COMPREHENSIVE CHILD AND ADOLESCENT NURSING
2016, VOL. 39, NO. 2, 107–138
http://dx.doi.org/10.3109/01460862.2015.1134720

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Caregiver-Infant Interaction Quality: A Review of Observational Assessment Tools

Panagiota D. Tryphonopoulos, BN, RN, PhD[a], Nicole Letourneau, RN, PhD, FCAHS[b], and Enrico DiTommaso, PhD[c]

[a]Department of Health Studies, Brandon University, Brandon, Manitoba, Canada; [b]Department of Nursing, University of Calgary, Calgary, Alberta, Canada; [c]Department of Psychology, University of New Brunswick, Saint John Campus, Saint John, New Brunswick, Canada

ABSTRACT

The relationship between caregiver and infant interaction quality and infant developmental outcomes has long been established. As children mature, problems stemming from troubled caregiver-infant relations may result in referral to mental health, early intervention, or child protection services. The accurate and appropriate assessment of caregiver-infant interaction is critical for early recognition of problematic relations and for informing suitable treatment modalities. Evaluating the quality of the caregiver-infant relationship poses a challenge for researchers and clinicians seeking to explore the association between infant development and the quality of early caregiving experiences. This paper describes and compares commonly used measures of caregiver-infant interaction, including the Parent-Child Interaction Scales, Mutual Regulation Scales, Parent-Child Early Relationship Assessment, Mother-Infant Communication Screening, Ainsworth Maternal Sensitivity Scales, Maternal Behavior Q-sort, and the Emotional Availability Scales.

ARTICLE HISTORY
Received 6 June 2015
Revised 27 November 2015
Accepted 1 December 2015

KEYWORDS
Caregiver-infant interaction; observational measures; quantitative measures

Introduction

Social interactions between infants and their primary caregivers (usually mothers) predict children's later experiences with their external world and serve as the foundation for social and emotional development (Tronick, 1989). Challenging caregiver-infant relationships, such as those documented in women with postpartum depression (Beck, 1995), young parental age (Drummond, Letourneau, Neufeld, Stewart, & Wei, 2008), and drug using parents (Burns, Chethik, Burns, & Clark, 1991), place children at risk for insecure attachment (Burns et al., 1991), future cognitive and developmental challenges, and decreased resiliency to stress (Essex, Klien, Cho, & Kalin, 2002; Grace, Evindar, & Stewart, 2003). The use of reliable and valid measures for assessing caregiver-infant interaction quality provides clinicians and researchers with strategies for identifying anomalous caregiving practices and intervening to

CONTACT Panagiota D. Tryphonopoulos tryphonopoulosp@brandonu.ca Faculty of Health Studies, Brandon University, 270 18th Street, Manitoba Canada, R7A 6A9.

enhance early relationships of high-risk dyads. As children mature, problems stemming from impaired relationships may result in subsequent need for referral to mental health or child protection services. Effective and timely assessment of problematic caregiver-infant interaction is crucial for identifying suitable treatment modalities (Crittenden, 2008). Selecting an appropriate tool may pose challenges; therefore, review and comparison of common assessments of caregiver-infant interaction would aid in the selection of appropriate assessment tools and promote effective interventions.

Review objectives

The purpose of this review is to compare and contrast observational strategies for assessing early relationships between caregivers and children from birth to toddlerhood. CINAHL, Medline, Scopus, PsychINFO, Health, and Psychosocial Instruments databases were searched to identify observational tools for assessing the essential components of caregiving quality. Descriptive information, a summary of advantages and disadvantages (Table 1) and psychometric qualities (Table 2) of the identified measures are reviewed. The measures were chosen for inclusion based on: 1) conceptual framework consistent with some aspect of optimal caregiving quality (e.g., caregiver sensitivity, contingent responsiveness, caregiver affect, dyadic communication); 2) applicability of use in either research or a primary health care setting; 3) documentation in peer-reviewed publications; and 4) evidence of validity and reliability. The measures reviewed include the following: Parent-Child Interaction Scales (Sumner & Spietz, 1994a; Sumner & Spietz, 1994b), Mutual Regulation Scales (Tronick, Als, Adamson, Wise, & Brazelton, 1978), Parent-Child Early Relationship Assessment (Lowe, Handmaker, & Aragon, 2006), Mother-Infant Communication Screening (Raack, 1989), Ainsworth Maternal Sensitivity Scales (1969/1978), Maternal Behavior Q-sort (Pederson & Moran, 1995), and the Emotional Availability Scales (Biringen, 2008). Each of these measures assesses an essential component of caregiving such as caregiver sensitivity, contingency of response, dyadic synchrony, and communication. These particular measures were selected based on the frequency in which they appeared in the database searches and the availability of information relevant to this review. The review also discusses the measures' implications for research and practice.

Theoretical perspectives of caregiver-infant interaction

The propensity for developing strong emotional bonds to particular individuals is a basic component of human nature (Bowlby, 1988). Caregiving and care seeking are indispensable social roles. In its purest form, caregiving consists of providing comfort and protection from harm (Bowlby, 1988). Perhaps the most important responsibility of caregivers is the way in which

Table 1. Comparison of measurements of caregiver-infant interaction quality.

	Parent Child Interaction (PCI) Teaching and Feeding Scales	Mutual Regulation Scales (MRSS & IRSS)	Parent-Child Early Relationship Assessment (PCERA)	Mother-Infant Communication Screening (MICS)	Ainsworth Maternal Sensitivity Scale (AMSS)	Maternal-Behaviour Q-sort (MBQS)	Emotional Availability (EA) Scales
Construct of Interest	Multiple features of caregiver-infant interaction: sensitivity; response to distress; social-emotional & cognitive growth fostering activities; infant clarity of cues & responsiveness to caregiver.	Synchronicity of dyadic interaction.	Assesses quality of feelings and behaviour in caregiver-child interactions.	Caregiver-infant communication disorders.	Caregiver sensitivity.	Caregiver sensitivity.	Caregiver components: sensitivity, structuring, non-intrusiveness, and non-hostility. Child components are responsiveness to the caregiver and the child's involvement of the caregiver.
Caregiver Behaviour or Dyadic Behaviour	Dyadic	MRSS measures parent behaviour. IRSS measures infant behaviour.	Dyadic	Dyadic	Caregiver	Caregiver	Dyadic
Training	2–6 day workshop.	Training required but not well described in the literature.	Workshop (40 hours over 4 or 5 days).	Self-training via study manual.	Training required but not well described in the literature.	Training required.	Training is offered both online and in vivo (3-day workshops).

