Evaluation of the social skills of low birthweight infants using the Interaction Rating Scale

YUKO SAWADA, RPT, PhD1)*, NORITSUGU HONDA, RPT, PhD2), MAKIKO NARUMIYA, CP, MS3), HIROSHI MIZUMOTO, MD, PhD3)

1) Department of Physical Therapy, Morinomiya University of Medical Sciences: 1-26-16 Nanko-kita, Suminoe-ku, Osaka 559-8611, Japan
2) Rehabilitation Center, Kitano Hospital, Tazuke Kofukai Medical Research Institute, Japan
3) Department of Pediatrics, Kitano Hospital, Tazuke Kofukai Medical Research Institute, Japan

Abstract. [Purpose] This study aimed to examine, using the Interaction Rating Scale, the effect of social skills at 18 months of life on the subsequent development of low birthweight infants. [Participants and Methods] The study participants were made up of a total of 23 infants who were admitted to the neonatal intensive care unit of Hospital A and whose developmental indexes were followed up at the outpatient clinic for up to 3 years of age. The survey was conducted twice in each infant, at a corrected age of 18 months and at 36 full months of age. Social skills and developmental indexes were assessed at the corrected age of 18 months, meanwhile only developmental indexes were assessed at 36 full months, to examine associations. The Interaction Rating Scale was used to assess social skills. This scale measures various aspects of social development by observing caregiver-child interactions in situations wherein children are engaged in tasks more difficult for their age. [Results] The results demonstrated that social skills at 18 months were associated with the developmental indexes at 18 and 36 months, whereas more items were associated with the developmental index at 36 months. [Conclusion] The results indicate the need for early prediction of developmental delay and timely intervention, by assessing social skills in low birthweight infants.

Key words: Low birthweight infants, Development, Social skills

INTRODUCTION

Advances in perinatal care technology have improved survival rates for low birthweight infants1–5). However, the number of infants undergoing treatment in neonatal units has increased, and their high risk of neurodevelopmental abnormalities represents a considerable challenge6–9). There are developmental risk challenges posed by preterm delivery and low birthweight10–13). In the neonatal intensive care unit (NICU), care is tailored to the developmental needs of the newborn, such as adjusting lighting and machine sounds14, 15). In clinical practice, follow-up outpatient clinics have been established to monitor children’s development over time and provide the necessary support when needed. The effectiveness of many interventions aimed at developmental support has been reported16). Developmental support should not be provided only for a short period during hospitalization but should involve a long-term perspective17, 18). Long-term follow-up has revealed that children who are hospitalized face a higher risk of developmental abnormalities compared to children who were not hospitalized, and their behavior during hospitalization is a predictor of this19, 20). Attention deficit hyperactivity disorder and autism spectrum disorders are considered severe developmental risks for high-risk children, who often have difficulty interacting with others and adjusting to group living. The symptoms of these problems often become apparent around the age of three. The challenge is to assess the child’s development and link it to the appropriate support in the follow-up outpatient clinic. In clinical situa-

*Corresponding author. Yuko Sawada (E-mail: y-sawada@morinomiya-u.ac.jp)
©2022 The Society of Physical Therapy Science. Published by IPEC Inc.
This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: https://creativecommons.org/licenses/by-nc-nd/4.0/)
tions, signs, such as “frequent crying” and “difficulty adjusting to the environment”, may be identified at an early stage. Early detection and early support based on predictive signs would be useful for the individual and their family.

In developmental cohorts of children in Japan, “social skills” have been the focus of attention, and assessments using the “involvement index” have been conducted\(^{21-27}\). Some studies have used pre- and post-intervention assessments and found that these abilities are changeable through intervention\(^{28-32}\). Moreover, it has also been found that “relationships with others” lead to change, that is, social skills increase, developmental indices also increase\(^{33-37}\). However, no studies have evaluated and validated social competence using the “Interaction Rating Scale (IRS)” in preterm infants. Therefore, it would be useful to add it to the index in follow-up outpatient care for preterm infants and to evaluate the developmental assessment situation objectively.

This study aimed to measure the involvement index in low birthweight infants who have experienced NICU hospitalization and verify its association with birth risk and developmental index.

