety, four for Popularity, two for Behavioral Adjustment, one for Intellectual and School Status, one for

| Assessment                                      | Mean (SD) | Range |
|------------------------------------------------|-----------|-------|
| Draw A Person                                   | 53.0 (11.5) | 32–80 |
| Piers-Harris Children’s Self-Concept Scale     |           |       |
| Total Score                                     | 53.6 (7.5) | 40–66 |
| Domains                                         |           |       |
| Behavioral Adjustment                           | 54.7 (7.0) | 37–62 |
| Intellectual and School Status                  | 51.5 (7.6) | 30–65 |
| Physical Appearance and Attributes              | 52.5 (7.4) | 38–65 |
| Freedom from Anxiety                            | 51.2 (8.0) | 37–65 |
| Popularity                                      | 50.8 (8.4) | 33–68 |
| Happiness and Satisfaction                      | 54.7 (6.2) | 40–59 |

| Behavior Assessment System for Children         |           |       |
| Composite Scores                                |           |       |
| Externalizing Problems                          | 46.9 (8.2) | 35–68 |
| Internalizing Problems                          | 50.6 (11.4) | 34–83 |
| Behavioral Symptoms Index                       | 48.3 (8.1) | 36–66 |
| Adaptive Skills                                 | 51.7 (9.3) | 30–66 |
| Scale Scores                                    |           |       |
| Hyperactivity                                   | 48.6 (9.3) | 36–67 |
| Aggression                                      | 46.8 (7.7) | 37–64 |
| Conduct Problems                                | 46.2 (8.1) | 34–73 |
| Anxiety                                         | 52.5 (13.0) | 30–76 |
| Depression                                      | 48.8 (11.4) | 37–94 |
| Somatization                                    | 50.0 (10.3) | 36–84 |
| Atypicality                                     | 48.3 (7.1) | 41–65 |
| Withdrawal                                      | 50.1 (9.9) | 34–78 |
| Attention Problems                              | 49.5 (10.6) | 35–72 |
| Adaptability                                    | 53.8 (10.1) | 21–68 |
| Social Skills                                   | 51.5 (10.6) | 32–69 |
| Leadership                                      | 53.5 (10.0) | 34–68 |
| Activities of Daily Living                      | 49.1 (8.9) | 34–67 |
| Functional Communication                        | 49.3 (9.3) | 28–66 |

![Fig. 1](image) Draw A Person: Screening Procedure of Emotional Disturbance: frequency distribution of levels of need for further evaluation.
Physical Appearance and Attributes, and none for Happiness and Satisfaction.

Parents’ responses on the BASC-2 PRS\textsuperscript{17} indicated for the composite scores that two children (7\%) were at risk and three (10\%) were in clinically significant range for Internalizing Problems, three children (10\%) were at risk and one (3\%) was in the clinically significant range for Adaptive Skills, three children (10\%) were at risk for Behavioral Symptom Index, and one child (3\%) was at risk for Externalizing Problems (\textbf{Fig. 3}). For each of the scales, the number and percentage of children who were scored as at risk or clinically significant are included in \textbf{Table 3}. Seven children (23\%) were considered to be at risk for difficulties in Social Skills, and four each (13\%) for Hyperactivity, Anxiety, and Functional Communication problems. The most frequent clinically significant score was for Anxiety (n = 4, 13\%). Seven of the eight children (88\%) who had at risk or clinically significant Anxiety scores were female. Clinically significant scores were also found for two children (7\%) for Depression, and one each (3\%) for Conduct Problems, Somatization, Withdrawal, Attention Problems, Adaptability, and Functional Communication. One parent’s BASC-2 PRS data were excluded because the form was not completed properly.

For the gender comparison, the males and females were of similar ages (11 years 5 months vs. 10 years 10 months; t (29) = 0.637, p = 0.529). The only significant differences in test scores were found on the BASC-2 PRS,\textsuperscript{17} with females having higher scores than males for Internalizing Problems (54.3 vs. 45.9; t(28) = -2.133, p = 0.042) and Anxiety (57.0 vs. 46.8; t(28) = -2.270, p = 0.031) (\textbf{Table 4}).