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Table 1. (Continued).

	Parent Child Interaction (PCI) Teaching and Feeding Scales	Mutual Regulation Scales (MRSS & IRSS)	Parent-Child Early Relationship Assessment (PCERA)	Mother-Infant Communication Screening (MICS)	Ainsworth Maternal Sensitivity Scale (AMSS)	Maternal-Behaviour Q-sort (MBQS)	Emotional Availability (EA) Scales
Location and time to administer	Brief to administer (10 min) and score, can be scored live or videotaped.	Data collection brief. Scored micro analytically, requires multi-coder approach, live coding not possible.	Data collection brief (5 min), moderate amount of time required for scoring (20–30 min).	Administered and during routine health encounter (10 min). 20–30 minutes need for scoring.	Can be scored during live observation or from video recorded interactions. Administration and scoring time varies, depends upon length of observance time.	Can be scored during live observation or from video recorded interactions. Long periods of time required for naturalistic observation (2–4 hours).	Data collection brief (20–30 min). Can be scored from during live observation or from video recorded interactions.
Equipment and Cost	Low cost, video recording optional	Low cost, requires video recording	Low cost, requires video recording	Low cost, video recording optional	Low cost, video recording optional	Low cost, video recording optional	Low cost, requires video recording
Child's Age	NCATS: Birth–36 months NCAFS: birth–12 months	Birth–12 months	Birth–4 years	Birth–12 months	Age range not specified.	Age range not specified	Infancy/Early Childhood Version: Birth–5 years. Older Child Version: 6–14 years.
Global or Discrete Scale	Global	Micro-analytic /discrete	Global	Discrete	Global	Yields global sensitivity score	Global

(*Continued*)

Table 1. (Continued).

	Parent Child Interaction (PCI) Teaching and Feeding Scales	Mutual Regulation Scales (MRSS & IRSS)	Parent-Child Early Relationship Assessment (PCERA)	Mother-Infant Communication Screening (MICS)	Ainsworth Maternal Sensitivity Scale (AMSS)	Maternal-Behaviour Q-sort (MBQS)	Emotional Availability (EA) Scales
Cultural Application	Thai families (Chivanon & Wacharasin, 2012). Portuguese families (Zuzarte & Calheiros, 2010). Japanese families (Teramoto et al., 2010). Mexican American families (Cabrera et al., 2009). Bangladeshi families (Frith et al., 2009). Aboriginal families (Letourneau, Hungler, & Fisher, 2005). Chinese families (Zhu et al., 2007). Hispanic immigrant mothers in the US (Gaffney et al., 2001).	No evidence of use in non-Western samples.	No evidence of use in non-Western samples.	No evidence of use in non-Western samples.	Lithuanian mothers (Kalinauskiene et al., 2009). Cameroonian families (Yovsi et al., 2009). Vietnamese and Hmong mothers (Foss, 2001). Dogon people of Mali (True et al., 2001).	Dutch, Moroccan, and Turkish mothers living in the Netherlands (Emmen et al., 2012). Chinese families (Ding et al., 2012).	North American, European and Asian mothers (Aviezer, Sagi, Joels, & Ziv, 1999; Howes & Obregon, 2009; Chaudhuri & Easterbrooks, 2009). Cross-cultural validity in Israel (Aviezer et al., 2003) US Hispanic mothers (Biringen & Allender, 2011). Italian families (Bornstein et al, 2011; Cassibba, 2009) Finish mothers (Flykt et al., 2012). Brazilian families (Fonseca et al., 2010). Mothers in urban India (John et al., 2012). South African families (Murray-Kolb & Beard, 2009 Mexican heritage migrants to the US (Howes & Obregon, 2009)
Number of Publications	194	39	72	Mostly applied to clinical practice.	194	159	123

(*Continued*)

Table 1. (Continued).

	Parent Child Interaction (PCI) Teaching and Feeding Scales	Mutual Regulation Scales (MRSS & IRSS)	Parent-Child Early Relationship Assessment (PCERA)	Mother-Infant Communication Screening (MICS)	Ainsworth Maternal Sensitivity Scale (AMSS)	Maternal-Behaviour Q-sort (MBQS)	Emotional Availability (EA) Scales
Contact Details/ Website	www.ncast.org	Co-developer, Dr. Edward Tronick (Edward.Tronick@umb.edu)	Developer, Dr. Rosanne Clark (rclark@wisc.edu)	http://clas.uiuc.edu/special/evaltools/cl01610.html	Not available	Co-developer, Dr. Greg Moran (gmoran2@uwo.ca).	www.emotionalavailability.com

they can influence children's affective and cognitive development. Consequently, a number of theories and conceptual models have emerged to explain various (and sometimes overlapping) facets of these complex human relationships (e.g., the Barnard Model, Mutual Regulation Model, Ainsworth's description of sensitivity).

Caregiver sensitivity

Sensitivity refers to the act of monitoring and responding and the caregiver's ability to be emotionally and psychologically available to the child (Sumner & Spietz, 1994b). Contingent responsiveness refers to the caregiver's ability to perceive and respond to the infant's signals accurately and promptly (Cassidy & Shaver, 2008). Barnard's Model suggests that successful interaction depends upon the caregiver and infant's capacity for adapting to one another. Caregivers must a) recognize and respond to infants' cues, b) understand that infants are capable of expressing their needs, and c) demonstrate sensitivity to infants through the type and timing of stimulation and responsiveness. Infants must a) send clear cues regarding needs and b) respond to their caregivers' attempts to interact and alleviate distress. It is the caregiver's responsibility to manage the interaction and adapt appropriate behaviors, ensuring that interactions become contingent. If both caregivers and infants fulfil these responsibilities, positive interactions are likely to occur (Barnard & Eyres, 1979).

