

INTAKT: A new instrument for assessing the quality of mother-child interactions

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Abstract

Despite abundant evidence for the influence of primary caregivers' interaction with young children, on their further development, there is a lack of standardized and published inventories for assessing the quality of such interactions. INTAKT, a newly developed instrument, which helps to rate maternal sensitivity, maternal feedback, and maternal interaction in joint attention episodes, is designed to close this gap. Two studies examined the psychometric properties of INTAKT, applying it to different kinds of mother-child dyads. Inter-rater reliabilities, as well as validation data using internal and external criteria, showed that the INTAKT scales allowed for an objective, reliable, and valid assessment of interaction quality between mothers and their children. Thus, the inventory is suitable as a diagnostic instrument for assessing the quality of mother-child interactions.

Key words: mother-child interaction; sensitivity; feedback; joint attention; assessment

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Introduction

Interactions between children and their primary caregivers have been studied extensively during the past decades. Related research has shown that the quality of such interactions influences important and diverse areas such as the child's cognitive competences (Saltaris et al., 2004), inhibitory control (Lunkenheimer et al., 2008), ability to engage in symbolic play (Noll & Harding, 2003), language development (Lunkenheimer et al., 2008), receptive cooperation with parents (Kochanska, Aksan, & Carlson, 2005), the child's adjustment to school (Stright, Gallagher, & Kelley, 2008), social and cognitive development through middle childhood (Stams, Juffer, & van IJzendoorn, 2002) and math and reading achievement in elementary school (NICHD Early Child Care Research Network, 2008).

Therefore, much interest has focused on the question of which components of parent-child interactions exhibit such beneficial influences on the development of children. Attachment theory (e.g., Ainsworth, Blehar, Waters, & Wall, 1978) has traditionally focused on the construct of sensitivity as a main precursor of secure attachment. But even within that theory it is well recognized that sensitivity is an important, but not exclusive, factor, promoting adaption in young children (De Wolff & van IJzendoorn, 1997). Other areas of parental behavior that have been associated with differential outcomes for children, include parental feedback (e.g., Kelley, Brownell, & Campbell, 2000) as well as parental interactive style during joint attention episodes (e.g., Saxon, Colombo, Robinson, & Frick, 2000). All of these areas shall be discussed in further detail below.

Sensitivity

Following the classical definition of Ainsworth, Bell, and Stayton (1974, p. 127), sensitivity is "the mother's ability to perceive and to interpret accurately the signals and communications implicit in her infant's behaviour, and given this understanding, to respond to them appropriately and promptly". It was first assessed by Ainsworth and colleagues and was found to be highly correlated with children's later attachment security (Ainsworth et al., 1978). Further research (e.g., Susman-Stillman, Kalkoske, Egeland, & Waldman, 1996) affirmed this connection, and a meta-analysis on the topic showed sensitivity to be an important, though not the exclusive, precondition of attachment security (De Wolff & van IJzendoorn, 1997). More recent work found that greater maternal sensitivity to infants' distress and not to nondistress predicts attachment security (McElwain & Booth-LaForce, 2006), and that the association between maternal sensitivity and infant-mother attachment is partially mediated by the infant's ability to regulate affect (Braungart-Rieker, Garwood, Powers, & Wang, 2001). Effects of interventions attempting to enhance parental sensitivity and attachment security also support the idea of a causal role of sensitivity in shaping attachment (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

Secure attachment, in turn, is known to be related to a range of positive developmental outcomes, e.g. growth of self-reliance, bigger capacity for emotional regulation, and

better social competence (Sroufe, 2005). Furthermore, attachment security at an earlier age could be shown to be associated with enhanced social problem-solving skills in toddlers, less loneliness and social isolation in first grade (Raikes & Thompson, 2008), and a better ability to recognize emotions in faces when the child is 6 and 11 years old (Steel, Steel, & Croft, 2008).

