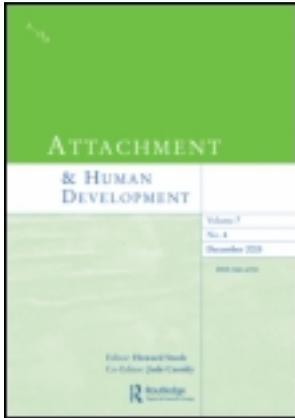


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Mary Ainsworth's legacy: a systematic review of observational instruments measuring parental sensitivity

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Since Mary Ainsworth's formulation of the Sensitivity-Insensitivity to Infant Signals and Communications observational scale, new instruments have been developed to observe parental sensitivity. In this paper, we provide an overview of eight commonly used observational instruments to measure parental sensitivity. Their similarities and differences in comparison to the original Ainsworth sensitivity construct and its applications will be discussed. Consistent with the search criteria, each of the instruments clearly includes the key elements of Ainsworth's definition of sensitivity. Notable deviations from the original scale are the use of composite scales rather than a single global scale and the related inclusion of new elements, and specifically the inclusion of positive affect as an indicator of sensitivity. Further, most of the instruments have a wider scope than Ainsworth's sensitivity scale in terms of target age groups and the assessment of sensitivity in fathers. We discuss the interpretation of the sensitivity construct depending on variations in how the construct is defined in different observational instruments, and advances in the application of the construct.

Keywords: maternal sensitivity; observation; instruments; positive affect; review

The introduction of the maternal sensitivity construct has proven to be one of Mary Ainsworth's most valuable contributions to the field of parenting and child development. The Sensitivity-Insensitivity to Infant Signals and Communications scale is part of the Maternal Care scales. These scales are clearly grounded in attachment theory and were designed to assess the quality of maternal behavior tailored to a specific infant and to explain individual differences in attachment quality (Ainsworth, Bell, & Stayton, 1971; Ainsworth, Blehar, Waters, & Wall, 1978). To this day the original Ainsworth sensitivity observation scale (Ainsworth, Bell, & Stayton, 1974), is still used in empirical studies (e.g., Fearon et al., 2006; Gonzalez, Jenkins, Steiner, & Fleming, 2012; Spangler, Johann, Ronai, & Zimmerman, 2009).

In addition, a number of new observation instruments have been designed to measure parental sensitivity. These newer instruments vary in their formulation of the sensitivity construct (Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996), with some being very similar to the original construct, and others including new elements or leaving out certain aspects. They also vary in their focus in terms of target age group and observational setting. The choice for one instrument over another when designing an observational study of sensitivity may be based on several theoretical and practical considerations. However, to date there is a lack of systematic comparisons between measures that may inform researchers about each instrument's qualities, and their representation of the

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sensitivity construct. In this systematic review, we provide an overview of observational instruments that are used to measure parental sensitivity, and analyze them in terms of their relation to the original Ainsworth sensitivity construct and practical aspects of their application. We focus on the sensitivity scale rather than the total set of Ainsworth's Maternal Care scales, as Ainsworth herself identified the sensitivity construct as pivotal to secure attachment development (Ainsworth et al., 1978). The other scales were developed primarily to differentiate between mothers of babies classified as avoidant and ambivalent in the Strange Situation (Ainsworth et al., 1971). In addition, the sensitivity construct and its label have been far more dominant in the empirical attachment literature than the auxiliary scales.

Mary Ainsworth's definition of sensitivity is a parent's ability to (1) notice child signals, (2) interpret these signals correctly, and (3) respond to these signals promptly and appropriately (Ainsworth et al., 1974). These components of parental behavior refer to universally relevant aspects of caregiving, including proximity to the child (necessary for protection and meeting basic needs), contingent responding (promoting social development), and appropriateness of parental interventions based on the child's responses rather than on a fixed list of specific parenting behaviors (Mesman, Oster, & Camras, 2012; Mesman, Van IJzendoorn, & Bakermans-Kranenburg, 2012). To provide a clear representation of Ainsworth's Sensitivity-Insensitivity to Infant Signals and Communications scale, the descriptions of the two extreme scores (9 = highly sensitive, and 1 = highly insensitive) are shown below (Ainsworth et al., 1974, pp. 131–133):

9. Highly sensitive. *This mother is exquisitely attuned to B's signals; and responds to them promptly and appropriately. She is able to see things from B's point of view; her perceptions of his signals and communications are not distorted by her own needs and defenses. She "reads" B's signals and communications skillfully, and knows what the meaning is of even his subtle, minimal, and understated cues. She nearly always gives B what he indicates that he wants, although perhaps not invariably so. When she feels that it is best not to comply with his demands – for example, when he is too excited, over-imperious, or wants something he should not have – she is tactful in acknowledging his communication and in offering an acceptable alternative. She has "well-rounded" interactions with B, so that the transaction is smoothly completed and both she and B feel satisfied. Finally, she makes her responses temporally contingent upon B's signals and communications.*

1. Highly insensitive. *The extremely insensitive mother seems geared almost exclusively to her own wishes, moods, and activity. That is M's interventions and initiations of interaction are prompted or shaped largely by signals within herself; if they mesh with B's signals, this is often no more than coincidence. This is not to say that M never responds to B's signals; for sometimes she does if the signals are intense enough, prolonged enough, or often enough repeated. The delay in response is in itself insensitive. Furthermore, since there is usually a disparity between one's own wishes and activity and B's signals, M who is geared largely to her own signals routinely ignores or distorts the meaning of behavior. Thus, when M responds to B's signals, her response is inappropriate in kind or fragmented and incomplete.*

These descriptions of highly sensitive and highly insensitive parents illustrate the key role of appropriate responding, and the child-centered definition of appropriateness (i.e., does it make the child content?) in Ainsworth's conceptualization of sensitivity. It is also interesting to note the absence of any references to parental positive affect or warmth in the descriptions of the scores (although warmth is mentioned briefly in the introduction to the scale descriptions), whereas several more recent approaches to parent-child

interactions explicitly emphasize the importance of positive affect and warmth in conceptualizations of sensitivity in the score descriptions (e.g., Biringen & Easterbrooks, 2012). In Ainsworth's Maternal Care scales, positive affect and warmth are represented most clearly in a different scale: the Acceptance versus Rejection scale, which she introduces as follows: "This scale deals with the balance between the mother's positive and negative feelings about her baby". Thus, the constructs of sensitivity and positive affect are part of the Maternal Care scales, but are rated as separate constructs.