Mutual regulation

In Weinberg and Tronick's (1994) Mutual Regulation Model (MRM), infant communication is emphasized because infants are biologically predisposed to communicate with their primary caregivers in order to alert caregivers to their affective state. Within the caregiver-infant dyad, interaction is bi-directional and mutually regulated toward a state of reciprocity. Each participant actively modulates his or her own interactions by responding to his or her partner's affective and behavioral displays. Consequently, the affective communications of one partner changes the emotional experience and behavior of the other (Tronick, 1989). As a result, the mutual regulation process depends on the infant and mother's ability to mutually regulate by identifying, interpreting, and appropriately responding to each other's affect and behavior (Weinberg & Tronick, 1994; Weinberg, Olson, Beeghly, & Tronick, 2006).

Summary of theoretical perspectives

There are many parallels in these perspectives. Each posits that the infant is competent (e.g., does not merely passively receive care) (Weinberg et al., 2006) and that both caregiver and child play distinct and active roles in developing the

relationship; nonetheless the caregiver takes on the majority of the responsibility (Crittenden, 2008; Weinberg et al., 2006). Another commonality is that children's behavior is organized, goal directed, and sensitive to contextual/environmental input. Each theory also specifies the predictive patterns of caregiver-child behavior that determine the quality of the relationship (Barnard & Eyres, 1979; Weinberg et al., 2006). Furthermore, within each perspective, the caregivers provide for children's physical needs and protect them from harm, thus, with their basic needs met, children can turn their attention toward learning about the salient features of their world. Perhaps the most obvious similarity between them is the emphasis each puts on caregiver sensitivity. The caregiver's ability to perceive the child's signals accurately and to respond adequately and promptly is considered to be a crucial determinant of the child's attachment security. Nevertheless, given the inherent complexity and multidimensionality of caregiver-infant relationships, caregiver sensitivity is not the lone determinant of interaction quality. For this reason other dimensions of caregiving—such as contingency, caregiver affect, and dyadic communication—warrant inclusion in assessment of early relationships.

Caregiver-infant interaction assessment tools

Parent-child interaction scales

Caregiver-infant interaction quality can be measured via the observational Parent-Child Interaction (PCI) Teaching and Feeding Scales (Sumner & Spietz, 1994a; Sumner & Spietz, 1994b). The PCI scales are among the most widely used standardized measures of caregiver-infant interaction quality. The accompanying NCAST (Nursing Child Assessment Satellite Training) Database has a collection of normative data on 2,100 children ages 1–53 months for comparative purposes. The PCI Scales assess caregiver-infant interaction through six subscales. These include parental Sensitivity to Cues (Subscale 1), Responsiveness to Distress (Subscale 2), Social-Emotional Growth Fostering Activities (Subscale 3), and Cognitive Growth Fostering Activities (Subscale 4). These scales also measure infant Clarity of Cues (Subscale 5) and Responsiveness to Parent (Subscale 6). Together, the Nursing Child Assessment Teaching Scale (NCATS) and the Nursing Child Assessment Feeding Scale (NCAFS) offer two conceptually parallel descriptions of the social interactions between caregivers and infants (Sumner & Spietz, 1994a; Sumner & Spietz, 1994b). The present form of the PCI scales, revised in 1994, remains essentially unchanged since the 1979 version. Primarily used to identify the strengths and weaknesses of the caregiver-infant interaction, the PCI Scales are highly structured, the behaviors assessed are clearly specified, and the judgments on behavior are simplified since they are dependent upon occurrence versus non-occurrence. Containing 73 binary items, the Teaching Scale is used to assess a child-defined, age-appropriate teaching interaction

between caregiver and child aged birth to 36 months. Observation of the teaching interaction typically takes approximately 10 minutes (Sumner & Spietz, 1994b). The Feeding Scale—containing 76 binary items—is used to assess a pre-defined set of behaviors within the context of the feeding interaction with infants from birth to 1 year of age (Sumner & Spietz, 1994a). Observation of the feeding interaction takes approximately 30 minutes. Training (typically delivered in a 2 to 6 day workshop) from an NCAST-certified instructor is mandatory for administering and scoring the measure (Sumner & Spietz, 1994a). Trainees are required to achieve 85% inter-observer reliability for clinical use or 90% inter-observer reliability for research purposes (Sumner & Spietz, 1994a; Sumner & Spietz, 1994b). Information on training in the PCI Scales is available from http://www.ncast.org/.

Application of the parent-child interaction scales

The PCI Scales have been extensively utilized for measuring caregiver-child interaction in screening, clinical practice, and research settings (used in over 194 observational and intervention studies between 1995 and 2013) with diverse groups of caregivers and children. Psychometric data are available (see Table 2). There is some degree of variability in the internal consistency and test-retest reliability of the PCI Scales. The internal consistency is lower for subscales that include items dependent upon partner behavior (i.e., Parental Sensitivity to Cues, Child Clarity of Cues) and test-retest reliability tends to be lower for infant subscale scores because measures obtained at 3- to 4-month intervals reflect rapid developmental changes (Sumner & Spietz, 1994a; Sumner & Spietz, 1994b). The Scales have been used to assess the quality of caregiver-infant interaction within the context of maternal depression (Britton, Gronwaldt, & Britton, 2001; LeCuyer-Maus, 2003; Letourneau et al., 2011), adolescent mothers (Drummond et al., 2008; Koniak-Griffin et al., 2002; Letourneau, 2001; Sadler, Swartz, & Ryan-Krause, 2003), substance abusing mothers (Suchman et al., 2010) and with fathers (Benzies et al., 2013; Brophy-Herb, Gibbons, Omar, & Schiffman, 1999; Goodman, 2008). The PCI Scales have also been used to assess caregiver-infant interaction quality in samples of low-income families (Horodynski & Gibbons, 2004; Schiffman, Omar, & McKelvey, 2003), infants with developmental disabilities (Becker, Englehardt, Steinmann, & Kane, 1997; Kusaka, Ohgi, Gima, & Fujimoto, 2007), pre-term infants (Evrard et al., 2011), aboriginal mothers and infants (Letourneau, Hungler, & Fisher, 2005), and HIV exposed infants (Bryne, Lobo, & Barnard, 1998; Lobo, 2001).