In addition to accounting for a secure attachment relationship, maternal sensitivity towards infants has also been shown to have other influences on a child's development. It is positively associated with social problem-solving skills at preschool age and negatively associated with aggressive responses to hypothesized offenses at the end of first grade (Raikes & Thompson, 2008). It is predictive of higher self-control, more compliance, and fewer problem behaviors in toddlers (NICHD Early Child Care Research Network, 1998) and even positively influences adjustment in adolescence (Feldman, 2010). Higher maternal sensitivity further predicts better social and cognitive development in middle childhood (Stams et al., 2002) and has been shown to mediate negative effects of poverty on children's cognitive and language performance (NICHD Early Child Care Research Network, 2005). As well as being predictive of children's separation anxiety, it also seems to mediate the influence of a mother's separation anxiety on her child's separation anxiety (Dallaire & Weinraub, 2005).

Parental feedback

Parental evaluative feedback provides the child with information about the appropriateness of his/her actions and the resulting outcomes and whether or not the child's efforts and outcomes meet or fall short of parental expectations (Harter, 1978). This feedback can take several forms, including positive evaluative statements, negative evaluative statements, and corrective statements. The latter is to be understood as an attempt to correct children's actions with feedback which is negative or critical in content but neutral or positive in tone (Kelley et al., 2000).

The kind of feedback children receive from their parents has been shown to influence various domains of development. Positive and corrective maternal feedback were found to relate to children's persistence in the face of difficulty (Kelley et al., 2000) and to less shame following task failure (Alessandri & Lewis, 1996). Negative maternal feedback, in turn, was related to more shame following task failure and less pride following success (Alessandri & Lewis, 1996; Kelley et al., 2000). In general, more negative feedback was provided by mothers who had an officially recorded history of maltreating their children (Alessandri & Lewis, 1996). High levels of negative maternal feedback, coupled with low levels of positive feedback, are associated with adolescent negative self-perceptions, which, in turn, place adolescents at risk for depressive symptoms (Jacquez, Cole, & Searle, 2004). Negative maternal feedback regarding a child's failure, in interaction with a child's experienced negative events, tends to predict a more negative cognitive style, entailing greater cognitive vulnerability to depression (Mezulis, Hyde, & Abramson, 2006).

Joint attention

Joint attention refers to the ability of a child to coordinate his/her attention with a social partner with respect to an object or event. There are several ways in which dyadic joint attention can be attained. A broad distinction can be made between the categories of “attention switching” versus “attention following”. The former, characterized by caregivers who actively seek to switch the infant’s attentional focus during interaction, seems to be more beneficial for infants 6 months and younger, because they are generally more passive and less likely to initiate or lead interactions with their caregivers. The latter, a style in which the caregiver follows the lead of the infant’s attentional focus, proves to be more conducive to older infants (e.g., Saxon et al., 2000).

Infants whose mothers are able to follow that developmental trend (i.e., change from more attention switching at 6 months to more attention following at 8 months) score higher on language measures, adaptive behavior measures, and a general intelligence scale later on (Saxon et al., 2000). Moreover 9 to 15 month-old children with mothers who use language that follows into their infant’s focus of attention, rather than leading the infant’s attention away, have better early skills of gestural and linguistic competence (Carpenter, Nagell, & Tomasello, 1998). Furthermore, 12 month-old infants with mothers who have a high ability to follow, rather than direct their infant’s play interest and to scaffold their infant’s play interest during joint attention episodes, engage in more advanced play (Bigelow, MacLean, & Proctor, 2004). Moreover children’s independence in cognitive and social skills is supported by a mother’s maintenance of her child’s interest at 2 years of age (Landry, Smith, Swank, & Miller-Loncar, 2000).

Compared with dyads in which mothers are better able to follow their child’s attention, mother-child dyads which are still characterized by a high level of attention switching at 8 months, spend much less time within joint-attention episodes (Saxon et al., 2000). This, in turn, seems to be disadvantageous to the child, since time spent within joint attention with the caregiver is associated with a range of favorable developmental outcomes. During joint attention episodes, the child’s attention is focused on the relevant aspects of the referential world, thus facilitating language acquisition by more easily identifying word-object mappings (e.g., Dominey & Dodane, 2004). Indeed, the amount of time young infants spend in joint engagement with their mothers can predict infants’ early linguistic competence (Carpenter et al., 1998; Markus, Mundy, Morales, Delgado, & Yale, 2000). Likewise, there is a strong association between children’s ability to initiate and respond to joint attention and their later language and cognitive abilities (Markus et al., 2000; Morales et al., 2000; Mundy et al., 2007), even up to the age of 8 years (Smith & Ulvund, 2003).