**PARTICIPANTS AND METHODS**

The participants comprised 23 children who were admitted to Hospital A’s NICU (Osaka city, Japan) between October 1, 2014 and December 31, 2018 with a birthweight of less than 1,500 g and a fertility week of less than 0 weeks. Their parents had consented to and participated in the 18-month and 36-month surveys. Figure 1 shows the process of selecting the study participants and the characteristics of the target children. The mean birthweight was 1010.5 (553–1,499) g, and the mean number of weeks of gestation was 28 w0d (23 w0d–36 w3d). The developmental index averaged 96.6 ± 19.2 (50–120) at 18 months corrected and 89.4 ± 14.9 (57–113) at 36 full months.

The following items were investigated: the birthweight, number of days after conception at birth, social skills (IRS)\(^{38}\), and developmental index (Kyoto Scale of Psychological Development 2001 [KSPD 2001])\(^{39}\). After discharge, social skills (18M) and the developmental index were assessed at the follow-up outpatient clinic.

In this study, we used the IRS to assess social ability. This index measures various aspects of social development by observing the interaction between caregivers and children. The reliability and validity of the assessment have been examined. The content is based on a situation in which a caregiver engages the child in a more difficult task than appropriate for the child’s age. The child works toward achieving the goal, and the interaction is assessed in an everyday, naturalistic manner\(^{38}\). The authors have conducted this evaluation as a preliminary study with three pairs of parents and children and have confirmed its feasibility\(^{39}\). It consists of five domains on the child’s side (autonomy, responsiveness, empathy, motor regulation, and emotional regulation) and five domains on the caregiver’s side (children’s independence, responsiveness, empathy, cognitive development, and consideration for socio-emotional aspects). In this study, only the “children’s aspect” was assessed because the social aspect of children was the subject of analysis. Five minutes of building blocks and drawing scenes were set up, which were used as the children’s domain score. The evaluation method was based on a binary evaluation (0 points, 1 point) of the occurrence or non-occurrence of the behavioral evaluation, and the domain score was calculated by simple addition.

The developmental outcome was evaluated at 18 months of corrected age and at 3 years of age using the KSPD 2001\(^{39}\). The KSPD 2001 is a standardized developmental test that has been widely used in clinical settings in Japan.

**Fig. 1.** Process of selecting the study participants and the characteristics.
The purpose, methods, and ethical considerations of the study were fully explained to the parents, and consent was obtained. Participation in the study was voluntary and could be terminated at any time. Names were kept anonymous and ID numbers were used to protect personal information. It was explained that the personal information would be kept strictly confidential, data would not be used for any purpose other than the study, and there would be no disadvantage or hindrance to the medical care provided if the study was terminated. The study was conducted with the approval of the Morinomiya Medical University Medical Review Committee (Approval No. 2019-073 Recognition date; October 11, 2019).

Analysis was conducted by calculating Spearman’s correlation coefficient to examine the relationship between the impression scores in each domain and the developmental index. In addition, the Mann–Whitney test was used to examine the relationship between impression scores and developmental indices. IBM SPSS Statistics 27 (Tokyo, Japan) was used as the analysis software.

RESULTS

Median values were compared by the occurrence of the behavior in each area. The results are shown in Table 1. There were no significant differences in behavioral occurrence in weeks of gestation and birthweight. In the modified 18-month developmental index, the medians for “Child stops displaying distress cues without caregiver’s soothing attempts” in the emotional regulation domain were 104.0 and 104.0. In the emotional regulation domain, the scores for “Child is not startled by caregiver’s movements or changes in their facial expression” were 104.0 for those with the behavior and 68.0 for those without it (p=0.01). The developmental index was significantly higher for those with the behavior.

In the developmental index at 36 months, the scores for “Child becomes appropriately active in response to task situation” in the autonomy domain were 95.0 and 86.0 (p=0.03) for those with and without the behavior, respectively; for “Child gives, shows, or points to task material to share emotion with a caregiver”, the scores were 98.0 and 83.5 (p=0.001) for those with and without the behavior, respectively. Furthermore, we obtained the following results: “Child smiles at a caregiver within five seconds” of the emotional regulation domain; “Child stops displaying distress cues without caregiver’s response” (Yes 96.5, No 87.0, p=0.02); “Child stops displaying distress cues without caregiver’s soothing attempts” (with 94.0, without 63.5, p=0.03)). Regarding “Child is not startled by caregiver’s movements or changes in their facial expression”, the developmental scores were 94.0 for children with the behavior and 63.5 for children without it (p=0.03). The index was significantly higher for children with the behavior.