Mutual regulation scales

The Maternal Regulatory Scoring System (MRSS) and the Infant Regulatory Scoring System (IRSS) are measurements derived from the Mutual Regulation Model and can be used with children from birth to 12 months.

Table 2. Psychometrics of interaction quality assessment tools.

	Reliability			Validity	
	Internal Consistency	Test-Retest	Inter-Rater	Predictive	Concurrent
PCI Teaching Scale	Individual subscales α= .50–.80 Total Teaching scale score α = .87 (Sumner & Speitz, 1994)	r = .85 for Total Parent score r = .55 for Infant Total score (Sumner & Speitz, 1994)	85% inter-observer reliability to administer the scale for clinical use 90% inter-observer reliability for research purposes (Sumner & Spietz, 1994a, 1994b)	r = .34 with Bayley Scales MDI (Barnard & Eyres, 1979)	r = .44 with HOME scales r = .34 with Bayley Scales MDI
PCI Feeding Scale	Individual subscales α= .56–.69 Total Feeding scale score α = .86 (Sumner & Speitz, 1994)	r = .75 for Total Parent score r = .51 for Total Parent score (Sumner & Speitz, 1994)	See inter-rater requirements for Teaching scale	r= .59 with Bayley Scales MDI	r = .54 with HOME scales r = .28 with Bayley Scales MDI
Mutual Regulation Scales (MRSS & IRSS)	Not available	Not available	76% to 94% for proximity to infant 75% for caregiving behaviour 89% to 98% for gaze directionality 75-96% for vocalization 80-100% for touch 77-93% for eliciting infant behaviour κ = .79 for gaze directionality κ = .85 for proximity κ = .82 for gaze κ = .76 for vocalizations	Not available	Not available

(*Continued*)

Table 2. (Continued).

	Reliability			Validity	
	Internal Consistency	Test-Retest	Inter-Rater	Predictive	Concurrent
Parent-Child Early Relationship Assessment (PCERA)	α = .78 - .91 (Clark, 1999) α = .83 - .93 (Grych & Clark, 1999) α = .84 - .91 (Pridham et al., 2001) α = .61 - .96. (Faugli et al., 2005)	Not available	83% to 97% (Poehlmann et al., 2011) 93% (Burns et al., 1991) r = .99 (Bystrova et al., 2009)	Not available	Not available
Mother-Infant Communication Screening (MICS)	A = .89 - .94 (Bryne & Keefe, 2003)	Not available	Not available	Not available	Positively correlated with NCAST Teaching Scale total scores (Bryne & Keefe, 2003)
Ainsworth Maternal Sensitivity Scale (AMSS)	α = .81 (Lambermon & van IJzendoorn, 1989)		ICC = .75 - .92 (Joosen et al., 2013) k = .75 (Meins et al., 2001) ICC = .72 - .86 (Kalinauskiene et al., 2009) 8-month-old infants (*r* = .94) and 12-month-old infants (*r* = .95) (Pederson & Moran, 1995) 98% (Pederson et al., 1990) ICC = .81 (Stiles, 2004) ICC = .63 – .89 (Lambermon & van IJzendoorn, 1989) ICC = 0.68 (Tharner et al., 2012)	r = .78 with attachment as measured by the Strange Situation Procedure (Ainsworth et al. 1978) r = .28 with attachment as measured by the Strange Situation Procedure (De Wolff & van IJzendoorn, 1997)	Not available

(*Continued*)

Table 2. (Continued).

	Reliability			Validity	
	Internal Consistency	Test-Retest	Inter-Rater	Predictive	Concurrent
Maternal-Behaviour Q-sort (MBQS)	Not available	r = .71 between 8 to 12 month (Pederson & Moran, 1995)	.82 (after 2 hr home visit) .85 (after 2 hr home visit) (Posada et al., 1999) .94–.95 (Pederson & Moran, 1995) r = .84 (Lindhiem, Bernard & Dozier, 2011) ICC= .87 (Bordeleau, Bernier & Carrier, 2012) ICC = .80 (Stiles, 2004)	r = .49 with attachment as measured by the Attachment Behaviour Q-sort (Moran et al., 1992)	r= .90 with AMSS (Pederson et al., 1990) r = .55 with AMSS (Moran et al., 1992)

(*Continued*)

Table 2. (Continued).

	Reliability			Validity	
	Internal Consistency	Test-Retest	Inter-Rater	Predictive	Concurrent
Emotional Availability Scales (EAS)	α = .67 - .98 (Bornstein et al., 2006) α = .71 - .84 (Vliegen, Luyten, & Biringen, 2009)	.59 to .67 over 5 months (Bornstein et al., 2006) Marginal evidence for stability in individual EA dimensions ratings across time (from 8, 14, 24, and 36 months respectively) (Howes & Obregon, 2009)	86 -100%; k = .81 -1.00 (Aviezer et al., 1999) 93 - 100%; .76 - .96 (Bornstein et al., 2006) 75% - 100% (Campbell & Johnston, 2009) .80 (Robinson & Spieker, 1996) k = .95 – 1.00 (Easterbrooks et al., 1996) r = .74 – .93 (Koren-Karie et al., 2009) ICC = .70 (Trupe, 2010) ICC = .84 to .95. (De Falco et al., 2009) r = .80 (Biringen et al., 2012)	Moderate correlation with disorganized attachment in middle childhood (p = .046) (Easterbrooks et al., 2012) Moderate correlation (r = 0.44) between secure attachment at 18-months as measured by the Strange Situation Procedure and EA scale scores at age 7 (Easterbrooks et al., 2000)	EA Maternal Sensitivity, EA Child Responsiveness, and EA Child Involvement related to child attachment using the Attachment Behaviour Q-sort (R2 = .16) (Altenhofen et al., 2013) EA Maternal Sensitivity, Maternal Structuring, and Maternal Non-Intrusiveness as well as EA Child Responsiveness and Child Involvement related to child attachment security measured by the Strange Situation Procedure (Ziv et al., 2000) EA Child Involvement related to attachment security measured by the Attachment Q-Sort (Sutherland et al., 2012) EA Maternal Sensitivity related to attachment security measured by the Strange Situation Procedure (Sagi et al., 2002)