Concerning a child’s social development, more frequent and consistent joint attention is longitudinally related to better social competence and less externalizing behavior (Vaughan Van Hecke et al., 2007), better theory of mind ability (Charman et al., 2000), a more active emotion regulation strategy use, less engagement in low-level play, and a tendency not to engage in self-soothing physical behaviors and to wait longer before attempting to retrieve a delay object (Morales, Mundy, Crowson, Neal, & Delgado, 2005).

Present research

From the findings reported above, it can be concluded that the quality of mother-child interactions, especially a mother's sensitivity towards the child's needs, her feedback regarding the child's activities, and her role in sustaining joint attention with the child, has a significant influence on the child's development. Therefore, a diagnostic instrument that allows for the assessment of the quality of mother-child interactions would be of great value to the domain of developmental psychology, especially since it could also serve as a source for subsequent interventions aiming at enhancing the quality of such interactions. To the best of our knowledge, no such instrument has been available to psychologists up until now. Wiefel et al. (2007, pp. 70-71) give an overview of the most widely used interaction scales. They refer to the Coding Interactive Behavior (CIB), the CARE-Index (CARE), and the Maternal Behavior Rating Scale (Mahoney), which are all unpublished instruments. They further list the Emotional Availability Scales (EAS), which are only available from the author after undergoing personal training. Also mentioned are the Mannheim Rating Scales for the Analysis of Mother-Child Interaction in Infants (Mannheimer) as well as the Bethlem Mother-Infant Interaction Scale (BMIS). However, these do not offer a standardized comparison sample, since the former is mainly intended for research purposes and the latter has only been developed and used in a psychiatric mother and baby unit. They finally list the FIT-K95 (a family- and kindergarten-interaction test), which does not allow for an evaluation of mother-child interactions by an independent observer, but only by the child itself. Thus, none of these instruments are readily useable for assessing the quality of observed mother-child interactions in a diagnostic context.

Hence, the aim of the following two studies was to develop an instrument that would allow for an objective, reliable, and valid assessment of the quality of mother-child interactions. In a Pilot Study, we tested the newly developed instrument and evaluated its psychometric properties. Subsequently, in an Extension Study we showed that inter-rater reliability can be raised through adjustment of behavioral category definitions and we further validated the instrument.

Study 1: Pilot Study

Method

Participants

We first developed the new instrument using video-sequences we had obtained from the Austrian Child Protective Services (CPS). Twenty videos were analyzed that had resulted from 14 cases of fosterage. Each video showed one mother (either a foster mother, $n = 8$ or a mother whose child had been placed in foster care, $n = 12$) interacting with her (foster) child. Five videos also included the (foster) father of the child; four included a sibling of the child. Children were between 1;4 and 8;4 years old ($M = 3;8$ years).

Measures

All interactions were coded with the new instrument, labeled INTAKT (an agglomeration of the German words *Interaktion* meaning interaction and *intakt* meaning intact, referring to an intact mother-child relationship). Details of coding are described in the Procedure section below.

As has become evident from theory, maternal sensitivity, maternal feedback, and maternal interactive style in joint attention episodes constitute relevant aspects of maternal interactive behavior, which should be evaluated when assessing the quality of mother-child interactions. Therefore, INTAKT comprises three scales: *Maternal Sensitivity*, *Feedback*, and *Joint Attention*.

Based on Ainsworth et al.'s (1974, 1978) theory, a 7-point scale for assessing *Maternal Sensitivity* was constructed, ranging from *very low sensitivity* (1) to *very high sensitivity* (7). Precise descriptions of maternal behaviors are given for points 1, 3, 5, and 7, respectively. They include information on whether the mother is able to attend to a common object with the child, whether she notices the child's signals and reacts promptly and appropriately to them, whether she can adopt the child's viewpoint, how she reacts to the child's accomplishments, and whether her language is appropriate for the child's developmental status.

