Interaction Rating Scale (IRS) as an Evidence-Based Practical Index of Children’s Social Skills and Parenting

Tokie Anme1,2, Ryoji Shinohara1,2, Yuka Sugisawa1,2, Lian Tong1,2, Emiko Tanaka1,2, Taeko Watanabe1,2, Yoko Onda1,2, Yuri Kawashima1,2, Maki Hirano1,2, Etsuko Tomisaki1,2, Yukiko Mochizuki1,2, Kentaro Morita1,2, Amarsanaa Gan-Yadam1,2, Yuko Yato1,3, Noriko Yamakawa1,4, and Japan Children’s Study Group

1Research Institute of Science and Technology for Society, Japan Science and Technology Agency, Tokyo, Japan
2Graduate School of Comprehensive Human Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan
3College of Letters, Ritsumeikan University, Kyoto, Japan
4Clinical Research Institute, Mie-Chuo Medical Center National Hospital Organization, Tsu, Japan

Received September 30, 2009; accepted December 11, 2009; released online February 23, 2010

ABSTRACT

Background: The purpose of this paper is to describe the features of the Interaction Rating Scale (IRS) as an evidence-based practical index of children’s social skills and parenting.

Methods: The participants in our study, which was conducted as part of a Japan Science and Technology Agency (JST) project, were 370 dyads of children (aged 18, 30, and 42 month) and 81 dyads of 7-year-old children with their caregivers. The participants completed the five minute interaction session and were observed using the IRS.

Results: The results indicated that the IRS can measure children’s social skill development and parenting with high validity. Along with the discriminate validity for pervasive development disorder (PDD), attention-deficit/ hyperactivity disorder (ADHD), abuse and maltreatment, a high correlation with the SDQ (Strength and Difficulties Questionnaire), and high reliability, the IRS is effective in describing features of social skill development.

Conclusions: The IRS provides further evidence of the fact that in order to study children’s social skill development, it is important to evaluate various features of the caregiver-child interaction as a predictor of social skills.

Key words: cohort study; social development; interaction; parenting; scale

INTRODUCTION

The study of children’s social development has attracted caregivers, practitioners, and researchers from all over the world. Social competence is defined as the ability to understand others in the context of social interaction and to engage in smooth communication with them. Increasing numbers of impulsive behavior and maladjustment to society in school-aged children and adolescents requires society to prepare appropriate education and environments for those children. Children’s social development is determined by the complex interaction of the child themselves, their home environment, peer relationships, and the larger sociocultural environment. Accordingly, children’s social skills should be evaluated with the interaction between the child and social environment. However, the methodology that considers children in conjunction with their social environment across developmental stages has not yet been well developed.

Many researchers are focused on measuring a quality of children’s rearing environment and parenting, based on the theory that early rearing environment is significantly related to child development. Two instruments, namely, the Home Observation for Measurement of the Environment (HOME) and the Index of Child Care Environment (ICCE) are often used in research related to child development.

The HOME and the ICCE evaluate the children’s rearing environment within natural settings, which reflects the caregivers’ emotional and verbal responsiveness to the child, and the caregivers’ acceptance of the child’s behavior. The HOME has been adopted by studies conducted at the National Institute of Child Health and Human Development (NICHD) in the United States, and is also widely used in more than one hundred countries. The ICCE has been used to investigate the effect of child care on children’s development in Japan. In addition, the Mediated Learning Experience Rating Scale (MLERS) has been used to assess the sensitivity and teaching of adults (caregivers and teachers) toward children through observation of the adult-child interaction.

Address for correspondence. Tokie Anme, PhD, Professor, Graduate School of Comprehensive Human Sciences, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8577, Japan (e-mail: anme@md.tsukuba.ac.jp).