The MRSS and IRSS evaluate specific aspects of caregiver and infant behaviors during the Face-to-Face Still Face Paradigm (FFSF), which has been used in over 80 empirical studies (Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009). First developed by Tronick and associates (Tronick et al., 1978), the FFSF paradigm offers an approach to assess the vocal/affective communication system (such as vocal/facial expressions, posture, gaze, and general activity) between caregivers and infants. The MRSS and IRSS evaluate the synchrony of caregiver-infant dyad interaction within the FFSF paradigm. Generally taking place in a laboratory setting where the interactions between caregivers and infants can be videotaped simultaneously using two cameras, the FFSF paradigm is comprised of three successive episodes: 1) a 2 minute face-to-face normal interaction during which mothers are asked to engage their infants in free play, 2) a 2 minute still-face interaction where mothers are asked to disengage from infants by refraining from looking at, smiling toward, or touching the infant, and 3) a 2 minute reunion episode during which mothers are asked to resume normal interaction (Weinberg et al., 2006). With the MRSS, caregiver behavior is coded based on six dimensions—namely, proximity to infant, caregiving behavior, gaze directionality, vocalizations, touch, and eliciting infant behavior. In the IRSS, infant behavior is coded according to nine dimensions: social engagement, object engagement, scans, vocalizations, gestures, self-comforting, distancing, autonomic stress indicators, and inhibition. Scoring of video recording is done micro-analytically on a second by second basis. The MRSS and IRSS can be used congruously to identify the degree of matched versus mismatched states between mothers and infants by calculating the proportion of the interaction spent simultaneously attending either social play or attending to an object jointly. Scoring of the MRSS and IRSS is typically done through a multi-coder approach where each coder assesses specific dimensions of mother-infant interaction (i.e., one coder looks at gaze directionality, and another codes vocalizations) (Tronick et al., 1978; Weinberg, Beeghly, Olson, & Tronick, 2008; Weinberg & Tronick, 1994).

Application of the mutual regulation scales

Researchers have used the MRSS and IRSS in studies involving depressed and anxious mothers (Weinberg et al., 2006; Weinberg & Tronick, 1998), mothers with panic disorders (Weinberg et al., 2008), premature infants (Fuertes, Faria, Soares, & Crittenden, 2009), and alcohol-exposed infants (Lowe et al., 2006). The MRSS and IRSS have also been used for assessing interaction quality between mothers and infants with orofacial clefts (Lowe et al., 2006) and in identifying gender differences and emotional expressivity and self-regulation in 6 month olds (Lowe et al., 2006).

Parent-child early relationship assessment

The Parent-Child Early Relationship Assessment (PCERA) measures caregiver-child interaction quality (Lowe et al., 2006). The PCERA can be used with children from birth until approximately 4 years of age and takes approximately 25 minutes to complete (Clark, Hyde, Essex, & Klein, 1997). The specific variables and behaviors selected for inclusion in PCERA are based on a conceptual framework derived from various perspectives spanning multiple disciplines such as psychodynamics, developmental psychology, attachment theory, and cognitive-linguistics, as well as developmental studies and clinical observations of high-risk and well-functioning mother-child dyads (Clark, 1999; Clark et al., 1997). The PCERA captures four dimensions of the caregiver-child interaction: the child's experience with the caregiver; the caregiver's experience with the child; the affective and behavioral characteristics that each participant brings to the relationship; and the overall quality of the interaction. This measure offers a systematic approach for identifying areas of concern as well as areas of strength for the caregiver, the child, and the caregiver-child dyad.

The PCERA employs a videotape-based scoring system where mothers and infants are recorded for 5 minutes while engaging in developmentally salient interaction (i.e., structured task or free play) that allows observation of joint attention, mutual enjoyment, and reciprocity (Clark, 1999). The scoring scale consists of 29 variables related to parental behavior, 28 related to child behavior, and 8 related to dyadic characteristics. Examples of parental assessment variables include positive and negative affect, sensitivity and contingent responsivity to infant cues, mirroring of infants' feeling states, and capacity to structure and mediate infants' environment. Examples of infant assessment variables include alertness/interest, social initiative and responsiveness, self-regulation, communicative competence, and soothability. Dyad assessment is based on variables such as mutual enjoyment, joint attention, reciprocity, dyadic disorganization/dysregulation, and state similarity (Clark, 1999; Clark et al., 1997). Each variable is scored with a 5-point Likert-based rating scale in which higher scores indicated more positive caregiver-child interactions. Administration and scoring of the PCERA requires training from an authorized instructor. Coders must complete at least 40 hours of training, which includes the opportunity for practice-rating pilot tapes. In order to attain practice and research reliability, coders must achieve an established criterion of .80 in categorical agreement with trainer ratings on four additional tapes (Clark, 1999; Clark et al., 1997).

Application of the parent-child early relationship assessment

The PCERA has proven a valuable tool for use with families who may be at high risk for exhibiting early disturbed relationship patterns, in intervention

or outcome studies, and in research seeking to establish a link between caregiver-infant interaction quality in high-risk groups (Clark, 1999; Clark et al., 1997). The PCERA has been used to assess caregiver-child interaction within the context of high-risk populations such as cocaine abusing mothers 4), adolescent mothers (Clark, 1999), depressed mothers (Korja et al., 2008; Pridham, Brown, Shondel, Clark, & Green, 2001), premature infants (Pridham et al., 2001), infants with failure to thrive (Black, Dubowitz, Hutcheson, Berenson-Howard, & Starr, 1995) and infants with esophageal atresia (Faugli, Aamodt, Bjørnland, Emblem, & Diseth, 2005).

Mother-infant communication screening

Based on Raack's (1989) work in early language development, the Mother-Infant Communication Screening (MICS) tool was designed to identify mother-infant dyad communication disorders in a clinical setting. Three concepts central to the Barnard Model and Mutual Regulation Model—synchronicity, reciprocity, and mutuality—also underpin the MICS. Unlike other caregiver-infant interaction measures like the PCERA that assess areas of strength as well as areas of concern, the MICS places greater emphasis on the deviations from optimal communication as the basis for dysfunctional interaction in the dyad. The MICS does not offer in-depth assessment of the dyad's communication skills, but it does facilitate evaluation of interactive mother-infant behavior that may help to identify high-risk situations and, thus, aid in qualifying subjects for early interventions (Bryne & Keefe, 2003).