Regarding theoretical background, Ainsworth's sensitivity scale was developed within the attachment framework and aimed at explaining individual differences in Strange Situation attachment classification (Ainsworth et al., 1971, 1978). Ainsworth's Baltimore study showed that maternal sensitivity was indeed related to attachment security (Ainsworth et al., 1978), a finding that has been replicated in a meta-analysis based on 66 studies (De Wolff & Van IJzendoorn, 1997), and confirmed by a meta-analysis showing that improvements in parental sensitivity induced by parenting interventions improves child attachment quality (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003). More recent work on the sensitivity construct has moved beyond the attachment framework and examines relations with a large variety of parental and child characteristics such as maternal depression (e.g., Campbell, Matestic, Stauffenberg, Mohan, & Kirchner, 2007) and child cognitive outcomes (e.g., Bernier, Carlson, & Whipple, 2010).

Regarding the observational setting, Ainsworth based her coding of maternal sensitivity in the Baltimore study on narrative accounts of naturalistic interactions during multiple home visits with five home visits lasting 4 hours each in the last quarter of the first year for each dyad (Ainsworth et al., 1978), and in subsequent studies it has generally been used to assess parent–infant interactions across the first year of life. In current-day research such intensive and naturalistic observations are rare and sensitivity is usually observed in time frames between 10 and 30 minutes (with some exceptions using longer observation periods, e.g., Grossman, Grossman, Spangler, Suess, & Unzner, 1985; Kochanska, Kim, Barry, & Philibert, 2011). As was common at the time, Ainsworth focused on mothers only, although her sensitivity scale has since been used with fathers (e.g., Grossman et al., 2002; Schoppe-Sullivan et al., 2006). In addition, adaptations of the sensitivity construct to father-specific interaction patterns have been designed (e.g., the Sensitive and Challenging Interactive Play Scale by Grossman et al., 2002). Ainsworth's sensitivity construct seems to have been inspired in part by her observations in Uganda, and her scale has been used in non-Western countries since then (e.g., True, Pisani, & Oumar, 2001; Yovsi, Kärtner, Keller, & Lohaus, 2009). However, observational research on parental sensitivity in non-Western countries is still very rare.

The growing research interest in sensitivity beyond the original use of the Ainsworth scale in terms of theoretical orientation, child age, caregiver identity, and observational settings is likely to have been a driving factor in the development of new observation instruments to measure sensitivity in the past decades. In the present paper we aim to provide an account of the legacy of Ainsworth's sensitivity scale by reviewing currently-used global observational instruments assessing parental sensitivity (or sensitive responsiveness). To find these instruments, we conducted a systematic literature search. Given the fact that the original Ainsworth sensitivity scale is a global rating scale, and the conceptual differences between such scales and other approaches such as behavior counts, event-based coding, or micro-level coding (Mesman, 2010), we decided to focus only on global rating scales. We examine these instruments in light of the original Ainsworth sensitivity scale, its behavioral descriptors, and its applications in terms of target population and setting.

Method

We conducted a systematic literature search for papers reporting on studies using observational instruments of parental sensitivity in Web of Science. The following keywords were used: Topic=((“maternal sensitiv*” OR ”maternal responsive*” OR “paternal sensitiv*” OR ”paternal responsive*” OR “mother* sensitiv*” OR ”mother* responsive*” OR “father* sensitiv*” OR ”father* responsive*” OR “parent* sensitiv*” OR ”parent* responsive*” OR “sensitive parenting”) AND (child* OR infan* OR adolescen* OR toddler OR preschooler OR baby OR babies)). The use of “Topic” as the search field means that the titles, abstracts, author keywords, and Web of Science keywords (KeyWords Plus) were searched.

In addition, we filtered on categories by excluding those that are obviously unrelated to our field (e.g., agriculture). We further selected only papers published in the English language. This search yielded 1014 publications (7 December 2012). Each of these publications was screened to find out whether they indeed included global observational instruments of parental sensitivity or sensitive responsiveness (and not just responsiveness in terms of frequency of responses) and a literature reference or specific name for the scale. This led to a set of 50 observation instruments. For the purpose of selecting instruments to discuss in the current review, we selected the eight instruments that were used in the highest number of publications (all in more than 10) within our search results. These eight instruments were coded regarding several characteristics, based on the coding manuals, the method sections of papers in our search results, their reference lists, but also other sources of information such as the authors of the scales. To correctly identify instrument characteristics, we also conducted additional literature searches to uncover studies using the instruments for specific purposes and in specific populations relevant to our review. We coded: (1) availability of the instrument; (2) age range for which the instrument is applicable; (3) the observational settings in which the instrument is used; (4) whether the scale has been used to code father sensitivity; (5) whether the scale has been used in non-Western countries; (6) the inclusion of a single sensitivity scale versus a composite sensitivity scale; (7) the inclusion of positive affect or warmth in the definition of sensitivity; and (8) the link with attachment quality.

On a cautionary note we would like to emphasize that the aim of the current review is to provide an account of observational measures that researchers have used to assess sensitivity. The guiding principle is the use of the term sensitivity (or responsiveness including sensitivity elements and not just response frequency) in empirical papers reporting on the instrument. This also means that instruments that do include a sensitivity(-like) or responsiveness(-like) construct but are not described as such by the researchers reporting on the instrument are not included in this review.