According to theory (e.g., Kelley et al., 2000), maternal *Feedback* can either be positive, corrective (i.e., feedback negative or critical in content but positive or neutral in tone), or negative. Alternatively, mothers might give no feedback to their children at certain times. Therefore, INTAKT divides feedback into four categories (*positive*, *corrective*, *negative*, *no feedback*) and offers precise behavioral definitions for each of them.

Based on the theoretical (e.g., Saxon et al., 2000) distinction between mothers who tend to follow their child's attentional focus and mothers who tend to switch their child's attentional focus in joint attention episodes, INTAKT defines six categories for the assessment of *Joint Attention*. Thus, mothers can: actively contribute to their child's joint attention by assuming an active role in their common play while following the child's attentional focus (*active maintenance*), or by verbally commenting on their child's actions and/or outcomes (*verbal maintenance*), passively contribute to their child's joint attention by watching and following the child's actions (*passive maintenance*), manipulate the child's attention during an ongoing activity by directing the child's attention to certain aspects or away from other aspects of a game (*attention manipulation*), directly attempt to switch their child's attention away from the ongoing activity towards a new one (*attention switching*), or not attain any joint attention with their child (*no joint attention*). INTAKT offers precise descriptions of the corresponding maternal behaviors for each category.

All three scales included an additional category for uncodeable sequences which had to be coded if the quality of the video-tapes did not allow for an understanding of what the mother was saying or if mothers left the part of the room captured by the video camera. Every sequence that had been recorded as uncodeable was eliminated from further analysis.

Procedure

Interactions took place in a playroom of the CPS, and mothers were allowed to use all available toys while interacting with their child. The interaction lasted between 12:19 and 42:21 minutes ($M = 22:03$ min.). Mothers were informed that CPS workers were to use the videos as a basis for decisions regarding the foster status (e.g., changes of custody or visitation rights) of the child. All participants agreed to their videos being used for purpose of our study as well.

All sequences were coded according to the INTAKT categories by the fourth author. Each video was also coded by one of two additional trained coders to assess inter-rater reliability. All of them were blind as to whether mothers were foster mothers or mothers with children in foster care.

Coding the sequences involved three steps. Firstly, *Maternal Sensitivity* was assessed using a time-sampling procedure with 2 minute intervals. This was realized by watching the video for two minutes and then making a judgment about the interaction quality during that interval on the 7-point scale. Then the next two minutes of the video were watched and afterwards rated, and so on. A second step consisted of recording maternal *Feedback*, and lastly, *Joint Attention* was coded. The latter two were recorded in a time-sampling procedure with 15 second intervals. Videos were thereby watched for 15 seconds, and then it was decided which *Feedback* category applied to the respective situation. After making decisions for all 15 second intervals of the video, the video was watched again and *Joint Attention* categories were coded every 15 seconds.

Results and discussion

Inter-rater reliability

Ordinal scaled rater agreement (weighted kappa, κ_w) for *Maternal Sensitivity* and nominal scaled rater agreement (Cohen's kappa, κ) for *Feedback* and *Joint Attention* were calculated twice; at first for all videos ($n = 20$), and then only for videos that did not include a sibling of the child in question ($n = 16$). This was due to the fact that coding seemed to be more difficult for videos including more than one child. All κ values are presented in Table 1. As expected, κ values for one-child videos were higher than those for all videos.

Table 1:
Inter-rater agreement for all videos and one-child videos (Pilot Study)

| Videos included | <i>Maternal Sensitivity</i> | <i>Feedback</i> | <i>Joint Attention</i> |
|------------------|-----------------------------|-----------------|------------------------|
| All videos | $\kappa_w = .386$ | $\kappa = .439$ | $\kappa = .473$ |
| One-child videos | $\kappa_w = .467$ | $\kappa = .478$ | $\kappa = .489$ |

Observed behavior and decisions of the experts

A hierarchical cluster analysis, using the algorithm of Ward (1963), was computed to detect subgroups of mothers within our sample who differed on the basis of their behavior towards their child. For each case, a mean value for *Maternal Sensitivity* was calculated. The categories for *Feedback* and *Joint Attention* were divided into positive (positive or corrective feedback; active, verbal, or passive maintenance) and negative (negative feedback; attention manipulation or switching, no joint attention) categories. The differences of the relative frequencies of positive and negative categories of *Feedback* and of *Joint Attention* were then calculated for each case. All three variables were then entered into the cluster analysis, which yielded a two-cluster solution with 10 mother-child dyads in each cluster.