Individual’s scores across the PHCSCS\textsuperscript{8} and BASC-2 PRS\textsuperscript{17} showed that two children had scores outside of the normal range on multiple scales on the BASC-2 PRS.

**Discussion**

In general, a positive psychological well-being was reported for the majority of children in the present study by both the children and their parents. The children described themselves as having an overall positive self-concept, with only a few expressing concerns with anxiety, peer relationships, acknowledgment of problematic behaviors, academic capabilities, physical appearance, leadership, and/or ability to express ideas. Additionally, the children’s drawings showed that most of them did not indicate emotional or related behavior problems, but for a small percentage, their drawings suggested further evaluation was warranted. Andersson et al,\textsuperscript{11} also using the PHCSCS,\textsuperscript{8} found similar results of no difficulties in self-concept and psychological well-being in a group of preadolescents with mild or severe hand deformities. When they divided their sample on the basis of the degree of deformity, the females categorized themselves as having greater anxiety than the males in the severe deformity group. Additionally, the males with mild deformities had poorer self-concept than those with severe deformities. The authors suggested that the child with a milder disability, by concealing their less obvious deformity, does not attract the needed support, leading to a diminished self-concept.

Parental responses revealed greater concerns about their children’s social-emotional functioning, particularly symptoms of anxiety. A gender difference, with females exhibiting greater anxiety than males, was noted on the parental report. Seven of the eight subjects with “at risk” or “clinically significant range” for Anxiety had female parents.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|}
\hline
Assessment & Frequency & Percent \\
\hline
\textbf{Draw A Person (N = 31)} & & \\
Further evaluation: & & \\
Not indicated & 18 & 58 \\
Indicated & 10 & 32 \\
Strongly indicated & 3 & 10 \\
\hline
\textbf{Piers Harris Children’s Self-Concept Scale (N = 31)} & & \\
Total score & & \\
Low & 0 & 0 \\
Average & 21 & 68 \\
High & 10 & 32 \\
\hline
\textbf{Behavioral Assessment System for Children (N = 30)} & & \\
Externalizing problems & & \\
Within normal limits & 29 & 97 \\
At risk & 1 & 3 \\
Clinically significant range & 0 & 0 \\
Internalizing problems & & \\
Within normal limits & 25 & 83 \\
At risk & 2 & 7 \\
Clinically significant range & 3 & 10 \\
Behavioral symptom index & & \\
Within normal limits & 27 & 90 \\
At risk & 3 & 10 \\
Clinically significant range & 0 & 0 \\
Adaptive skills & & \\
Within normal limits & 26 & 87 \\
At risk & 3 & 10 \\
Clinically significant range & 1 & 3 \\
\hline
\end{tabular}
\caption{Clinical classifications}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Piers-Harris Children’s Self-Concept Scale: frequency distribution of Total score.}
\end{figure}
significant” scores on the Anxiety Scale were females. Other than for anxiety, only an occasional child was deemed to have clinically significant issues on any of the BASC-2 PRS scales. In a comparison of children with BPBI and a control group, parents evaluated their children's emotional and behavioral symptoms using a comparable test, the Child Behavior Checklist, and similarly viewed their children to have higher levels of anxiety than the control group. For all scales representing similar psychological constructs (i.e., aggression, anxiety, somatization, withdrawal, attention problems, social skills), a greater percentage of the children in the BPBI group were scored in the clinically significant range than the children in the current study. In contrast to these authors’ findings of 26% of the scores being in the clinical range for externalizing problems as well as internalizing problems, the present group had only 10% in the clinically significant range for internalizing problems and none for externalizing problems. Furthermore, these percentages were similar to those of their control group, 12 and 0%, respectively.

Overall psychological adjustment should not be based on the results of one measure. For the three cases whose DAP/SPED scores suggested further evaluation, their scores on the other two assessments were not elevated. Similarly, two different children had at-risk or clinically significant scores on multiple scales of the BASC-2 PRS, but their scores on the other two instruments did not indicate similar concerns.

One limitation of the study was the inability to compare the child’s and parent’s assessment of self-concept and emotional-behavioral functioning utilizing their responses to the child and parent versions of the same standardized test. An evaluation of current functional abilities was not included and therefore the potential relationship between function and self-concept could not be examined. The initial level of brachial plexus injury was reported, but this was not an adequate indicator of function as many of the children have had surgical intervention, which could have had an effect on their abilities.