Results

Table 1 shows the characteristics of the eight selected instruments for observing parental sensitivity and sensitive responsiveness developed after Ainsworth’s original scale. The characteristics of these instruments can be summarized as follows: five are freely available without cost or mandatory training, the target age ranges vary substantially, free play is the most-often used observational setting, all eight have been used for coding maternal as well as paternal sensitivity, six have been applied in non-Western cultures, three include a single sensitivity scale (rather than a composite of separate subscales), seven included positive affect as a criterion or indicator for sensitivity, and seven have been found to

Table 1. The Ainsworth sensitivity scale and eight commonly used newer observation instruments measuring parental sensitivity and their characteristics.

Instrument name	Freely available ¹	Age range ²	Observation setting ³	Fathers ⁴	Non-Western cultures ⁵	Single global rating ⁶	Positive affect ⁷	Link with attachment ⁸
Ainsworth sensitivity scale (Ainsworth et al., 1974)	Yes	Infancy	N; P; F; T; D	Yes	Yes	Yes	–	Yes
CARE-Index (Crittenden, 2001)	No	Infancy – Preschool	P; FF	Yes	Yes	No	++	Yes
Coding Interactive Behavior (CIB; Feldman, 1998)	No	Infancy – Adolescence	P; F	Yes	Yes	No	++	No
Emotional Availability Scales (EA Scales; Biringen, 2008; Biringen et al., 1998)	No	Infancy – Adolescence	P; T; D	Yes	Yes	Yes/No*	++	Yes
Erickson scales (Erickson et al., 1985)	Yes	Toddler – Preschool	T	Yes	Yes	No	+	Yes
Global Ratings of Mother–Infant Interaction (Murray et al., 1996)	Yes	Infancy	P; FF	Yes	Yes	Yes	+	Yes
Maternal Behavior Q-Sort (MBQS; Pederson & Moran, 1995)	Yes	Infancy – Preschool	Mix**	Yes	Yes	No	+	Yes
NICHD-SECCYD sensitivity scales (Owen, 1992).	Yes	Infancy***	P	Yes	No	Yes	–	Yes
Parent–Child Early Relational Assessment (PCERA; Clark, 1985)	Yes	Infancy – Toddler	F; P; T	Yes	No	No	++	Yes

Notes: We have done our best to uncover all relevant information about the instruments in the table.

¹No if the instrument is only made available when attending an official training.

²Age range as reported in the manual (if mentioned) combined with the ages found in the papers in our search results.

³Observational setting as found in the papers within our search results: N = Naturalistic; F = Feeding; P = Play (with or without toys); FF = Face-to-face interaction (with or without toys); T = Teaching task (e.g., puzzle, problem-solving); D = Demanding task (e.g., clean-up, no-touch, competing demands).

⁴Has the instrument's sensitivity scale been used with fathers?

⁵Has the instrument's sensitivity scale been used in a non-Western cultures?

⁶Does the instrument include a single global sensitivity rating? (No if a composite of several scales or items is used to derive a sensitivity or responsiveness scale.)

⁷Is positive affect included in the definition of sensitivity? ++ = prominently included; + = minimally included; – not included.

⁸Is there evidence for a link between the instrument's sensitivity scale and child attachment security?

**In the 3rd edition a single global sensitivity rating is used, but in the 4th edition the sensitivity scale consists of seven subscales.

***The MBQS is coded during extensive home visits based on observations of parental behavior throughout the visit, often in the context of an interview, including naturalistic interactions, and sometimes specific play or teaching settings are added.

****For older ages the Erickson scales are used in the NICHD-SECCYD.

relate to child attachment quality. We will now discuss each of the instruments in some more detail, in alphabetical order. The provided information is based on the instruments' coding manuals, supplementary information materials, and the method sections of papers reporting on the instruments. We describe the characteristics summarized in Table 1 for each instrument (in alphabetical order). We also discuss the theoretical background of the instrument, specifically whether it is grounded in attachment theory as Ainsworth's scale was, and we summarize empirical studies using the instrument in relation to attachment constructs.

The Child–Adult Relationship Experimental Index (CARE-Index)

The CARE-Index was first developed for scoring adult interactions with infants and was later adapted to fit interactions with toddlers up to age 36 months (Crittenden, 2001), and can even be used up to 70 months (Künster, Fegert, & Ziegenhain, 2010). The instrument is described as a screening tool and seems to be mostly used to code sensitivity in free play settings, although there does not seem to be any reason not to use it in other settings. As is common in this field, the CARE-Index has been mostly used with mothers, but there are studies that have employed the instrument to rate father–child interactions (e.g., Kelley, Smith, Green, Berndt, & Rogers, 1998). The CARE-Index is only made available to those who follow the training. The instrument does not have a single sensitivity scale. Instead, seven aspects of maternal interactive behavior are evaluated, including facial expression, vocal expression, position and body contact, expressions of affection, pacing of turns, control, and choice of activity. Scores on each of these aspects are then evaluated in terms of sensitivity, control, and unresponsiveness (on 0–2 scales), and for each of these three parenting constructs the seven items are summed (yielding scores 0–14). The CARE-Index information materials do not describe a specific theoretical framework, although they do briefly mention attachment and, on the scale authors' website, it is mentioned that the CARE-Index was developed under Mary Ainsworth's guidance, and in consultation with John Bowlby.

The CARE-Index scale descriptions clearly include salient aspects of Ainsworth's definitions of sensitivity relating to availability to meet the child's needs, contingent responsiveness, and appropriate timing and content of activities. Although not found explicitly in Ainsworth's descriptions, affection and warmth are coded as important aspects of sensitivity. The CARE-Index sensitivity scores have been found to predict attachment security in the USA as measured in the Strange Situation (e.g., Fuentes, Lopes-dos-Santos, Beeghly, & Tronick, 2009), and using a representational attachment measure (Goodman, Aber, Berlin, & Brooks-Gunn, 1998). It has also been found to predict attachment security in a study in Chile (Valenzuela, 1997). In addition, the sensitivity scale differentiated between mothers with different attachment states of mind (Ward & Carlson, 1995). Finally, the scale can detect improvements in sensitivity following parenting intervention (e.g., Barlow et al., 2007).