Scoring of the MICS can be incorporated into routine health encounters and can be administered at home or in a clinic setting. One of the applications of the MICS was for use in a busy clinical setting; accordingly, the instrument was designed to be self-taught via study manual. Equipment demands are minimal, with only a copyrighted form required for scoring observations. Although the MICS was designed for live coding in practice settings, interactions can also be video-recorded and scored at a later time. This measure is intended for use with infants from birth to 12 months and should not be administered if another caregiver, such as the father, is present. Structured activity and stimulus materials are not required for the interview, which takes approximately 10 minutes to complete and then an additional 20–30 minutes to score. The five areas of dyad behavior observed during the interview include language and synchrony, distress, feeding, play or neutral state, and rest. Each subscale contains 3 to 8 items scored on a 5-point Likert scale where higher scores indicate more positive caregiver behavior. One such variable from the language and synchrony subscale asks if the caregiver praises the child. The five response options to this variable are as follows: 1) very negative comments, 2) negative comments, 3) rare or no praising, 4) praised at least a few times, and 5) praised

several times. An average score on all of these items is then calculated: scores of 3 or below indicate a need for further assessment and highlight possible impairment in the synchronous nature of caregiver-infant communication (Bryne & Keefe, 2003; Raack, 1989).

Application of the mother-infant communication screening

Minimal psychometric evaluations for the MICS have been reported, and the potential threats to reliability inherent in a tool with relatively few items and brief, non-standardized administration protocol have been identified as shortcomings (Bryne & Keefe, 2003). Although the MICS was designed as an observational instrument for use in a clinical practice, it may be used in research as well. For example, the MICS was used to examine maternal-infant communication quality in a study seeking to refine and test an intervention for managing infant irritability (Keefe, Froese-Fretz, & Kotzer, 1997).

Ainsworth's sensitivity scales

Based on her observations of mothers and infants in Uganda and Maryland, Ainsworth developed the Maternal Sensitivity Scale (AMSS) as a measure of maternal sensitivity (Ainsworth, 1969/1978). The AMSS is a single-item, bi-dimensional scale consisting of *five* "anchor points" (e.g., 1 = "highly insensitive," 3 = "insensitive," 5 = "inconsistently sensitive," 7 = "sensitive," and 9 = "highly sensitive") (Ainsworth et al., 1974). Each anchor point corresponds with a detailed description of maternal traits reflecting sensitivity on a continuum from *highly insensitive* (1) to *highly sensitive* (9). According to Ainsworth, mothers are highly sensitive if they demonstrate an awareness of, accurately interpret, and appropriately and promptly respond to their infant's signals—this is conceptually parallel to Barnard and Eyre's (1979) description of sensitivity. Rather than scoring the minutiae of interactions, the AMSS gives a global rating of how sensitive a mother is to her infant's behavior. A score of 7 or above is recognized as well-functioning interaction (Ainsworth et al., 1974).

Since Ainsworth developed the AMSS through extended periods of naturalistic observations (i.e., >12 hours), a short protocol for use was not described (Ainsworth, 1969). Nevertheless, this length of time for observation is prohibitive in most research or clinical settings. Researchers seeking to measure sensitivity have reduced the time spent observing the mother and infant from the 12 to 64 hours per dyad that was used by Ainsworth to anywhere from 3 minutes to 2 hours per dyad (Sroufe & Sampson, 2000). Administration of the AMSS offers a great deal of flexibility since it can be done in a laboratory, clinic, or home setting, and dyadic interactions of interest can occur during free play (with or without toys) or during more

structured tasks (i.e., bathing) (Joosen et al., 2013). The AMSS can be scored live or from a video recording. Although training is required for coding the AMSS, details are not well described in the literature; however, a conceptual grasp of attachment, maternal sensitivity and experience in observing caregiver-child interactions are advantageous (Stiles, 2004).

Application of ainsworth's sensitivity scales

Psychometrics data for the AMSS have been reported (see Table 2). The AMSS has been used to examine maternal sensitivity in numerous studies including in assessing the efficacy of a video-feedback intervention in promoting positive parenting (Kalinauskiene et al., 2009); comparing highly sensitive and less sensitive mothers in their physiological reactivity to infant cry sounds (Joosen et al., 2013); testing the effects of an attachment intervention for mother-infant dyads at high psychosocial risk (Mörelius, Nelson, & Gustafsson, 2007); comparing paternal sensitivity in primary and non-primary care giving fathers (Lewis et al., 2009); and testing the supposition that maternal interactive behavior during infancy is a predictor of pre-schoolers' attachment representation (Miljkovitch et al., 2013). The AMSS has also been demonstrated to be useful with mothers of varying ethnic backgrounds such as Vietnamese and Hmong (Foss, 2001) and Lithuanian women (Kalinauskiene et al., 2009).

Maternal behavior q-sort (MBQS)

The 90-item Maternal Behavior Q-sort (MBQS) measures maternal sensitivity by comparing the subject's behavior with an expert-established criterion derived from a prototypically "ideal sensitive" mother (Pederson & Moran, 1995). Each item is inscribed on a card (numbered 1–90) depicting an aspect of maternal behavior related to mothers' recognition of infant signals and the promptness and appropriateness of her responses. Sample items include maternal affect (e.g., comments about the baby are generally positive), attentiveness (e.g., mother is preoccupied with interview and ignores infant), and interaction style (e.g., describes interesting things in infant's environment) (Pederson, Moran, & Bento, 1999). Q-sorts are obtained from naturalistic home observation. Initially, the mother is asked to commence with her normal routine; then, for 30 minutes, observers divert her attention toward a specific task (i.e., completing a questionnaire) in order to divide her attention between the infant and the task thereby simulating a more realistic everyday scenario. According to Pederson & Moran (1995), this high-demand situation is necessary in order to distinguish between a highly sensitive mother and a less sensitive mother, since even a mother who lacks sensitivity can appear attuned to her infant if she has nothing else competing for her attention. Observation times range from 2–4 hours (Pederson & Moran, 1995).