DISCUSSION

The contributions of this study are as follows. First, it was possible to measure social competence in a follow-up outpatient setting for low birthweight infants. With an increase in impulsive behavior and social maladjustment during school age and adolescence, interest in children’s social development in this era of declining birthrates has increased. Hence, it is paramount to accurately capture the development of children’s social skills and propose early interventions. The development of children’s social competence arises under the interaction between children’s innate individual factors and family relationships, including caregivers, peer relationships, and socio-cultural environmental factors. Particularly, in the early stages of development, an attachment relationship is formed between the child’s innate temperament and the caregiver’s involvement as the most immediate social environment because of their mutual interaction. Stable attachments with caregivers represent an internal working model that defines the nature of subsequent peer and retreat relationships and fosters the social skills necessary for communication. Several indicators have been developed from the perspective of their importance in child development; HOME has been utilized in many national and international studies, including the NICHD study. Index of Child Care Environment (ICCE) has been utilized in a Japanese childcare cohort, and the IRS was developed as a methodology that could efficiently measure various aspects of social competence in an internationally comparable and institutional manner. Interactions between children and caregivers can be efficiently assessed in everyday settings to measure social competence. Moreover, professionals can use it in practice settings for interventions. In the present study, the index was used in a follow-up outpatient setting after the discharge of low birthweight infants. It can be administered in a natural setting in a short five-minute period before the developmental examination. It can also provide simple feedback to the caregivers present, allowing them to collectively discover the beneficial aspects of child development and link them to growth. This enabled us to measure the social skills needed by high-risk children in a simple way.

Second, social competence at 18 months was related to the developmental index at 36 months as well, suggesting the possibility of predicting developmental risk from an earlier age. In Japan, medical advances have made it possible for high-risk children to survive. However, it is challenging to provide long-term support for the upbringing of high-risk children. Particularly, early detection and early intervention for the risk of developmental disabilities is a challenge. Low birthweight infants are at risk for developmental disabilities and are followed up with by outpatient clinics to observe their progress. Various reports have already been published. In general, social development starts early, but it only becomes apparent after three years of age, when group living begins. It is crucial that early detection lead to early intervention. In the present study, social scores using the IRS were significantly associated with the developmental index. Higher social competence tended to
| 1. Autonomy | Birth weight (g) | Gestational period (days) | 18 months | 36 months |
|-------------|-----------------|--------------------------|-----------|-----------|
| Child vocalizes while looking at the task materials. | yes | 15 | 65.2 | 986.0 | 0.21 | 198.0 | 0.43 | 100.0 | 0.83 | 95.0 | 0.24 |
| | no | 8 | 34.8 | 1,252.5 | 206.5 | 101.0 | 88.0 | |
| Child becomes appropriately active in response to task situation. | yes | 16 | 69.6 | 1,006.5 | 0.45 | 203.5 | 0.41 | 101.5 | 0.18 | 95.0 | 0.03 |
| | no | 7 | 30.4 | 699.0 | 202.0 | 87.0 | 86.0 | |
| Child attempts to make eye contact with caregiver. | yes | 21 | 91.3 | 998.0 | 0.51 | 201.0 | 0.96 | 98.0 | 0.44 | 94.0 | 0.39 |
| | no | 2 | 8.7 | 901.5 | 203.5 | 106.5 | 86.5 | |
| Child initiates interaction with caregiver spontaneously. | yes | 22 | 95.7 | 959.0 | 0.78 | 201.5 | 0.96 | 99.0 | 0.78 | 92.5 | 0.61 |
| | no | 1 | 4.3 | 1,197.0 | 205.0 | 104.0 | 86.0 | |
| Child attempts to elicit caregiver’s response. | yes | 21 | 91.3 | 920.0 | 0.20 | 201.0 | 0.79 | 98.0 | 0.16 | 94.0 | 0.51 |
| | no | 2 | 8.7 | 1,308.5 | 205.5 | 112.0 | 87.5 | |