Copyright © 2010 by the Japan Epidemiological Association

S-419
The tool that is currently used to assess social competence is the Social Skills Rating System (SSRS), which was developed in the study conducted at the NICHD. The SSRS evaluates children’s social competence on the basis of information provided by parents and teachers; however, this method of evaluating social competence suffers from the inevitable drawbacks of the possibility of parents and teachers missing out on or distorting information. The Nursing Child Assessment Satellite Training (NCAST), which emphasizes the role of the caregiver in the development of social competence, was developed in the United States. The validity of NCAST had been confirmed for evaluating the communication and interactional patterns between caregiver and child. It is useful to evaluate the quality of child-rearing objectively, but it was much concentrated on caregiver’s teaching skills, so cannot be used directly for assessing children’s social skills development.

The Interaction Rating Scale (IRS) can evaluate the child-caregiver interactions in a short period of time in daily situations. The inter-observer reliability of the IRS was found to be 90%. The purpose of this paper is to describe the features of Interaction Rating Scale (IRS) as an evidence-based practical index of children’s social skills and parenting.

METHODS

Participants
The participants of the study were 231 (aged 18 months), 344 (aged 30 months), 175 (aged 42 months) and 82 (aged 7 years) dyads of children and their caregivers, who participated in the Japan Science and Technology Agency (JST) project.

In order to comply with the ethical standards laid down by the JST, before conducting the research, the families of all the participants signed informed consent forms and were made aware that they had the right to withdraw from the experiment at anytime. As the infants were too young to provide informed consent, we carefully explained the purpose, content, and methods of the study to the caregivers and obtained their consent. To maintain confidentiality of the personal information of the participants, their personal information was collected anonymously, and a personal ID system was used to protect personal information. Further, all the image data were stored on a disk, which was password protected; only the researchers who were granted permission from the chairman were given access to the data.

This study was approved by the ethics committee of the JST.

Measures
The IRS is used to measure the child’s social competence and the caregiver’s child rearing competence through five minute observations of caregiver-child interactions. It is appropriate for the assessment of interactions between caregivers and children from infant to eight-year-old. It includes 70 items for a behavioral score and 11 items for an impression score, grouped into ten subscales. Five subscales focus on children’s social competences: 1) Autonomy, 2) Responsiveness, 3) Empathy, 4) Motor regulation, and 5) Emotional regulation. Another five items assess the caregiver’s parenting skills: 6) Respect for autonomy development, 7) Respect for responsiveness development, 8) Respect for empathy development, 9) Respect for cognitive development, and 10) Respect for social-emotional development. And one item assesses an overall impression of synchronous relationships.

The total of 81 items was composed from several sources: original items by the study authors, several overlapping items from the HOME (Home Observation for Measurement of the Environment), the SSRS (Social Skills Rating Systems), and the NCAST (Nursing Child Assessment Satellite Training) teaching scales (36 items).

A training manual for the IRS has been developed for practitioners and researchers. Two different sets of variable are scored: behavior items and impression items for each subscale. Each subscale assesses the presence of behavior (1 = Yes, 0 = No), and the sum of all items in the subscale provides the overall behavior score.

Scores on the impression items and the overall impression item are on a five-point scale, where 1 = not evident at all, 2 = not evident, 3 = neutral, 4 = evident, 5 = evident at high level.

The evaluator completes the checklist composed of 25 items focusing on children’s behavior toward caregivers (e.g., Child looks at caregiver’s face as social referencing) and 45 items focusing on the caregiver behavior. The observer then provides an impression on a 5-point scale of the level of development for each subscale and for an overall impression.

Internal consistency in each categories, as measured by Cronbach’s alpha, ranged from .43 to .88, and the total internal consistency was excellent (.85–.91).

Procedure
In this study, the IRS was evaluated as follows: a five minute video recording of the setting of the child-caregiver interaction (the child and caregiver playing with blocks and putting them in a box) was conducted. The caregiver-child interactions were videotaped in a controlled laboratory environment. The recording was carried out in a room with five video cameras; one camera was placed at each of the four corners and one was placed in the central ceiling position. The dyads of children were escorted into a room (with dimensions of $4 \times 4$ meters) furnished with a small table and a small-sized chair meant for a child. The caregiver introduced herself to the child and interacted with the child in a natural manner, just as she would on a regular day.