In conclusion, the children with BPBI had good self-concept and emotional-behavioral functioning, and their parents viewed them similarly. Because the staff of the Brachial Plexus Clinic have a greater awareness of the possibility of children with BPBI having social-emotional problems, the pediatric occupational therapists currently screen each child using the Self-Evaluation Scale of the Brachial Plexus Outcome Measure. This combined with clinical observation and parental interview as well as interdisciplinary team discussion would determine if a mental health referral is warranted.

Table 3  Frequency of clinical classifications of BASC-2 PRS Scale Scores

| Scale               | At risk (%) | Clinically significant (%) |
|---------------------|-------------|----------------------------|
| Hyperactivity       | 4 (13)      | 0                          |
| Aggression          | 2 (7)       | 0                          |
| Conduct Problems    | 0           | 1 (3)                      |
| Anxiety             | 4 (13)      | 4 (13)                     |
| Depression          | 1 (3)       | 2 (7)                      |
| Somatization        | 3 (10)      | 1 (3)                      |
| Atypicality         | 3 (10)      | 0                          |
| Withdrawal          | 3 (10)      | 1 (3)                      |
| Attention Problems  | 3 (10)      | 1 (3)                      |
| Adaptability        | 1 (3)       | 1 (3)                      |
| Social Skills       | 7 (23)      | 0                          |
| Leadership          | 2 (7)       | 0                          |
| Activities of Daily Living | 3 (10) | 0                          |
| Functional Communication | 4 (13) | 1 (3)                      |
Table 4  Comparison of males and females (t-test for independent samples)

| Assessment                                      | Males     | Females   | p-value |
|-------------------------------------------------|-----------|-----------|---------|
| Draw A Person                                   | 50.1 (12.0) | 55.3 (10.9) | 0.222  |
| Piers-Harris Children’s Self-Concept Scale      |           |           |         |
| Total Score                                     | 52.8 (7.1) | 54.2 (8.0) | 0.601  |
| Behavioral Adjustment                           | 53.8 (7.1) | 55.5 (7.0) | 0.513  |
| Intellectual and School Status                  | 49.5 (5.7) | 53.1 (8.7) | 0.201  |
| Physical Appearance and Attributes              | 53.5 (7.1) | 51.6 (7.8) | 0.483  |
| Freedom from Anxiety                            | 51.6 (7.9) | 50.9 (8.4) | 0.817  |
| Popularity                                      | 50.2 (9.4) | 51.4 (7.6) | 0.712  |
| Happiness and Satisfaction                      | 53.6 (7.0) | 55.5 (5.5) | 0.405  |
| Composite Scores                                |           |           |         |
| Externalizing Problems                          | 46.9 (10.2) | 46.8 (6.5) | 0.974  |
| Internalizing Problems                          | 45.9 (7.3) | 54.3 (12.8) | 0.042  |
| Behavioral Symptoms Index                       | 47.0 (7.9) | 49.3 (8.3) | 0.450  |
| Adaptive Skills                                  | 51.3 (8.9) | 52.1 (9.9) | 0.831  |
| Scale Scores                                    |           |           |         |
| Hyperactivity                                    | 47.5 (10.2) | 49.4 (8.9) | 0.607  |
| Aggression                                       | 47.1 (9.5) | 46.7 (6.4) | 0.883  |
| Conduct Problems                                 | 47.0 (10.1) | 45.7 (6.5) | 0.659  |
| Anxiety                                          | 46.8 (9.2) | 57.0 (14.0) | 0.031  |
| Depression                                       | 44.9 (7.2) | 51.9 (13.2) | 0.094  |
| Somatization                                     | 48.2 (8.5) | 51.4 (11.5) | 0.418  |
| Atypicality                                      | 48.1 (7.5) | 48.5 (6.9) | 0.883  |
| Withdrawal                                       | 48.5 (9.5) | 51.2 (10.3) | 0.470  |
| Attention Problems                               | 50.1 (12.0) | 49.0 (9.7) | 0.788  |
| Adaptability                                     | 55.9 (7.4) | 52.2 (11.7) | 0.323  |
| Social Skills                                    | 50.1 (12.1) | 52.6 (9.5) | 0.529  |
| Leadership                                       | 51.8 (10.0) | 54.9 (10.1) | .408  |
| Activities of Daily Living                      | 49.5 (9.0) | 48.7 (9.0) | .804   |
| Functional Communication                         | 48.2 (9.7) | 50.1 (9.3) | .592   |

Conflict of Interest
The authors declare that they have no conflict of interest.