Coding Interactive Behavior (CIB)

The observation instrument Coding Interactive Behavior (CIB; Feldman, 1998) consists of 22 scales measuring different aspects of adult–child interactions (rated on a scale from 1 = a little to 5 = a lot). There are versions of the CIB for newborns, infants, toddlers, preschoolers, and adolescents, but we did not uncover the specific age-related changes made for each version. The instrument appears to have been used only in (face-to-face) free-play settings, except for parental sensitivity with 13-year-olds which was assessed

during a conversation aimed at planning an enjoyable activity (Feldman, 2010). There is also a modified version specifically tailored to assessing sensitivity in feeding situations (Feldman, Keren, Gross-Rozval, & Tyano, 2004). In addition to being used for coding mother–child interactions, the CIB has also been used to code father–child interactions (e.g., Feldman & Eidelman, 2007) and caregiver–child interactions (e.g., Klein & Feldman, 2007). The CIB is only made available in the context of training. The instrument does not have a single sensitivity scale. A parental sensitivity construct is derived by combining scores on a selection of the 22 adult scales, generally including scales such as acknowledgement of child signals, positive affect, gaze, appropriate vocal quality, consistency of style, resourcefulness, and supportive presence. Several scales clearly refer to the most salient behaviors from Ainsworth’s definition as they focus on noticing child signals and appropriate responding across different modalities of interaction. Warmth and positive affect are also explicitly part of the sensitivity construct, which is not the case in Ainsworth’s sensitivity scale.

The CIB information materials mention attachment and the work of Mary Ainsworth, and some studies using the CIB sensitivity scale refer to salient aspects of attachment theory (e.g., Kim et al., 2011). The CIB sensitivity scale appears to be used mostly in relation to parental or child social-emotional risk (e.g., Feldman et al., 2009; Feldman & Klein, 2003; Keren, Feldman, & Tyano, 2001). Finally, the scale is able to detect improvements in maternal sensitivity following intervention (e.g., Feldman, Weller, Sirota, & Eidelman, 2003), and has also been used in a non-Western context in Palestinian families in Ramallah and the West Bank, revealing interesting culture-specific patterns of sensitivity and child outcomes (Feldman & Masalha, 2010).

Emotional Availability Scales (EA Scales)

The 3rd edition of the Emotional Availability scales (EA scales; Biringen, Robinson, & Emde, 1998) has been widely used in studies on sensitivity. It has been applied to mothers as well as fathers (e.g., Atzaba-Poria et al., 2010; Lovas, 2005), generally in free-play settings. The 4th edition of the EA scales (Biringen, 2008) is still relatively new and studies using this edition are only just starting to be published (e.g., Flykt et al., 2012). According to the manual, the newest edition can be applied to any adult caregiver interacting with children aged 0–14 years (with an infancy/early childhood version and a middle childhood/youth version), although the two versions are nearly identical. It is suggested that the version for older children may be extended to older ages.

The EA sensitivity scale in the 3rd edition consists of a single 9-point rating scale, and a highly sensitive parent is described as follows: “Emotional communication between parent and infant is for the most part positive, appropriate, and creative. The highly sensitive parent displays much genuine, authentic and congruent interest, pleasure, and amusement with the infant” (Biringen et al., 1998, p. 257). It is clear from this description that the EA sensitivity scale is much broader than the original sensitivity scale and includes strong references to parental affect. This is consistent with the theoretical background of the EA scales (Biringen & Easterbrooks, 2012), which includes clear references to attachment theory, but also explicitly acknowledges the influence of frameworks emphasizing affective attunement (e.g., Emde & Easterbrooks, 1985).

In contrast to the 3rd edition, the 4th edition of the EA scales is not freely available, as it is only released to those who follow the EA training. The 4th edition does not have a single sensitivity scale, but instead includes seven subscales for coding sensitivity, of which the first two are the most salient (scored on a 1–7 scale) and the last five contributing less to the overall

score (1–3 scale). The two main subscales are labeled “Affect and Clarity of Perceptions” and “Appropriate Responsiveness”. As in the 3rd edition, affect plays a far more important role than in Ainsworth’s original sensitivity scale as evidenced by the following sentence from the manual: “The key characteristic of the sensitivity construct, in our view, is affect” (Biringen, 2008, p. 17, underlining by Biringen).

The 3rd edition of the EA sensitivity scale shows meaningful relations with child attachment security in risk samples in Western countries (Oppenheim, Koren-Karie, Dolev, & Yirmiya, 2012; Van IJzendoorn et al., 2007) and in a non-Western country (John, Morris, & Halliburton, 2012, in India). The sensitivity scale also relates to parental attachment state of mind (Aviezer, Sagi, Joels, & Ziv, 1999; Coppola, Cassibba, & Costantini, 2007; Edelstein et al., 2004), and has been shown the ability to detect changes in maternal sensitivity following intervention (e.g., Salomonsson & Sandell, 2011).

Erickson scales

The Erickson scales (Egeland, Erickson, Clemenhagen-Moon, Hiester, & Korfmacher, 1990; Erickson, Sroufe, & Egeland, 1985) are generally used to code interactions in teaching situations (e.g., making a puzzle that is too difficult for the child to solve on his/her own) with toddlers and preschoolers. The Erickson scales have also been used with fathers in the context of the NICHD-SECCYD study (see below; NICHD Early Childcare Research Network, 2000). Although the manual does not provide a theoretical framework, the first study to use these scales (Erickson et al., 1985) was clearly grounded in attachment theory. The scales include supportive presence, lack of respect for autonomy (later labeled as intrusiveness), hostility, clarity of instruction, sensitivity and timing of instruction, and confidence. These scales are coded using scores 1 to 7, each with specific behavioral descriptions and without shorthand labels. The instrument does not actually include a scale with the label “sensitivity”, but several research groups have used composites of (a selection of) these scales to measure the construct of sensitivity (e.g., Alink et al., 2009; Bell & Belsky, 2008). Interestingly, the Erickson scales are also part of the observational battery in the NICHD study where they are also used to derive an overall sensitivity construct (see also the description of the NICHD sensitivity scales below). Various elements of the Erickson scales are indeed relevant to the sensitivity construct, such as the parent’s ability to provide support when the child needs it, and tailoring support to the needs of the child in terms of timing and content. Positive regard is mentioned as an aspect of supportive presence, but is not prominent in the descriptions.