To score the behavior, two members of the research team coded the behaviors observed. A third child professional, who...
had no contact with the participants, also scored the behavior. The behavior of the children and caregiver during the caregiver-child interaction was coded as follows. If the child displayed the behavior described in the item, a score of 1 was given; conversely, if the child failed to display the behavior described in the item, a score of 0 was given. A child’s total score was the sum of the score that he/she received on all the subscales. A higher score indicated a higher level of development. The same method of coding was used to evaluate the caregivers’ behavior. The total IRS score was the total score of the child plus the total score of the caregiver.

RESULTS

Table 1, 2 show the frequencies of items on the Interaction Rating Scale for 18-month-old, 30-month-old, 42-month-old and 7-year-old children.
This study provides evidence that the IRS can be used as a reliable, valid, feasible and practical tool for the studies of caregiver-child interaction over time.15

First of all, the analysis of the IRS by age showed that IRS has high validity for cohort studies, because it can be used with the same subscales framework across ages from infants to 8-year-old.

Secondly, the IRS can be used in international comparative studies, because it is based on the most common frameworks used all over the world. The child subscales are based on various categories which are widely used in the research of social skills indicators. Also the caregiver’s subscales are based on the Home Observation for Measurement of the Environment (HOME), which has been widely used.

Third, we have evidence of the IRS in terms of discriminant validity for pervasive development disorder (PDD), attention-deficit/hyperactivity disorder (ADHD) and abused children. Children with PDD, ADHD, and abused children had lower levels of empathy and self-control in areas such as motor regulation and emotional regulation compared to children without these conditions.13

Fourth, the IRS has high correlations with the SDQ (Strength and Difficulties Questionnaire), and high reliability.16 There were significant correlations between the “empathy”, “motor regulation”, “emotional regulation”, caregiver’s “Respect for responsiveness” in the IRS and the “hyperactivity-inattention domain” in the SDQ. Also, “autonomy”, “responsiveness”, “empathy” in the IRS and

**DISCUSSION**

Significant age differences were found on the subscales of autonomy, and emotional regulation. Autonomy at 30 months, 42 months, and 7 years was significantly higher than at 18 months. Seven-year-old children had significantly higher emotional regulation than the 18, 30, and 42-month-old children.

Other age differences were that older children used significantly more verbal responsiveness. There were also age differences among specific items, revealing important differences, for example, in types of interactions. Younger children and caregivers were more likely to demonstrate empathy through reference to a common thing (eg “look at the bird”), while older children were more able to respond to non-verbal cues, such as the nodding or eye movements of the caregiver.

### 4. MOTOR REGULATION

Child’s behavior is clearly directed toward the task and he/she is not overactive/underactive.

| Items | Categories | 18M n | 30M n | 42M n | 7Y n |
|-------|------------|-------|-------|-------|------|
| 1. Child widens eyes and/or shows postural attention to task situation. | not evident at all | 0 | 0.0 | 1 | 0.3 | 3 | 3.7 |
| | not evident | 6 | 2.6 | 6 | 1.7 | 9 | 4.4 | 2 | 2.4 |
| | neutral | 25 | 10.5 | 22 | 6.4 | 34 | 16.4 | 5 | 6.1 |
| | evident | 65 | 28.1 | 100 | 29.1 | 103 | 49.7 | 11 | 13.4 |
| | evident at high level | 135 | 58.5 | 215 | 62.5 | 61 | 29.5 | 61 | 74.4 |

- a: Tukey-Kramer multiple comparison tests (behavioral total score was used).
- b: 18 < 30 < 42, 18 < 30 < 42, 18 < 42, 30 < 42, 42 < 18, 42 < 7Y, 18 < 7Y, 30 < 7Y, 42 < 7Y.