Upon completing the observation, the observer then sorts the behavioral description cards into one of nine piles designated from least characteristic (pile one) of the mother's behavior to most characteristic (pile nine). Behaviors that are either ambiguous or not observed are positioned in the middle pile (pile five) (Pederson & Moran, 1995). The ranked description cards are entered into a spreadsheet (e.g., Microsoft Excel)—the authors suggest using a spreadsheet of 9 rows (numbered 1 through 9 to correspond with pile allocation) and 10 columns (Pederson et al., 1999)—and resorted by card number. Each numbered behavior (cards 1–90) is assigned a value based on the original sort (i.e., cards placed in pile 1 are valued as a 1, pile 2 are valued as a 2, etc.). Maternal sensitivity scores are obtained by comparing the mother's Q-sort description (an accumulation of the behavioral items scored) with the expert-established criterion sort. The resulting correlation yields the subject's score and ranges from -1 (*insensitive*) to +1 (*highly sensitive*) (Pederson & Moran, 1995). Training is required in order to reliably observe and sort the MBQS. The full protocol and details regarding training are available from co-developer Dr. Greg Moran (gmoran2@uwo.ca).

Application of the maternal behavior q-sort

The MBQS has been widely utilized for naturalistic observation in a home setting (Moran, Pederson, & Bento, 2009) as well as with video-recorded samples of interaction obtained in a laboratory (Evans, Moran, Bento, & Pederson, 2007). In addition to the standard 90-item sort there is 72-item sort. An abbreviated 25-item sort that can be scored from a 10-minute play interaction has been validated; however this yields a less detailed description of maternal sensitivity and must be interpreted cautiously (Tarabulsy et al., 2009). Psychometric data have been reported in numerous studies (see Table 2), including evidence for content and criterion validity (Moran, Pederson, Petit, & Krupka, 1992; Pederson & Moran, 1995, 1996; Pederson et al., 1990). The MBQS has been used in numerous studies with diverse populations, including adolescent mothers (Tarabulsy et al., 2009), mothers at high risk for neglect (Lindhiem, Bernard, & Dozier, 2011) and developmentally delayed infants (Moran et al., 1992). To date, the MBQS has been used for predominantly exploratory research: Moran and colleagues (2008) investigated how both maternal sensitivity and atypical maternal behavior predicted attachment security and disorganization; Emmen and colleagues (2012) explored whether sensitive mothering was a cross-cultural ideal of Dutch, Moroccan, and Turkish mothers living in the Netherlands; while Bordeleau, Bernier, and Carrier (2012) examined infant sleep duration as a moderator of the relations between maternal sensitivity and child externalizing and internalizing symptoms.

Emotional availability (EA) scales

Biringen's (2008) Emotional Availability Scales (EAS) were designed to assess the quality of dyadic interaction between a child (0–14 years) and any adult caregiver (e.g., biological, adoptive, or foster parent, or other consistent caregiver). Based on an amalgamation of Ainsworth's conceptualization of maternal sensitivity and Emde's work in emotional perspectives—the supposition that emotion was "sensitive barometer" of the relationship between a parent and a child (Emde & Easterbrooks, 1985, p. 80)—emotional availability is a relational construct comprised of elements such as emotional expression and responsiveness, as well as the openness, warmth, and mutual understanding which underpin the bidirectional communicative relationship between partners in a dyad. This emotional "attunement" is characterized by 1) the caregiver's emotional signals, 2) the child's emotional signals, and 3) the caregiver's ability to identify and accurately interpret the child's emotional experience (Biringen, 2008). The prototypically emotionally available caregiver engages in a sensitive, structuring, non-intrusive, and non-hostile style of caregiving. This approach promotes the child's self-expression, facilitates the child's ability to reciprocate in a responsive and involving manner, and offers a practice arena for emotional regulation whereby the child learns that emotional states can be tolerated and changed (Biringen, 2008; Easterbrooks & Biringen, 2000).

The EAS consist of six subscales: four that focus on caregiver behavior (i.e., sensitivity, structuring, non-intrusiveness, and non-hostility) and two that focus on child behavior (i.e., responsiveness to caregiver and involvement of caregiver) (Biringen, 2008). Although each of the six subscales assesses the behavior of one partner, these are not necessarily regarded as individual characteristics but, instead, as characteristics of a specific relationship (i.e., "relationship variables") and, thus, both the caregiver and child items are holistically adjudicated within the context of the interaction. The scoring structure of each subscale is as follows: maternal sensitivity ranges from *highly insensitive* (1) to *highly sensitive* (9); structuring ranges from *non-optimal* (1) to *optimal* (5); non-intrusiveness ranges from *intrusive* (1) to *nonintrusive* (5); non-hostility ranges from *markedly hostile* (1) to *non-hostile* (5); and child responsiveness and involvement of caregiver each range from *non-optimal* (1) to *optimal* (7) (Biringen, 2008). Higher scores reflect better overall quality of the affective relationship between parent and child (Biringen, 2008).

Assessment of the EAS can be conducted in the home or a lab setting and may include a variety of observational contexts, including free-play, structured play (i.e., a teaching episode or interaction based around a specific activity or toy) or social play (i.e., caregiver and child play together without the aid of toys)—even though these interactions must conform to

specifications presented in the scoring manual (Biringen, 2008). Observation times range from 20 to 30 minutes or longer. Shorter observation times (i.e., 5 or 10 minute sessions) are feasible in some instances; however, these time frames may limit the confidence and validity of results (Biringen, 2005). The EA scales are typically scored after viewing a video-recorded session between the caregiver and the child; however, Biringen and colleagues (2014) argue that direct, non-video-recorded observations are just as meaningful, provided that training and reliability have been achieved. The EAS require extensive training from a certified instructor. Training is offered both online and in vivo (workshops). The training involves reading, lecture, and practice on approximately 10 training videos of parent–child relationships. Training takes place across 3 days and then approximately 10 h of inter-lab reliability testing and feedback through the secure website (Biringen et al., 2014). Information pertaining to workshops and training strategies can be found at www.emotionalavailability.com. Trainees must also demonstrate adequate inter-laboratory reliability (e.g., interrater reliability with a central collection of video-recordings provided by Biringen's laboratory) as well as interrater reliability with the requirement of achieving greater than 80% agreement across all codes in order to obtain permission to use the EAS (Biringen, 2005; Biringen et al., 2014).