The sensitivity construct based on the Erickson scales has been found to be related to child attachment security in a USA sample (McElwain, Cox, Burchinal, & MacFie, 2003) and in a Japanese sample (Vereijken, Riksen-Walraven, & Kondo-Ikemura, 1997), and can detect improvements in maternal sensitivity as a result of intervention (e.g., Stams, Juffer, Van IJzendoorn, & Hoksbergen, 2001; Stolk et al., 2008).

Global Ratings of Mother–Infant Interaction

As the name suggest, the Global Ratings of Mother–Infant Interaction (Murray, Fiori-Cowley, Hooper, & Cooper, 1996) was specifically designed to assess maternal interactions with infants. The manual states that it is intended to measure interactions with 2- to 5-month-old infants in a face-to-face setting. It has been applied to interactions during the Still-Face Paradigm (e.g., Grant, McMahon, Reilly, & Austin, 2010), but also to free play settings (e.g., Stein et al., 2012) and with older infants up to age 12 months in our search

results (e.g., Hobson, Patrick, Crandell, García-Pérez, & Lee, 2005). Despite its name it has also been used to code father–infant interactions (Ramchandani et al., 2013). The manual does not provide a theoretical background, but the first study using the scales (Murray et al., 1996) also included the Strange Situation and found no relations between the scales and attachment security. The instrument includes a single specific sensitivity scale (scored 1 to 5) that can be seen as a summary of scales regarding warmth, acceptance, responsiveness, and non-demandingness that are scored first, but it is coded separately. The sensitivity scale description clearly reflects Ainsworth’s original definition as it includes references to signal perception, empathy, and appropriate responsiveness. The developers of the scale also specifically mention taking the child’s perspective as a guiding principle. Positive affect as reflected in the scale assessing warmth is also part of the sensitivity construct in this instrument. However, the manual explicitly mentions that high maternal warmth without appropriate responsiveness can not lead to a very high sensitivity score.

The sensitivity construct derived from the Global Ratings of Mother–Infant Interaction is related meaningfully to infant attachment security in a South African sample (Tomlinson, Cooper, & Murray, 2005), and has been found to detect improvement in sensitivity through intervention in mothers of very-low-birth-weight infants (Feeley, Zelkowitz, & Shrier, 2012).

Maternal Behavior Q-Sort (MBQS)

The MBQS (Pederson et al., 1990; Pederson & Moran, 1995; Pederson, Moran, & Bento, 1999) is a Q-set consisting of 90 cards with statements about maternal behaviors. The MBQS is not a regular global rating scale, but it was included here because it yields a global sensitivity score. The cards are sorted into nine piles of 10 items each ranging from highly uncharacteristic to highly characteristic. A single sensitivity score is derived by correlating the scores for each mother’s Q-sort with a criterion sort provided by experts describing the prototypically sensitive mother. The MBQS was originally designed for home observations of maternal interactions with infants, but has also been used with fathers (Colonesi et al., 2013). The MBQS has also been used beyond infancy (e.g., Selcuk et al., 2010), and a preschool version of the instrument has been developed (Maternal Behavior for Preschoolers Q-Set; Posada, Kaloustian, Richmond, & Moreno, 2007).

The developers of the MBQS explicitly mention the work of Mary Ainsworth as a major source for the item descriptions (Pederson et al., 1990). The 90 items indeed include clear references to Mary Ainsworth’s definition of sensitivity, with descriptions of signal perception (e.g., “notices when baby smiles, vocalizes”), and prompt and child-centered appropriate responding (e.g., “responds accurately to signals of distress”) with the aim of satisfying the child (e.g., “interventions satisfy baby”). There are also some references to positive affect (e.g., “displays affection by touching, caressing”), but only sporadically within the total set of 90 items, and thus unlikely to make the difference between ratings reflecting highly sensitive interactions versus ratings reflecting insensitive interactions.

The MBQS sensitivity score is highly correlated with the Ainsworth sensitivity scale (Behrens, Hart, & Parker, 2012), and shows associations with infant attachment quality in Western samples (Bailey, Moran, Pederson, & Bento, 2007; Behrens, Parker, & Haltigan, 2011; Kim & Kim, 2009; Pederson et al., 1990) and in a Colombian sample (Posada et al., 1999). It has also been found to relate meaningfully to maternal attachment state of mind (Bailey, Moran, Pederson, & Bento, 2007; Lindhiem, Bernard, & Dozier, 2011; Whipple,

Bernier, & Mageau, 2011). Finally, the MBQS sensitivity scale has been found to be sensitive to improvements in parenting quality following intervention (Moss et al., 2011).

NICHD-SECCYD sensitivity scales

In the National Institute of Child Health and Human Development study of Early Child Care and Youth Development (NICHD-SECCYD), several single scales are used to assess sensitivity. From infancy up to 24 months, two sensitivity scales are used: one for sensitivity to nondistress and one for sensitivity to distress, scored on a scale from 1 (not at all characteristic) to 4 or 5 (highly characteristic), and generally used in semi-structured free play settings (Owen, 1992). For older ages, slightly adapted versions of the Erickson scales are used to code parental behavior in free play and teaching tasks (also focusing more on teaching-related interactions), and a sensitivity construct is derived by combining the scales for supportive presence, respect for autonomy, and hostility (see discussion of Erickson scales above).