**5. EMOTIONAL REGULATION**

Child adjusts his/her emotional state to a comfortable level.

| Items | Categories | 18M n | 30M n | 42M n | 7Y n |
|-------|------------|-------|-------|-------|------|
| 1. Child stops displaying distress cues without caregiver’s response. | not evident at all | 1 | 0.4 | 3 | 0.9 | 0 | 0.0 | 0 | 0.0 |
| | not evident | 12 | 5.2 | 16 | 4.7 | 12 | 5.8 | 2 | 2.4 |
| | neutral | 25 | 10.8 | 54 | 15.7 | 47 | 22.7 | 4 | 4.9 |
| | evident | 80 | 34.7 | 112 | 32.5 | 88 | 42.5 | 22 | 26.8 |
| | evident at high level | 113 | 48.9 | 162 | 47.1 | 60 | 29.0 | 53 | 64.7 |

- **a**: 18 < 30 < 42, 18 < 42, 30 < 42, 42 < 18, 42 < 7Y, 18 < 7Y, 30 < 7Y, 42 < 7Y.
Table 2. Frequencies of caregiver items and overall evaluation on Interaction Rating Scale (18M, 30M, 42M, 7Y)

| Items | Categories | 18M | 30M | 42M | 7Y |
|-------|------------|-----|-----|-----|----|
|       | n          | %   | n   | %   | n  | %   |
| Total | 231 100.0  | 344 100.0  | 207 100.0  | 82 100.0  |

### 6. RESPECT FOR AUTONOMY DEVELOPMENT

- Partner encourages child's autonomy.
  - not evident at all: 0 0.0, 0 0.0, 0 0.0, 0 0.0
  - not evident: 5 2.2, 6 1.7, 7 3.9, 8 9.8
  - evident: 49 21.2, 138 40.1, 110 53.1, 57 32.9
  - evident at high level: 168 72.7, 163 47.4, 60 29.0, 31 37.8

1. Caregiver allows child to explore task material for at least five seconds before providing first task related instruction.
   - No: 25 10.8, 3 0.9, 7 3.4, 0 0.0
   - Yes: 206 89.2, 341 99.1, 200 96.6, 82 100.0

2. Caregiver pauses when child initiates behaviors during episode.
   - No: 3 1.3, 8 2.3, 22 11.0, 5 6.1
   - Yes: 228 98.7, 336 97.7, 185 89.4, 77 93.9

3. Caregiver asks for no more than three repetitions when child is successful at completing the task.
   - No: 5 2.2, 5 1.5, 8 3.9, 0 0.0
   - Yes: 226 97.8, 339 98.6, 199 96.6, 82 100.0

4. Caregiver does not physically force child to complete task.
   - No: 21 9.1, 20 5.8, 20 9.7, 13 15.9
   - Yes: 210 90.9, 324 94.2, 187 90.3, 69 84.2

5. Caregiver halts the episode when child is distressed.
   - No: 14 6.1, 27 7.9, 22 10.6, 11 13.4
   - Yes: 217 93.9, 317 92.2, 185 89.4, 71 86.6

6. After giving instructions, caregiver allows at least five seconds for child to attempt task before intervening.
   - No: 16 6.9, 11 3.2, 17 8.2, 23 28.1
   - Yes: 215 93.1, 336 97.7, 190 91.8, 77 93.9

### 7. RESPECT FOR RESPONSIVENESS DEVELOPMENT

- Partner encourages child's responsiveness.
  - not evident at all: 0 0.0, 0 0.0, 0 0.0, 1 1.2
  - not evident: 2 0.9, 1 0.3, 2 1.0, 2 2.4
  - evident: 56 24.2, 133 38.6, 123 63.4, 80 97.6
  - evident at high level: 168 72.7, 183 52.3, 57 27.5, 41 50.0

1. Caregiver positions child to safely support it.
   - No: 1 0.4, 11 3.2, 21 10.1, 0 0.0
   - Yes: 230 99.6, 333 96.8, 186 99.9, 82 100.0