Table 2 summarizes the differences between those clusters. No significant differences between the two clusters were observed concerning the sex of the child as well as the relationship towards the child (i.e. whether the observed person was a biological or a foster mother). Clusters differed regarding maternal behavior. Mothers in Cluster 1 ("positive interaction") had higher mean sensitivity ratings than mothers in Cluster 2 ("negative interaction"), gave more positive than negative feedback and sustained joint attention with their child mainly through active, verbal, or passive maintenance, while mothers in Cluster 2 provided slightly higher proportions of negative feedback and applied a higher rate of attention switching and attention manipulation.

For a first evaluation of the concurrent validity of INTAKT we were able to use the decisions of the CPS workers regarding the foster status of the child as an external criterion. CPS workers had made their decisions without any information regarding the

Table 2:
Demographic factors, INTAKT subscales, and decision of experts according to clusters
(Pilot Study)

| Characteristic | Cluster 1 (<i>n</i> = 10) | Cluster 2 (<i>n</i> = 10) | <i>t</i> / χ^2 | <i>p</i> |
|-----------------------------|-------------------------------|-------------------------------|-------------------------|----------|
| Sex of child | | | | |
| Girls | 7 | 7 | $\chi^2(1, 20) = 0$ | 1 |
| Boys | 3 | 3 | | |
| Mother | | | | |
| Biological | 5 | 7 | $\chi^2(1, 20) = 0.833$ | .650 |
| Foster | 5 | 3 | | |
| <i>Maternal Sensitivity</i> | <i>M</i> = 4.908 | <i>M</i> = 3.098 | <i>t</i> (18) = 5.746 | <.001 |
| <i>Feedback</i> | <i>M</i> = .20 | <i>M</i> = -.03 | <i>t</i> (18) = 4.334 | <.001 |
| <i>Joint Attention</i> | <i>M</i> = .66 | <i>M</i> = .36 | <i>t</i> (18) = 2.552 | .020 |
| Decision of experts | | | | |
| Positive decision | 6 | 1 | $\chi^2(1, 14) = 7.143$ | .029 |
| Negative decision | 1 | 6 | | |

INTAKT codings. They had gotten to know the families at the CPS and had evaluated the quality of interactions between (foster) mother and child as well as other family and life circumstances according to their own criteria. For 14 of the observed videos, the decisions constituted either a positive or negative consequence for the observed (foster) mother. For example, if the observed mother was a biological mother, a return of the child into her custody would have been a positive consequence; a continuance of the foster care would have been a negative consequence. In order to see if those decisions related to the evaluation of mother-child interaction quality with INTAKT, they were compared with the described clusters (see Table 2).

There was a significant connection between the observed maternal behavior and the decisions of the experts, $\chi^2(1, 14) = 7.143, p = .029$. Mothers with more positive interactions were confronted with more positive decisions by CPS workers, while mothers with more negative interactions faced more negative decisions regarding the foster status of their child. Thus, measuring *Maternal Sensitivity*, *Feedback*, and *Joint Attention* with INTAKT seems to allow for a valid assessment of the quality of mother-child interactions.

Study 2: Extension Study

After having successfully developed an instrument for assessment of the quality of mother-child interactions with videos obtained from local CPS, we intended to extend the approach to a broader sample. Thus, mother-child dyads with a middle-class family background were used as a sample for our Extension Study. Moreover, we aimed at improving inter-rater reliability through adjusting the definitions of the categories of maternal behavior. Furthermore, in the Extension Study we were able to code all interactions using the Mangold Software INTERACT instead of the paper-pencil method applied in our Pilot Study. Therefore, an event-sampling procedure could be used to code maternal *Feedback* and *Joint Attention*.