In this section we focus on the infancy scales that were specifically designed for the NICHD-SECCYD. In one of the scale documents, it is stated that the sensitivity to distress scale was adapted from Ainsworth et al. (1978), whereas the sensitivity to nondistress is based on work by Margaret Fish, who in turn acknowledges Ainsworth's work when introducing her measure (Fish, Belsky, & Stifter, 1991). Thus it appears that the attachment framework was used as a guiding principle for both infant sensitivity scales. Given the context of a large longitudinal study, these sensitivity scales have been widely used in research publications, and have been applied to both mothers and fathers (e.g., Barnett, Deng, Mills-Koonce, Willoughby, & Cox, 2008). In both of the sensitivity scales that are used up to age 24 months, the focus is on appropriate responsiveness judged on the basis of the effectiveness of parental responses. In the case of distress this means the child is soothed and in the case of nondistress that the child is engaged and content. These descriptions clearly reflect the main elements of Ainsworth's sensitivity scale. The scales do not include specific mention of parental positive affect as a main element of sensitivity. However, in some studies a composite sensitivity score is used that does include a specific rating of positive regard (e.g., Bradley & Corwyn, 2008; Hirsch-Pasek & Burchinal, 2006).

The NICHD sensitivity scales used for infants up to age 24 months have been found to relate to infant attachment quality (e.g., Bakermans-Kranenburg, Van IJzendoorn, & Kroonenberg, 2004; McElwain & Booth-LaForce, 2006; NICHD Early Child Care Research Network, 2006) and child separation anxiety (Dallaire & Weinraub, 2005). Finally, the scale has been found to reveal improvements in maternal sensitivity towards preterm infants following a parenting intervention (Ravn et al., 2011).

Parent–Child Early Relational Assessment (PCERA)

The Parent–Child Early Relational Assessment (PCERA; Clark, 1985) is an observational rating scale with 65 items (scored 1–5) designed to comprehensively assess the frequency, duration, and intensity of adaptive behavior in terms of social-emotional and task-related qualities. In the manual four coding situations are mentioned, including feeding, structured task, free play, and separation/reunion. Regarding target population, the scale title suggests applicability to both parents, and potentially a range of child ages. We were unable to find out the intended age range of the scales, but found almost exclusively papers reporting on mothers and infants up to 12 months and only one on toddlers with

fathers (Eiden, Edwards, & Leonard, 2006). One of the items is labeled “parent reads child’s cues and responds sensitively and appropriately”. The item title captures the scale’s content well, in that the focus is clearly on signal perception and appropriate responsiveness. Similar to Ainsworth’s scale descriptions, empathic awareness is specifically mentioned. In addition, some other items also refer to contingent responsiveness to specific child behaviors, thus also reflecting sensitivity. Positive affect is not a part of the sensitivity construct described in the sensitivity item. However, the studies that use the PCERA do not report on a single sensitivity scale, but all report on composite sensitive responsiveness scales that include other PCERA items that do clearly refer to positive affect (e.g., Brown, 2007; Bystrova et al., 2009; Scher, 2001). Thus, it seems that the sensitivity item is not used as a separate scale.

The manual does not provide a theoretical background, although in one paper Ainsworth’s work is mentioned in the introduction of the section on the PCERA (Kivijarvi et al., 2001). The PCERA maternal sensitivity construct has been found to predict attachment security in infants born prematurely (Shah, Clements, & Poehlmann, 2011). The PCERA has been used to evaluate intervention effectiveness (e.g., Clark, Tluczek, & Brown, 2008), but we did not find any studies reporting on significant intervention effects on PCERA constructs labeled sensitivity. Finally, the PCERA sensitivity scale does not seem to have been used in non-Western countries.

Discussion

For this review we unearthed no less than 50 different observational instruments used to measure parental sensitivity in early childhood, showing the viability of Mary Ainsworth’s formulation of this construct. The selected eight instruments that were used most often to measure sensitivity within our search results do show marked differences in the conceptualization of the construct and in their applications. Nonetheless, consistent with the original aim of the sensitivity construct, for most instruments we found studies reporting on meaningful associations with child attachment security.

Interestingly, only three of the eight most-used instruments include a single global rating scale for sensitivity (EA scales 3rd ed., Global Ratings of Mother–Infant Interaction, and NICHD-SECCYD sensitivity scales), whereas the others require the summing of several scales. This is in contrast to the original Ainsworth sensitivity scale that requires the observer to make one global assessment of sensitivity, rather than separately evaluate specific maternal behaviors that contribute to the sensitivity construct. In addition, the multi-aspect composites used in some instruments extend beyond Ainsworth’s core elements. Some of these specific additions seem to reflect the extension to older ages in which other types of interactions are observed than in infancy and need to be rated on sensitivity as well (e.g., teaching behavior in the Erickson scales). In other cases, elements are split up into more specific pieces. For instance, in the CARE-Index each modality of interaction (e.g., facial, vocal, body) is rated separately regarding sensitivity. From a cross-cultural perspective this is an interesting approach, as there is evidence that the use of specific modalities in maternal interactions with infants may vary across cultures (e.g., Kärtner, Keller, & Yovsi, 2010). Specifying separate subscales per modality could thus provide interesting information about culture-specific patterns of sensitive responding.

Some have suggested that the use of a multi-aspect composite is actually a better approach because sensitivity is a complex construct (Seifer et al., 1996). However, studies on the components of sensitivity are surprisingly rare. In a study by Lohaus, Keller, Ball, Elben, and Voelker (2001), independent ratings were obtained for overall sensitivity

and each of the main elements of the sensitivity construct. The results showed high correlations between the overall rating of sensitivity and its elements: signal perception ($r = 0.56$), correct interpretation ($r = 0.77$), prompt reaction ($r = 0.75$), and appropriate reaction ($r = 0.72$). These findings could be taken to suggest that when it comes to the main components of sensitivity, coding separate scales is not really necessary, as they are also captured largely by one overall rating. However, high correlations do not mean that the elements can not contribute uniquely to specific aspects of child development. Assessing particular aspects of sensitive parent-child interactions separately may bring to light specific patterns and associations with child outcomes. In most cases however, the subscales are not used separately and are instead used as a part of the final total sensitivity score, including not only the original elements of sensitivity, but also other added elements. To enhance our understanding of the sensitivity construct it may be worthwhile to explore the independent contributions of each of its core and added elements, and to compare this to the contribution of composite constructs. This would require independent coding and sufficient intercoder reliability for each subscale. Independent coding may be quite a challenge given the larger number of coders needed, and regarding reliability it is our experience that the reliability on the final aggregate score can be high even when reliabilities on separate subscales are insufficient. But if separate subscales are thought to reflect significantly different aspects of sensitivity, it may be worthwhile investing in solving these issues.