2. Caregiver provides an environment free of distractions.
   - No: 3 1.3, 0 0.0, 4 1.9, 5 2.4, 1 2.4
   - Yes: 228 98.7, 341 99.1, 202 97.6, 80 97.6

3. Caregiver positions child so it can reach and manipulate materials.
   - No: 0 0.0, 1 0.3, 3 1.5, 0 0.0
   - Yes: 231 100.0, 343 99.7, 204 98.5, 82 100.0

4. Caregiver seeks the child's attention before beginning the task, at the outset of the teaching interaction.
   - No: 7 3.0, 13 3.8, 12 6.0, 5 6.1
   - Yes: 224 97.0, 331 96.2, 194 94.0, 75 94.0

5. Caregiver gives instruction only when the child is attentive (90% of the time).
   - No: 9 3.9, 69 20.1, 40 19.3, 16 19.5
   - Yes: 222 96.1, 275 79.9, 163 80.7, 66 80.5

6. Caregiver positions child so eye contact is possible during the teaching period (60%).
   - No: 12 5.2, 0 0.0, 2 1.0, 1 1.2
   - Yes: 219 94.8, 344 100.0, 205 99.0, 71 98.8

7. Caregiver changes position of child and/or materials after unsuccessful attempts by the child to do the task.
   - No: 6 2.6, 8 2.3, 7 3.4, 4 4.9
   - Yes: 225 97.4, 336 97.7, 200 96.6, 76 95.1

8. Caregiver keeps child in visual range.
   - No: 1 0.4, 0 0.0, 0 0.0, 2 2.4
   - Yes: 230 99.6, 344 100.0, 207 100.0, 76 97.6

9. Caregiver stays close to child and pays good attention.
   - No: 0 0.0, 0 0.0, 0 0.0, 1 1.2
   - Yes: 231 100.0, 344 100.0, 205 99.0, 76 97.6

### 8. RESPECT FOR EMPATHY DEVELOPMENT

- Partner encourages child's empathy development.
  - not evident at all: 0 0.0, 0 0.0, 0 0.0, 0 0.0
  - not evident: 3 1.3, 0 0.0, 5 2.4, 8 9.8
  - evident: 72 31.2, 150 43.6, 117 56.5, 41 50.0
  - evident at high level: 143 61.9, 150 43.6, 53 26.5, 13 15.9

1. Caregiver praises child's efforts at least once during the episode.
   - No: 65 28.1, 86 25.0, 50 24.2, 49 59.8
   - Yes: 166 71.9, 258 75.0, 157 75.8, 33 40.2

2. Caregiver emits positive, sympathetic, or soothing verbalizations.
   - No: 11 4.8, 11 3.2, 3 1.5, 9 11.0
   - Yes: 220 95.2, 333 96.8, 204 96.2, 75 89.0

3. Caregiver smiles, or touches child within five seconds after child's smile or vocalization (more than 90% of the time).
   - No: 34 14.7, 9 2.6, 8 3.9, 6 7.3
   - Yes: 197 85.3, 335 97.4, 194 96.1, 75 92.7

4. Caregiver emits soothing non-verbal response (ie, pat, touch, rock, caress, kiss).
   - No: 34 14.7, 237 68.9, 166 80.2, 70 85.4
   - Yes: 197 85.3, 107 31.1, 41 19.8, 12 14.6

5. Caregiver diverts the child by playing games, introducing new toy.
   - No: 69 29.9, 52 15.1, 35 16.9, 21 25.6
   - Yes: 162 70.1, 292 84.9, 172 83.1, 61 74.4