Method

Participants

19 mother-child dyads from Austrian families with medium to high socioeconomic status were videotaped. They included 8 boys and 11 girls between 3 and 6 years old. Additionally, we recoded 14 videos from our Pilot Study using the INTERACT software and our more precise category definitions. Videos with more than one child were excluded because they had proven to be too difficult to code reliably. Two videos had to be omitted due to technical reasons, leaving six videos with foster mothers and eight with mothers whose children had been placed in foster care. Children in those videos were between 1;4 and 4;4 years old ($M = 3;0$ years).

Measures

All interactions were coded with the INTAKT categories as described above (see “measures” section of Pilot Study). Some adjustments were made regarding the precise definitions of the behavioral categories.

Procedure

The interactions took place at home. Mothers and children were seated at a table with liquid as well as solid glue, colored felt-pens, scissors for adults as well as for children, and colored fancy papers with triangular roofs, round roof-lights, walls, square windows, and rectangular doors on them. They were told, “Look, I’ve got some craft materials here. Could you (*child*) change that boring house into a beautiful, colored house? Your mom can assist you with it and you (*both*) can use everything that’s on the table.” So the children were free to produce the house either by using the papers or by drawing, or by using a combination of both. The interactions lasted between 11:01 and 35:17 minutes ($M = 16:58$ min.), depending on how long it took the mother and child to complete the task.

The videotaped sequences were coded according to the INTAKT categories, using the Mangold Software INTERACT, by the fifth author who was blind as to whether mothers in the CPS-videos were foster mothers or mothers with children in foster care. Ten (27 % of the total sample) randomly selected sequences were additionally coded by the first author to assess inter-rater reliability.

Coding the sequences involved four steps. Firstly, the video was viewed without coding, in order to gain an overview of the interaction. In a second step, *Maternal Sensitivity* was assessed using a time-sampling procedure with 2 minute intervals (see Study 1). A third step consisted of recording maternal *Feedback*, using an event-sampling procedure. Thereby the video was watched and for every moment of the video it was decided which category of *Feedback* applied to the situation. Lastly, *Joint Attention* was coded in an event-sampling procedure. The video was therefore watched again and a decision about the applicable *Joint Attention* category was made for every moment of the interaction.

Results and discussion

All analyses were conducted after omitting the first two minutes of the videos to allow mothers and children to adjust to the situation and to being videotaped.

Inter-rater reliability

A weighted κ with squared weights was calculated for *Maternal Sensitivity*, reaching a value of .81. Cohen’s κ were calculated for *Feedback* and *Joint Attention* with help of the Mangold Software INTERACT. To allow for differences in reaction time between the two coders, codings were considered equal if they overlapped for at least 80 % or if they

did not overlap but coding started within a time limit of two seconds. Kappa reached a value of .58 for *Feedback* and .57 for *Joint Attention*.

Differences between mothers

For further validation of INTAKT, we compared maternal behavior in our normal sample with maternal behavior in CPS videos. If the INTAKT scales provide a valid measure of interaction quality, one should expect mothers from our second sample to achieve better values, especially when compared with mothers whose children had been placed in foster care.

Mean *Maternal Sensitivity* values for each of the three groups were as follows, inconspicuous mothers $M = 6.17$, foster mothers $M = 5.14$, and mothers with children in foster care $M = 4.01$. A one-way ANOVA showed significant differences of these means, $F(2, 33) = 13.881$, $p < .001$. A post-hoc analysis (Scheffé) revealed this to be due to a significant difference between inconspicuous mothers and mothers with children in foster care ($p < .001$). The latter were judged to be less sensitive when interacting with their children.