Another notable deviation from the original Ainsworth sensitivity scale is the inclusion of positive affect or warmth as a criterion or indicator for sensitivity in seven out of eight instruments reviewed. In some instruments this aspect is particularly salient (e.g., the EA scales, the CARE-index), whereas in others it is a rather minor part of the scale descriptions (e.g., the MBQS, the Erickson scales). The terms positive affect and warmth usually refer to maternal smiling and positive tone of voice, and often also to physical affection like caressing. There is something to be said for including positive affect in the definition of sensitivity, as significant correlations between the two constructs have been observed. However, when rated independently these correlations are generally only moderate in size (e.g., 0.12 to 0.45 in Lohaus, Keller, Ball, Voelker, & Elben, 2004, 0.37 in Oppenheimer, Hankin, Jenness, Young, & Smolen, 2013, and 0.49 in Spinrad, Eisenberg, & Silva, 2012), especially compared to the correlations with the basic elements of sensitivity as described above. In addition, there is evidence that warmth and sensitive responsiveness show differential predictive associations with child outcomes. For instance, observed sensitivity was found to predict child regulation of negative affect and empathy towards distressed others, whereas warmth (a multi-method composite including observations) predicted child regulation of positive affect (Davidov & Grusec, 2006). In another study, maternal sensitivity to distress predicted security of attachment whereas maternal affect (defined as social/affective interactions) did not (Del Carmen, Pedersen, Huffman, & Bryan, 1993), and both maternal sensitivity and positive regard (defined as demonstrations of affirmation, warmth, and affection toward the child) have been found to be independent predictors of child ADHD symptoms (Keown, 2012). In a related vein, it has been suggested that warmth and sensitive responsiveness belong to different motivational systems, with different evolutionary functions (MacDonald, 1992). However, to complicate matters, there is also evidence that attachment security is predicted by positive affect and several other aspects of parenting to the same extent as by sensitivity (De Wolff & Van IJzendoorn, 1997).

Supporting the idea that positive affect and prompt appropriate responding to infant signals to facilitate infant secure-base behavior are distinct, Ainsworth reported warmth and

affection in all but two mothers in her Uganda study, which by her own interpretation ruled out warmth as a predictor of secure attachment patterns (Ainsworth, 1967). In a related vein, our own extensive experiences with coding parent–child interactions in a variety of samples and observational settings reveal that in a subgroup of parents, high levels of positive affect are accompanied by extreme intrusiveness and lack of signal perception. These parents play with their children vigorously, with a lot of tickling, poking, and fun-making, while not noticing that their child is not enjoying the interaction. The parent’s positive affect is genuine, in that she really does enjoy this type of play with her child, but it is not accompanied by sensitivity at all. This interaction pattern appears to have also been noted by Mary Ainsworth as shown in her description of a mother of an infant in the resistant attachment group (C₁): “She continually interrupted her daughter to train her, to show off her accomplishments, or merely because she herself felt like playing with the baby or showing her affection” (Ainsworth et al., 1978, p. 238). Of course in the observational instruments which include positive affect this type of parent could never receive a top score on sensitivity because of the lack of appropriate responsiveness, but her sensitivity score is likely to be at least inflated because of the presence of high levels of positive affect. This particular interaction pattern would yield a relatively high sensitivity score if positive affect is included in the definition of sensitivity, thus obscuring the fact that the mother actually did not show appropriate responsiveness. Thus, Ainsworth certainly acknowledged the importance of positive affect and since it also relates to attachment security, it may be helpful to rate sensitivity and positive affect separately, consistent with the structure of the original Maternal Care scales. It then also becomes possible to examine both the unique and additive or even interactive effects of each of these components on child outcomes.

Regarding the target age range of the children, the focus of the reviewed instruments is predominantly on early childhood, although there are some exceptions (EA scales and CIB). Those studies that do assess sensitivity towards adolescents are generally conducted by researchers who also study early childhood parenting, often longitudinally (e.g., Feldman, 2010). The idea that the attachment framework is also relevant to adolescent as a developmental period in its own right was pointed out by Allen (2008) who suggests that the balance between exploration and attachment behaviors in infancy can be translated to the balance between autonomy and attachment processes in adolescence. In addition, indirect assessments of maternal sensitivity (i.e., concordance between maternal and adolescent reports on the adolescent’s characteristics) have shown meaningful relations with adolescent attachment states of mind (Allen et al., 2003; Berger, Jodl, Allen, McElhaney, & Kuperminc, 2005).

There are very few studies reporting on directly observed sensitivity in adolescence in relation to adolescent development, but there is some evidence that such relations exist. For instance, observed maternal sensitivity in adolescence has been found to predict adolescent social development (e.g., Jaffari-Bimmel, Juffer, Van IJzendoorn, Bakermans-Kranenburg, & Mooijaart, 2006), and higher levels of observed maternal support during a discussion task has been found to predict adolescent autonomy problems, and a greater susceptibility to the influence of peers regarding substance use (Allen, Chango, Szewedo, Schad, & Marston, 2011). One study also showed that a variety of risk factors increased adolescent allostatic load, but only for adolescents with mothers observed to show low levels of sensitive responsiveness (e.g., Evans, Kim, Ting, Teshler, & Shannis, 2007). Overall it seems that extending research on sensitivity to older ages and adapting observational instruments accordingly is a worthwhile endeavor.