Continued on next page.
| Items | Categories | 18M | 30M | 42M | 7Y |
|-------|------------|-----|-----|-----|-----|
|         | n  | %   | n  | %   | n  | %   | n  | %   |
| 6. Caregiver does not vocalize to the child while the child is vocalizing. | No | 0 | 0.0 | 1 | 0.3 | 8 | 3.9 | 2 | 2.4 |
|         | Yes | 231 | 100.0 | 343 | 99.7 | 199 | 96.1 | 80 | 97.6 |
| 7. Caregiver verbally praises child during the episode. | No | 78 | 33.8 | 101 | 29.4 | 77 | 37.2 | 46 | 56.1 |
|         | Yes | 153 | 66.2 | 243 | 70.6 | 130 | 62.8 | 36 | 43.9 |
| 8. Caregiver smiles and/or nods at the child. | No | 32 | 13.9 | 4 | 1.2 | 3 | 1.5 | 5 | 6.1 |
|         | Yes | 199 | 86.1 | 340 | 98.8 | 204 | 96.1 | 77 | 93.9 |
| 9. Caregiver responds to child's vocalizations with affectionate verbal response. | No | 20 | 8.7 | 16 | 4.7 | 21 | 10.1 | 6 | 7.3 |
|         | Yes | 211 | 91.3 | 328 | 95.4 | 186 | 92.9 | 79 | 92.7 |

9. RESPECT FOR COGNITIVE DEVELOPMENT

Caregiver encourages child's cognitive development.

|         | not evident at all | not evident | neutral | evident | evident at high level |
|---------|-------------------|-------------|---------|---------|----------------------|
| No | 18 | 7.8 | 26 | 7.6 | 4 | 1.9 |
| Yes | 231 | 100.0 | 343 | 99.7 | 199 | 96.1 |
| 2. Caregiver describes perceptual qualities of task materials to child. | No | 186 | 80.5 | 169 | 49.1 | 66 | 31.9 |
|         | Yes | 45 | 19.5 | 175 | 50.9 | 141 | 68.1 |
| 3. Caregiver uses at least two different sentences or phrases to describe task to child. | No | 128 | 55.4 | 156 | 45.4 | 53 | 25.6 |
|         | Yes | 103 | 44.6 | 340 | 98.8 | 154 | 74.4 |
| 4. Caregiver uses explanatory verbal style more than imperative style in episode. | No | 228 | 98.7 | 339 | 98.6 | 201 | 97.1 |
|         | Yes | 9 | 0.4 | 7 | 2.1 | 1 | 0.5 |
| 5. Caregiver's instructions are clear and unambiguous. | No | 98 | 42.4 | 188 | 54.7 | 57 | 27.5 |
|         | Yes | 133 | 57.6 | 154 | 45.3 | 132 | 63.8 |
| 6. Caregiver uses both verbal description and non-verbal instruction | No | 6 | 2.6 | 12 | 3.5 | 14 | 6.8 |
|         | Yes | 225 | 97.4 | 332 | 96.5 | 193 | 93.2 |
| 7. Caregiver uses teaching loops (alerting, instruction, performance, and feedback) in instructing child. | No | 81 | 35.1 | 118 | 34.3 | 40 | 19.3 |
|         | Yes | 150 | 64.9 | 278 | 80.8 | 154 | 71.5 |
| 8. Caregiver signals completion of task verbally or non-verbally. | No | 122 | 52.8 | 113 | 32.9 | 59 | 28.5 |
|         | Yes | 109 | 47.2 | 231 | 67.2 | 148 | 71.5 |
| 9. Length of caregiver instruction to child is age appropriate. | No | 22 | 9.5 | 339 | 98.6 | 200 | 96.6 |
|         | Yes | 209 | 90.5 | 339 | 98.6 | 200 | 96.6 |

10. RESPECT FOR SOCIAL-EMOTIONAL DEVELOPMENT

Caregiver encourages child's social-emotional development.