2. RESPONSIVENESS

| Birth weight (g) | Gestational period (days) | 18 months | 36 months |
|-----------------|--------------------------|-----------|-----------|
| Child displays strong reaction during the interaction | yes | 22 | 95.7 | 959.0 | 0.78 | 201.5 | 0.96 | 99.0 | 0.78 | 92.5 | 0.61 |
| | no | 1 | 4.3 | 1,197.0 | 104.0 | 86.0 | |
| Child gazes at caregiver’s face or task materials after caregiver’s non-verbal behaviors. | yes | 22 | 95.7 | 959.0 | 0.78 | 201.5 | 0.96 | 99.0 | 0.78 | 92.5 | 0.61 |
| | no | 2 | 3.4 | 1,197.0 | 205.0 | 104.0 | 86.0 | |
| Child looks at caregiver’s face or eyes when caregiver attempts eye contact | yes | 20 | 87.0 | 959.0 | 0.97 | 199.5 | 0.76 | 99.0 | 0.76 | 94.5 | 0.09 |
| | no | 3 | 13.0 | 1,197.0 | 205.0 | 104.0 | 86.0 | |
| Child vocalizes or bubbles within five seconds after caregiver’s verbalization. | yes | 9 | 39.1 | 896.0 | 0.60 | 197.0 | 0.28 | 103.0 | 0.44 | 95.0 | 0.52 |
| | no | 14 | 60.9 | 1,153.5 | 205.5 | 97.0 | 90.0 | |
| Child vocalizes or bubbles within five seconds of caregiver’s gestures, touch, or changes in facial expression. | yes | 10 | 43.5 | 908.0 | 0.69 | 197.5 | 0.23 | 101.5 | 0.61 | 95.0 | 0.21 |
| | no | 13 | 56.5 | 1,197.0 | 206.0 | 98.0 | 89.0 | |

3. EMPATHY

| Birth weight (g) | Gestational period (days) | 18 months | 36 months |
|-----------------|--------------------------|-----------|-----------|
| Child gives, shows, or points to task material to share emotion with caregiver. | yes | 15 | 65.2 | 988.0 | 0.78 | 201.0 | 0.55 | 100.0 | 0.39 | 98.0 | 0.00 |
| | no | 8 | 34.8 | 1,058.5 | 203.5 | 97.5 | 83.5 | |
| Child looks at caregiver’s face to gather information/gain understanding. | yes | 20 | 87.0 | 959.0 | 0.83 | 199.5 | 0.36 | 99.0 | 0.90 | 94.5 | 0.46 |
| | no | 3 | 13.0 | 1,197.0 | 205.0 | 104.0 | 87.0 | |
| Child vocalizes or adjusts own behavior within five seconds in response to caregiver’s verbalization. | yes | 19 | 82.6 | 1,015.0 | 0.05 | 206.0 | 0.46 | 100.0 | 0.73 | 91.0 | 0.91 |
| | no | 4 | 17.4 | 688.5 | 201.5 | 98.0 | 90.5 | |
| Child smiles at caregiver within five seconds of caregiver’s verbalization. | yes | 16 | 69.6 | 1,006.5 | 0.45 | 203.5 | 0.41 | 101.5 | 0.18 | 95.0 | 0.03 |
| | no | 7 | 30.4 | 699.0 | 202.0 | 87.0 | 86.0 | |
| Child behaves within five seconds in accord with caregiver’s gestures, touch, or changes in expression. | yes | 21 | 91.3 | 998.0 | 0.57 | 202.0 | 0.39 | 100.0 | 0.64 | 91.0 | 0.71 |
| | no | 2 | 8.7 | 942.0 | 187.5 | 95.5 | 90.0 | |

4. MOTOR REGULATION

| Birth weight (g) | Gestational period (days) | 18 months | 36 months |
|-----------------|--------------------------|-----------|-----------|
| Child widens eyes and/or shows postural attention to task situation. | yes | 23 | 100 | 998.0 | 202.0 | 100.0 | 91.0 | |
| | no | 0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Child becomes appropriately active in response to task situation. | yes | 23 | 100 | 998.0 | 202.0 | 100.0 | 91.0 | |
| | no | 0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Child’s movements are clearly directed toward/away from the task or task material. | yes | 23 | 100 | 998.0 | 202.0 | 100.0 | 91.0 | |
| | no | 0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Child makes clearly recognizable hand motions towards task materials during the episode. (60% or more of the time). | yes | 23 | 100 | 998.0 | 202.0 | 100.0 | 91.0 | |
| | no | 0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Child is neither restless nor overactive. | yes | 22 | 95.7 | 1,006.5 | 0.96 | 203.5 | 0.35 | 99.0 | 0.96 | 92.5 | 0.44 |
| | no | 1 | 4.3 | 780.0 | 197.0 | 103.0 | 81.0 | |