Mothers provided feedback to their children for about the same amount of time (6.19, 4.60, and 7.07 % of the time; $\chi^2(2, 33) = 5.146$, $p = .076$). Table 3 shows how the different kinds of feedback were distributed amongst the three groups of mothers. Mothers differed in the amount of positive, $\chi^2(2, 33) = 14.464$, $p = .001$, and negative, $\chi^2(2, 33) = 6.538$, $p = .038$, feedback they gave to their children. Specifically, inconspicuous mothers provided more positive feedback than foster mothers, $z = -2.736$, $p = .006$, and mothers with children in foster care, $z = -3.186$, $p = .001$. Negative feedback, in turn, was used more often by mothers with children in foster care than by inconspicuous mothers, $z = -2.480$, $p = .013$.

Table 3:

Percentage of time in which mothers gave different kinds of feedback and spent within each category of joint attention (Extension Study)

| INTAKT category | Inconspicuous mothers | Foster mothers | Mothers with children in foster care |
|------------------------|-----------------------|----------------|--------------------------------------|
| <i>Feedback</i> | | | |
| Positive feedback | 67.36 % | 41.82 % | 17.25 % |
| Corrective feedback | 30.97 % | 56.44 % | 59.27 % |
| Negative feedback | 1.67 % | 1.74 % | 23.48 % |
| <i>Joint Attention</i> | | | |
| Active maintenance | 39.79 % | 38.64 % | 43.03 % |
| Verbal maintenance | 33.08 % | 25.34 % | 20.13 % |
| Passive maintenance | 24.29 % | 19.62 % | 11.32 % |
| Attention manipulation | 1.91 % | 6.18 % | 13.01 % |
| Attention switching | 0.37 % | 3.22 % | 6.47 % |
| No joint attention | 0.57 % | 7.00 % | 6.04 % |

Mothers also differed according to the way they sustained joint attention with their children while playing with them. Table 3 shows the percentage of time they spent within each category. While no differences between mothers could be observed regarding their active, $\chi^2(2, 33) = 0.310, p = .856$, and verbal, $\chi^2(2, 33) = 2.231, p = .328$, maintenance of the child's joint attention, time spent passively maintaining the child's joint attention differed between groups of mothers, $\chi^2(2, 33) = 8.772, p = .012$, with inconspicuous mothers spending more time within that category than mothers with children in foster care, $z = -2.920, p = .003$. Regarding the differences in attention manipulation, $\chi^2(2, 33) = 9.649, p = .008$, and attention switching, $\chi^2(2, 33) = 13.111, p = .001$, the results show that mothers with children in foster care spent more time within those categories than inconspicuous mothers, $z = -2.829, p = .005$ and $z = -3.446, p = .001$ respectively.

In summary, the comparison between the three groups of mothers showed that the differences appeared as predicted. In particular, maternal behavior in normal mother-child dyads was evaluated in a more positive way than that of mothers whose children had been placed in foster care. Thus, the comparison of those extreme groups of mothers provided further evidence for the validity of the instrument.

Cluster solutions depending on maternal behavior

Similar to the Pilot Study, a hierarchical cluster analysis, using the algorithm of Ward (1963), was computed to detect subgroups of mothers, within our sample, who differ on the basis of their behavior towards their child. For each case, a mean value for *Maternal Sensitivity* was calculated. Categories for *Feedback* and *Joint Attention* were divided into positive (positive or corrective feedback; active, verbal, or passive maintenance) and negative (negative feedback; attention manipulation or switching, no joint attention) categories. Differences regarding the relative duration of positive and negative categories of *Feedback* and of *Joint Attention* were then calculated for each case. All three variables were then entered into the cluster analysis, which yielded a two-cluster solution with 25 mother-child dyads in Cluster 1 and eight dyads in Cluster 2.

Table 4 summarizes differences between those clusters. Contingency analysis revealed no differences between the two clusters concerning sex of the child. Cluster 1 ("positive interaction") was characterized by highly sensitive mothers who gave positive feedback to their children and sustained joint attention with them in a positive way. Cluster 2 ("negative interaction") was characterized by less sensitive mothers who provided a higher proportion of negative feedback and manipulated or switched the attentional focus of the child more often. All mothers from our second sample were in the "positive interaction" Cluster, while most mothers whose children had been placed in foster care were part of the "negative interaction" Cluster. These results were in line with our expectation that mothers whose children had been taken into custody by the CPS should achieve lower values than mothers from a normal sample, and thus provided further evidence for the validity of our instrument.