|         | not evident at all | not evident | neutral | evident | evident at high level |
|---------|-------------------|-------------|---------|---------|----------------------|
| No | 8 | 3.5 | 16 | 4.7 | 15 | 7.3 |
| Yes | 223 | 96.5 | 328 | 95.4 | 192 | 92.7 |
| 2. Caregiver does not yell at the child. | No | 1 | 0.4 | 1 | 0.3 | 1 | 0.5 |
|         | Yes | 230 | 99.6 | 343 | 99.7 | 206 | 99.5 |
| 3. Caregiver does not use abrupt movements or rough handling. | No | 2 | 0.9 | 5 | 1.5 | 1 | 0.5 |
|         | Yes | 229 | 99.1 | 339 | 99.6 | 206 | 99.5 |
| 4. Caregiver does not slap, hit, or spank. | No | 0 | 0.0 | 2 | 0.6 | 0 | 0.0 |
|         | Yes | 231 | 100.0 | 342 | 99.4 | 207 | 100.0 |
| 5. Caregiver does not make negative comments to observer about the child. | No | 9 | 3.9 | 0 | 0.0 | 2 | 1.0 |
|         | Yes | 222 | 96.1 | 344 | 100.0 | 205 | 99.0 |
| 6. Caregiver's body posture is relaxed during the episode (more than 50% of the time). | No | 0 | 0.0 | 7 | 2.0 | 4 | 1.9 |
|         | Yes | 231 | 100.0 | 337 | 98.0 | 203 | 98.1 |
| 7. Caregiver places him/herself in a face-to-face position with the child when talking to the child (more than 50% of the time). | No | 40 | 17.3 | 0 | 0.0 | 0 | 0.0 |
|         | Yes | 191 | 82.7 | 344 | 100.0 | 207 | 100.0 |
| 8. Caregiver behaves affectionately to child during the episode. | No | 3 | 1.3 | 4 | 1.2 | 6 | 2.9 |
|         | Yes | 228 | 98.7 | 340 | 98.8 | 201 | 97.1 |
| 9. Caregiver makes constructive or encouraging statements to the child during episode. | No | 197 | 85.3 | 192 | 55.8 | 79 | 38.2 |
|         | Yes | 34 | 14.7 | 152 | 44.2 | 126 | 61.8 |

* OVERALL IMPRESSION: A SYNCHRONOUS RELATIONSHIP

|         | not evident at all | not evident | neutral | evident | evident at high level |
|---------|-------------------|-------------|---------|---------|----------------------|
| No | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Yes | 8 | 3.5 | 15 | 4.4 | 10 | 4.8 |

1-4: Tukey-Kramer multiple comparison tests (behavioral total score was used).
5: Y < 18 < 30, 42 < 30, 42 < 18, 7Y < 18, 18 < 30, 18 < 42, 18 < 7Y, 7Y < 42, 18 < 30, 18 < 42, 18 < 7Y, 18 < 30, 18 < 42, 7Y < 42.
less “peer problems domain” in the SDQ, “responsiveness”, “empathy”, “motor regulation” in the IRS and “prosocial behavior domain” in the SDQ, caregiver’s “respect for empathy development” in the IRS and less total difficulties scores in the SDQ.

While the IRS provides valuable insights, it is also important to acknowledge its limitations. First, the IRS subscales might not cover all dimensions of social skills, although we used the most common frameworks of social skills. Second, while the IRS expects to use same scoring standard from birth to eight years old as a standardized tool in cohort studies, different developmental features of items across developmental stages might be better to take into consideration. Despite these limitations, the IRS can be considered an established, valid screening instrument reflecting child-related attributes of the caregiver-child interaction. It provides evidences of the fact that in order to study children’s social development, it is important to evaluate various features of the caregiver-child interaction as a measure of social skills.

We are in the process of analyzing data of 42-month-old. Further research has the potential to reveal the features of the caregiver-child interaction development, and enhance knowledge of implications for caregivers and child-care professionals.

ACKNOWLEDGEMENTS

This research was supported by the R&D Area “Brain-Science & Society” of Japan Science and Technology Agency, Research Institute of Science and Technology for Society, and as a part of “Exploring the effect factors on the child’s cognitive and behavior development in Japan”, and Grants-in-Aid for Scientific Research (19330126).

APPENDIX

Japan Children’s Study Group

Chairman: Zentaro Yamagata (Department of Health Sciences, School of Medicine, University of Yamanashi), Hideaki Koizumi (Advanced Research Laboratory, Hitachi, Ltd.).