Birth weight, weeks of gestation, and developmental index were compared for the occurrence or non-occurrence of involvement behavior in each domain as “yes” or “no.”
be associated with a higher developmental index at 18 months and at age three. This confirms the findings of previous studies and suggests the need for early intervention. Children with low scores can be monitored for developmental trends. Appropriate support can be implemented by shortening the time until the next outpatient visit and connecting with the health center.

Nevertheless, the limitations of this study are as follows. First, the number of participants was small; the follow-up period for each person is three years. Therefore, it takes time to accumulate data. In the future, it will be necessary to increase the number of participants and conduct multifaceted analyses by collaborating with multiple facilities. Second, the observation period was short. The risk of developmental disorders related to social skills becomes more apparent and severe after school age. In this regard, it is necessary to conduct continuous observation and report the results.

Despite these limitations, we believe that we achieved a certain level of success in verifying how assessable the social abilities of high-risk children are and clarifying their relationship with developmental risk. The future challenge will be to establish a system for appropriate support, early detection, and early intervention and to verify the effectiveness of this system.

Author contributions
Conceptualization, Y.S., N.H., M.N., and H.M.; methodology, Y.S., N.H.; software, Y.S., N.H., M.N.; validation, Y.S., N.H.; formal analysis, Y.S., N.H.; investigation, Y.S., M.N.; resources, Y.S.; data curation, Y.S., M.N.; writing—original draft preparation, Y.S.; writing—review and editing, Y.S., N.H., M.N., and H.M.; supervision, H.M.; project administration, Y.S.; funding acquisition, Y.S. All authors have read and agreed to the published version of the manuscript.

Funding
This work was funded by JSPS KAKENHI Grant Number 19K14186.

Conflicts of interest
The authors declare no conflict of interest.

ACKNOWLEDGMENT

We express our deepest gratitude to the participants and staff members.

REFERENCES
1) Kusuda S, Fujimura M, Sakuma I, et al. Neonatal Research Network, Japan: Morbidity and mortality of infants with very low birth weight in Japan: center variation. Pediatrics, 2006, 118: e1130–e1138. [Medline] [CrossRef]
2) Smith PB, Ambalavanan N, Li L, et al. Generic Database Subcommittee Eunice Kennedy Shriver National Institute of Child Health Human Development Neonatal Research Network: Approach to infants born at 22 to 24 weeks’ gestation: relationship to outcomes of more-mature infants. Pediatrics, 2012, 129:

Table 1. Continued

|                  | Birth weight (g) | Gestational period (days) | 18 months | 36 months |
|------------------|------------------|--------------------------|-----------|-----------|
|                  | n   | %     | median | p-value | median | p-value | median | p-value |
| 5. EMOTIONAL REGULATION |                 |                           |          |          |        |          |        |          |
| Child stops displaying distress cues without caregiver’s response. | yes  | 16 | 69.6 | 1,006.5 | 0.54 | 203.0 | 0.82 | 104.0 | 0.07 | 96.5 | 0.02 |
|                  | yes  | 16 | 69.6 | 1,006.5 | 0.54 | 203.0 | 0.82 | 104.0 | 0.07 | 96.5 | 0.02 |
|                  | yes  | 19 | 82.6 | 1,015.0 | 0.22 | 205.0 | 0.14 | 104.0 | 0.01 | 94.0 | 0.03 |
|                  | yes  | 22 | 95.7 | 1,006.5 | 0.61 | 203.5 | 0.70 | 101.5 | 0.70 | 91.0 | 0.78 |
|                  | yes  | 19 | 82.6 | 1,015.0 | 0.22 | 205.0 | 0.14 | 104.0 | 0.01 | 94.0 | 0.03 |
|                  | yes  | 19 | 82.6 | 1,015.0 | 0.22 | 205.0 | 0.14 | 104.0 | 0.01 | 94.0 | 0.03 |
|                  | yes  | 19 | 82.6 | 1,015.0 | 0.22 | 205.0 | 0.14 | 104.0 | 0.01 | 94.0 | 0.03 |
|                  | yes  | 19 | 82.6 | 1,015.0 | 0.22 | 205.0 | 0.14 | 104.0 | 0.01 | 94.0 | 0.03 |