The extension of the observation of sensitivity to fathers is a notable advance in the field of attachment research (Bretherton, 2010). All instruments reviewed in this paper have also

been used with fathers and have shown meaningful associations between paternal sensitivity and a variety of other variables (e.g., Kelley et al., 1998; Lewis & Lamb, 2003; Lucassen et al., 2011; Shannon, Tamis-LeMonda, & Cabrera, 2006; Shannon, Tamis-LeMonda, London, & Cabrera, 2002). However, it has been suggested that other aspects of father-child interactions may be more salient for child development, such as challenging and stimulating play (Grossmann, Grossmann, Kindler, & Zimmermann, 2008). In a recent meta-analysis this idea was not confirmed, as paternal sensitivity including stimulating play was not more strongly predictive of attachment security than paternal sensitivity alone (Lucassen et al., 2011). Nevertheless, studies with observations of father-child interactions are still scarce, and more research is needed to understand the role of paternal sensitivity and related behaviors in predicting child outcomes.

Another important issue regarding the observation targets is the fact that the vast majority of studies assessing parental sensitivity is conducted in Western ethnic majority samples, although a recent review has shown that sensitivity is relevant for child development in ethnic minority families as well (Mesman et al., 2012). As described in our review of the eight observation instruments, some have indeed been used in non-Western samples and have contributed to the notion that parental sensitivity is a universal phenomenon that can be successfully assessed using existing observational instruments. However, we still know relatively little about the nature of predictive relations between sensitivity and child outcomes outside the USA and Europe, and this area of research deserves our full attention in the future.

Going back to the staggering 50 new sensitivity observational instruments that we found, we wondered whether the field needs that many different instruments, each with their own minor and/or major variations on the original conceptualization of the sensitivity construct. At the very least our review results suggest that there is no need for the development of additional instruments to measure sensitivity, because there are already so many of them to choose from. Taking this point a bit further, it may be beneficial to the field if the set of instruments was more restricted and above all include only those with clearly-defined behavioral descriptions of its elements so that readers may know exactly what was measured. Conceptual clarity is of key importance for the interpretation of research results based on different observational instruments. In a related vein, it was surprising to find that most manuals do not provide a clear theoretical framework. The EA scales and the MBQS are notable exceptions as their manuals include explicit theoretical backgrounds. This of course does not mean that the other scales are not grounded in theory. Most do seem to relate to attachment theory, given that seven out of eight have been found to predict attachment security, but it would be helpful to researchers trying to choose an observation instrument if the theoretical background of each instrument was explicitly described.

To promote conceptual clarity, the term sensitivity should not be used too lightly to retain a clear distinction between the original clearly defined and delineated construct and other more elaborate constructs. The instrument that comes closest to Ainsworth's sensitivity scale is the NICHD-SECCYD sensitivity scale as used up to age 24 months, since it consists of a single global rating scale that does not call for evaluating maternal warmth, positive affect, or other added elements. The MBQS is also very close to Ainsworth's sensitivity construct, as the formulation of the items was explicitly guided by her work (Pederson et al., 1990). Instruments using broader conceptualizations can certainly be an asset to the field, but only when its elements are clearly defined. When there are many added elements, it may be advisable to not use the term sensitivity to describe the construct being measured.

There are some limitations to the current review. First, our literature search to find observational instruments measuring parental sensitivity did not uncover all relevant papers, as was shown by additional searches conducted to find more information about specific instruments or topics. Unfortunately it was not possible to perform a cited-reference search for most of the selected instruments, because the instrument manuals were generally unpublished manuscripts. We therefore had to rely on a search with keywords. Our extra searches revealed that some relevant papers only include terms such as “parenting quality” or “parent–child interactions” and were not captured by our search if the terms sensitivity or responsiveness were not explicitly mentioned in the abstract or keywords of the papers, even though they were measured. Expanding our keywords to capture such papers would have led to a much larger number of hits far too great to process within a reasonable time. However, our goal was not to find all existing papers on parental sensitivity, but to find observational measures assessing parental sensitivity. Although it may be that the total set of 50 instruments that we found represents an underestimation of the actual number, it is very unlikely that an expanded search would have led to a change in the set of eight most commonly used instruments that we discussed in detail. Second, although we have done our best to adequately describe the eight selected instruments, it was sometimes surprisingly difficult to obtain information. Some coding manuals were hard to find and in some cases the instrument was used in many different ways, making it more difficult to provide a description that captures all its applications. We did attempt to contact the authors of each of the scales, but were not always successful. Nevertheless, anyone interested in a particular instrument is encouraged to contact the authors of the instrument to make sure that they receive all relevant information, independent of this review.

Although there are some limitations, this is the first systematic review of observational instruments assessing parental sensitivity, and the first attempt to analyze these instruments in relation to the original Ainsworth sensitivity construct. The number of observational instruments to measure sensitivity is very impressive and reflects the value of the construct. However, the interpretation of research results would be served by a more limited and clearly defined set of instruments. The eight observational instruments reviewed in detail all include the main elements from Ainsworth’s sensitivity scale. Salient and common deviations from the original scale include the use of composite scales rather than a single global scale and the related inclusion of new elements, and specifically the inclusion of positive affect as an indicator of sensitivity. The variety of parental behaviors that constitute the sensitivity construct across instruments highlights the importance of conceptual clarity. The potential danger of adding elements to scales labeled as assessing sensitivity is that the measures will reflect overall good/positive parenting rather than sensitive responsiveness specifically. Indeed, there is evidence that separating the core sensitivity construct from additions such as warmth and positive affect is worthwhile, and even that distinguishing between the core elements of sensitivity might be helpful. Regarding the targets of observation, the extension of the assessment of sensitivity to older age groups, fathers, and non-parental caregivers has clearly been very valuable to the field and is likely to foster new studies in the future. Most instruments appear to be applicable to both Western and non-Western samples, which is encouraging for the field of cross-cultural studies on parenting and child development. In sum, the legacy of Mary Ainsworth’s sensitivity construct and observational scale is truly impressive and her work will continue to inspire researchers across the globe for many decades to come.

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