Compliance with Ethical Approval
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all individual participants included in the study (informed assent was obtained from children and informed consent from parents).

References
1. Bager B. Perinatally acquired brachial plexus palsy—a persisting challenge. Acta Paediatr 1997;86(11):1214–1219
2. Hardy AE. Birth injuries of the brachial plexus: incidence and prognosis. J Bone Joint Surg Br 1981;63-B(1):98–101
3. Walsh JM, Kandamany N, Ni Shuibhne N, Power H, Murphy JF, O’Herlihy C. Neonatal brachial plexus injury: comparison of incidence and antecedents between 2 decades. Am J Obstet Gynecol 2011;204(4):324.e1–324.e6
4. DiTaranto P, Campagna L, Price AE, Grossman JAI. Outcome following nonoperative treatment of brachial plexus birth injuries. J Child Neurol 2004;19(2):87–90
5. Wall LB, Mills JK, Leveno K, et al. Incidence and prognosis of neonatal brachial plexus palsy with and without clavicle fractures. Obstet Gynecol 2014;123(6):1288–1293
6. Grossman JAI, Ramos LE, Shumway S, Alfonso I. Management strategies for children with obstetrical brachial plexus injuries. Int Pediatr 1997;12:82–85
7. Ruchelsman DE, Pettrone S, Price AE, Grossman JAI. Brachial plexus birth palsy: an overview of early treatment considerations. Bull NYU Hosp Jt Dis 2009;67(1):83–89
8. Piers EV, Herzberg DS, Piers-Harris Z; Piers-Harris Children’s Self-Concept Scale. 2nd ed. Manual. Los Angeles, CA: Western Psychological Services; 2002
9. Varni JW, Setoguchi Y, Rappaport LR, Talbot D. Psychological adjustment and perceived social support in children with congenital/acquired limb deficiencies. J Dev Behav Pediatr 1989;10(1):13–16
10. Andersson GB, Gillberg C, Fernell E, Johannson M, Nachemson A. Children with surgically corrected hand deformities and upper limb deficiencies: self-concept and psychological well-being. J Hand Surg Eur Vol 2011;36(9):795–801
11. Riad J, Broström E, Langius-Eklöf A. Do movement deviations influence self-esteem and sense of coherence in mild unilateral cerebral palsy? J Pediatr Orthop 2013;33(3):298–302
12. Al-Qattan MM, Al-Khawashki H. The “beggar’s” hand and the “unshakable” hand in children with total obstetric brachial plexus palsy. Plast Reconstr Surg 2002;109(6):1947–1952
13. Bellew M, Kay SP, Webb F, Ward A. Developmental and behavioural outcome in obstetric brachial plexus palsy. J Hand Surg [Br] 2000;25(1):49–51
14. Naglieri JA, McNeish JA, Bardos AN. Draw A Person: Screening Procedure for Emotional Disturbance. Examiner’s Manual. Austin, TX: Pro-ed; 1991
15. Reynolds CR, Kamphaus RW. BASC-2: Behavior Assessment System for Children. 2nd ed. Manual. Bloomington, MN: Pearson; 2004
16. Matto HC. Investigating the validity of the Draw-A-Person: Screening Procedure for Emotional Disturbance: a measurement validation study with high-risk youth. Psychol Assess 2002;14(2):221–225
17. Alyanak B, Kılıçaslan A, Kutlu L, Bozkurt H, Aydin A. Psychological adjustment, maternal distress, and family functioning in children with obstetrical brachial plexus palsy. J Hand Surg Am 2013;38(1):137–142
18. Ho ES, Curtis CG, Clarke HM. The brachial plexus outcome measure: development, internal consistency, and construct validity. J Hand Ther 2012;25(4):406–416, quiz 417