Participating Researchers: Kevin K. F. Wong, Yoko Anji, Hiraku Ishida, Mizue Iwasaki, Aya Kutsuki, Misa Kuroki, Haruka Koike, Daisuke N Saito, Akiko Sawada, Yuka Shiotani, Daisuke Tanaka, Shunyue Cheng, Hiroshi Toyoda, Kumiko Namba, Tamami Fukushima, Ayumi Seki, Arikio Takeuchi (Faculty of Regional Sciences, Tottori University), Hideo Kawaguchi (Advanced Research Laboratory, Hitachi, Ltd.), Sonoko Egami (Hokkaido University of Education), Yoshihiro Komada (Department of Pediatric and Developmental Science, Mie University Graduate School of Medicine Institute of Molecular and Experimental Medicine), Hatsumi Yamamoto, Motoki Bonno, Noriko Yamakawa (Clinical Research Institute, Mie-chuo Medical Center, National Hospital Organization), Masatoshi Kawai (Institute for Education, Mukogawa Women’s University), Yoko Yato (College of Letters, Ritsumeikan University), Koichi Negayama (Graduate School of Human Sciences, Waseda University).

REFERENCES

1. Gary WL. The role of gender, Emotion, and culture in children’s social competence and peer relations. In: Gary WL, editors. Children’s Peer Relations and social competence. London: Yale University Press; 2005. p. 286–320.
2. Lidz CS. Practitioner’s guide to dynamic assessment. New York: Guilford Press; 1991.
3. Feuerstein R, Rand Y, Hoffman MB. The dynamic assessment of retarded performers: The Learning Potential Assessment Device: Theory, instruments and techniques. Baltimore: University Park Press; 1979.
4. Caldwell BM. Bradley RH. Home Observation for Measurement of the Environment. Little Rock: Center for Research on Teaching and Learning, University of Arkansas, 1974.
5. Anme T, Segal U. Center-based evening child care: Implications for young children’s development. Early Child Educ J. 2003;30(3):137–43.
6. NICHD Early Child Care Research Network. Relations between family predictors and child outcomes: Are they weaker for children in child care? Dev Psychol. 1998;34(5):1119–28.

7. Anme T. Evidence based Child Care: Enhance Quality of Care and Environment. Tokyo: Keiso Shobo; 2004.

8. Anme T, Segal UA. Implications for the development of children placed in 11+ hours of center-based care. Child Care Health Dev. 2004;30(4):345–52.

9. Anme T, Tanaka H, Sakai H, Shoji T, Miyazaki K, Maruyama A, et al. Quality of Environment and child development: Five-year follow up study. Child, Youth and Environmental Studies. 2005;1(1):159–64.

10. Burchinal MR, Campbell FA, Bryant DM, Warsik BH, Ramey CT. Early Intervention and Mediating Process in Cognitive Performance of Children of Low-Income African American Families. Child Dev. 1997;68(5):935–54.

11. Gresham FM, Elliot SN. Social Skills Rating System - Secondary. Circle Pines, MN: American Guidance Service. 1990.

12. Barnard K. Nursing Child Assessment Satellite Training Manual. 1994.

13. Anme T, Yato Y, Shinohara R, Sugisawa Y. The validity and reliability of interaction rating scale (IRS): characteristics for children with behavioral or environmental difficulties. Japanese Journal of Human Sciences of Health-Social Services. 2007;14:23–31.

14. Anme T. Manual of Interaction Rating Scale. Tokyo: Japan Pediatric Press. 2009.

15. Anme T. Bridge between Mind and Education: Evidence from Longitudinal Research on Child Care Environment and Child. Asia Pacific Conference on Mind, Brain and Education. 2008;1:14–18.

16. Sugisawa Y, Shinohara R, Tong L, Tanaka E, Anme T. The relationship between Interaction Rating Scale and Strength and Difficulties Questionnaire. 68th Conference of Japanese Public Health. 2008.