Birth weight, weeks of gestation, and developmental index were compared for the occurrence or non-occurrence of involvement behavior in each domain as “yes” or “no”.
31) NICHD Early Child Care Research Network: Child care structure→process→outcome: direct and indirect effects of child care quality on young children’s development. Psychol Sci, 2002, 13: 199–206. [Medline] [CrossRef]

32) NICHD Early Child Care Research Network: Early child care and children’s development prior to school entry: results from the NICHD Study of early child care. Am Educ Res J, 2002, 39: 133–164. [CrossRef]

33) NICHD Early Child Care Research Network: Before head start: income and ethnicity, family characteristics, child care experiences, and child development. Early Educ Dev, 2001, 12: 545–576. [CrossRef]

34) NICHD Early Child Care Research Network: Child care and mother–child interaction in the first three years of life. Dev Psychol, 1999, 35: 1399–1413. [CrossRef]

35) NICHD Early Child Care Research Network: Early child care and mother–child interaction from 36 months through first grade. Infant Behav Dev, 2003, 26:
The NICHD Early Child Care Research Network: Early child care and self-control, compliance, and problem behavior at twenty-four and thirty-six months. Child Dev, 1998, 69: 1145–1170. [Medline]

Child-care and family predictors of preschool attachment and stability from infancy. Dev Psychol, 2001, 37: 847–862. [Medline] [CrossRef]

Anme T, Shinohara R, Sugisawa Y, et al.: Gender differences of children’s social skills and parenting using Interaction Rating Scale (IRS). Procedia Soc Behav Sci, 2010, 2: 260–268. [CrossRef]

Sawada Y, Honda N, Narumiya M, et al.: Characteristics of social skills of high risk children with NICU hospitalization experience. J Jpn Soc Neonatal Health Dev, 2018, 30: 2189–7549.

Brownell CA, Ramani GB, Zerwas S: Becoming a social partner with peers: cooperation and social understanding in one- and two-year-olds. Child Dev, 2006, 77: 803–821. [Medline]

Bronfenbrenner U: The ecology of human development: experiments by nature and design. Cambridge: Harvard University Press, 1979.

Erikson EH: Identity and life cycle: selected papers. In: Psychological issues. New York: International Universities Press, 1959.

Bronfenbrenner U: The ecology of human development: experiments by nature and design. Cambridge: Harvard University Press, 1979.

Anme T, Segal UA: Implications for the development of children in over 11 hours of centre-based care. Child Care Health Dev, 2004, 30: 345–352. [Medline] [CrossRef]

Society for the Kyoto Scale of Psychological Development Test: Shinpan K Shiki Hattatsu Kenshohou 2001 Nenban [The Kyoto Scale of Psychological Development Test 2001]. Kyoto: Nakanishiya Shuppan, 2008 (in Japanese).

Tanaka E, Tomisaki E, Shinohara R, et al.: Implication of social competence development among thirty-month toddlers: focused on theory of mind. J Epidemiol, 2010, 20: 447–451. [CrossRef]

Tomisaki E, Tanaka E, Shinohara R, et al.: Social competence development and sleep habits: longitudinal perspective. J Epidemiol, 2010, 20: 435–440. [CrossRef]

Anme T: An evaluation of environmental stimulation and health and welfare support system. J Natl Rehab Cent Disabl, 1991, 12: 29–36.

Anme T: Evaluation for child care environment. Tokyo: Kawasima Publication, 1996.

Anme T: Evaluation of child care environment for 18-month child. Jpn J Public Health, 1997, 44: 346–352.

Tanaka E, Watanabe T, et al.: Japan children’s study group. Parent-child interactions and child social competence: longitudinal evidence using the interaction rating scale (IRS). New York: Nova Science Publisher, 2015.

Iwata O, Iwata S, Lin YC, et al.: Promoting sound development of preterm infants in the name of developmental neuroscience: beyond advanced life support and neuroprotection. Pediatr Neonatol, 2021, 62: S10–S15. [Medline] [CrossRef]