Table 4:
Demographic factors and INTAKT subscales according to clusters (Extension Study)

| Characteristic | Cluster 1 (<i>n</i> = 25) | Cluster 2 (<i>n</i> = 8) | <i>t</i> / χ^2 | <i>p</i> |
|-----------------------------|-------------------------------|------------------------------|--------------------------|----------|
| Sex of child | | | | |
| Girls | 16 | 6 | $\chi^2(1, 33) = 0.330$ | .687 |
| Boys | 9 | 2 | | |
| Mother | | | | |
| Biological | 2 | 6 | $\chi^2(2, 33) = 17.573$ | <.001 |
| Foster | 4 | 2 | | |
| Normal | 19 | 0 | | |
| <i>Maternal Sensitivity</i> | <i>M</i> = 6.07 | <i>M</i> = 3.56 | <i>t</i> (31) = 8.072 | <.001 |
| <i>Feedback</i> | <i>M</i> = .06 | <i>M</i> = .03 | <i>t</i> (31) = 2.927 | .006 |
| <i>Joint Attention</i> | <i>M</i> = .91 | <i>M</i> = .40 | <i>t</i> (31) = 8.041 | <.001 |

General discussion

In summary, our results showed that the defined behavioral categories can be objectively and reliably assessed with INTAKT and that they offer valid information on the quality of mother-child interactions. By redefining maternal behavior descriptions, it was possible to raise inter-rater reliability considerably. Validity of the instrument was proven on the basis of internal as well as external criteria.

Thus, observation of maternal sensitivity, maternal feedback, and maternal behavior in joint attention episodes provides a solid basis for the assessment of the quality of mother-child interactions. As can be seen from the extensive research reported above, interactional quality in those areas has a great impact on the further development of the child (e.g., Mezulis et al., 2006; Raikes & Thompson, 2008; Vaughan Van Hecke et al., 2007). Therefore, assessment via INTAKT is likely to provide additional information when assessing the developmental status of a child. Research linking INTAKT measures with developmental measures is currently under way.

In a next step, norms should be created for the newly developed instrument, so that it can then be used in the context of routine mother-child assessments. The assessment of maternal behavior could then also be used as a starting point for maternal counseling and interventions regarding the interactions with her child.

So far, INTAKT has only been used with (foster) mothers and their children. However, there does not seem to be any reason why it should not be possible to use the same categories to evaluate interactions between fathers or other caregivers (e.g., day care providers) and their children. Further research should focus on this topic.

There are some mentionable limitations to our studies: Firstly, we used a rather small sample size, which was due to the fact that all videos had to be taped in the homes of the families or were provided by the CPS. On the other hand, this assured a high ecological

validity and meant that all participants were highly motivated to interact with their child in the most positive way they could. In particular, mothers whose children had been placed in foster care knew that a decision about the foster status of their child was at hand. Under those circumstances, a positive interaction would have been expected. Nonetheless, significant differences in behavior, compared with inconspicuous mothers, could be observed using the INTAKT categories.

Another limitation concerns the differences between videos obtained from CPS and those recorded at home. On average, the former included younger children than the latter. As it seems possible that the age of the child might influence a mother's interactive style, more research about age-related effects seems necessary. Analysis of age-related differences for INTAKT categories is currently underway. Another difference between the videos concerns the play situation itself. While CPS videos included a less structured play situation, standardized materials and instructions were used in the videos recorded at home. This represents an important step in the development of INTAKT, and more research using the more standardized procedure is imminent. Furthermore, it can also be seen as a positive fact that INTAKT scales proved their worth in such different settings.

Another difference between the two studies concerns the time-sampling (paper-pencil) vs. event-sampling (PC-software) method for coding maternal *Feedback* and *Joint Attention*. Both alternatives proved to be useful, with the event-sampling method providing even more detailed data.

In conclusion, INTAKT appears to have potential as a useful instrument for the assessment of the quality of mother-child interactions, for researchers as well as practitioners.

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