Application of emotional availability scales

Currently in the fourth edition, the EA scales have been in existence since 1987 and have since been utilized in a wide range of research. Psychometric data have been reported in numerous studies (see Table 2) and Biringen et al. (2014) have recently published a thorough review, which includes details of the reliability and validity of the EA scales. Studies have demonstrated concurrent validity with mother-child attachment security using the Strange Situation (Easterbrooks, Biesecker, & Lyons-Ruth, 2000; Easterbrooks & Biringen, 2000; Ziv, Aviezer, Gini, Sagi, & Koren Karie, 2000). The EAS have been applied to research concerning children with special needs such as preschoolers with autism spectrum disorder (Dolev, Oppenheim, Koren-Karie, & Yirmiya, 2009), Down syndrome (de Falco, Venuti, Esposito, & Bornstein, 2009), and in infants with congenital blindness (Campbell & Johnston, 2009). The EAS have been used to examine maternal emotional availability in the context of postpartum depression (Vliegen, Luyten, & Biringen, 2009), substance abuse (Salo et al., 2009), and economic disadvantage (Little & Carter, 2005). Although the majority of studies focus on the mother-infant relationship, the EA scales have been used to examine patterns of emotional availability in father-child dyads as well (Lovas, 2005). The EA scales have demonstrated cross-cultural usefulness and have been employed in varying cultural contexts in over 20

countries, including North American, European, and Asian nations (Aviezer, Sagi, Joels, & Ziv, 1999; Chaudhuri & Easterbrooks, 2009; Howes & Obregon, 2009).

Discussion

The assessment approaches discussed each have unique properties, limitations, and strengths. A major strength is that the Parent-Child Interaction Scales, Mutual Regulation Scales, Parent-Child Early Relational Assessment, Mother-Infant Communication Screening, Ainsworth Maternal Sensitivity Scale, Maternal Behavior Q-sort, and Emotional Availability Scales are all grounded in theoretical foundations with shared underlying assumptions regarding the critical importance of sensitive and consistent caregiving behaviors for enhancing caregiver-infant relationship quality and, in turn, promoting optimal child development. Tables 1 and 2 provide side-by-side comparison of all the assessment tools and associated psychometric characteristics. The PCI Scales have the most complete information concerning reliability and validity while the MICS (primarily a screening tool) has received the least psychometric evaluation (representing a potential area for future research).

Training requirements

Training and passing a reliability test are compulsory for administration and scoring of each measure, though the scope of training may be viewed as either a strength or a limitation depending upon the availability of resources. Given the complexity of caregiving relationships, specialized skills are required to reliably conduct assessment procedures and to interpret dyadic behaviors. As such, the PCI Scales, MRSS and IRSS, PCERA, AMSS, MBQS, and EAS require thorough training from a certified instructor—an endeavor that can be costly and time consuming, especially considering the expenditures associated with travelling to and participating in multi-day workshops (though EAS training is offered online as well). However, these rigorous training procedures, the demonstration of continued practice and competence, as well as the maintaining of reliability in the measure enhance the veracity of results. Alternatively, the same extent of preparation is not required for the MICS, which is self-taught via training manual. This less-standardized training approach has indeed been identified as a potential limitation of this tool (Bryne & Keefe, 2003). Nonetheless, the MICS's minimal training and uncomplicated administration makes this particularly amenable for use as a screening tool in busy clinical settings where a more complex assessment approach may be time- and cost-prohibitive. Another issue requiring consideration when comparing the various caregiver-infant

interaction assessment strategies is coder or observer drift. This refers to a deviation from initial training procedures causing a change in the interpretation of coding items over time (Smith, 1986). With the exception of the PCI Scales, which are a more factual coding scheme since judgments on behavior are dependent upon occurrence versus non-occurrence, all of the measures described here may weather some threat to reliability due to coder drift. A number of approaches may be employed in order to mitigate these risks including the following: periodically checking observers against a master coder; regularly retraining observers and providing opportunity for feedback for any deviations from the training protocol; and randomly selecting a sample of sessions for coding by more than one observer to assess inter-observer reliability (Ostrov & Hart, 2013). Moreover, the use of video-recorded observation offers an advantage over real-time observations since this grants coders the opportunity to take breaks as needed, thus minimizing problems associated with observer fatigue and drift (Haidet Tate, Divirgilio, Kolanowski, & Happ, 2009).

Administration procedures

An assessment tool's feasibility and usefulness is largely dependent upon administration procedure, equipment, and scoring requirements. Simple administration procedures, few equipment requirements (i.e., video-recorders), relatively short observation times and brief scoring make the PCI Scales, PCERA, MICS, AMSS, and EAS particularly adaptable for use in a variety of clinical and research settings. Conversely, the Mutual Regulation Scales (administered in a laboratory during the FFSF paradigm) and Maternal Behavior Q-sort (requiring 2–4 hours of home observation) are setting-specific and call for more complicated administration and coding procedures. Precluding real-live scoring, the microanalysis of video-recordings of the Mutual Regulation Scales is time-consuming while data reduction poses challenges. While a great deal of time is needed for caregiver-child observation, observers administering the MBQS in the home may remain unobtrusive, giving this measure a higher degree of ecologic validity when compared to lab-based procedures. Given the involvedness of the MRS and MBQS, there may be inherent challenges in utilizing these measures with large sample sizes and in instances where multiple assessments are required (i.e., intervention research).

Relevance with diverse populations

Another important consideration in measurement selection is applicability with diverse populations (i.e., caregivers from various cultural and ethnic backgrounds, adolescent mothers, infants with disabilities). Although

observational research on parental sensitivity in non-Western countries is still relatively rare (Mesmen & Emmen, 2013), particular attention should be paid to the cultural applicability of each of these assessment tools, especially if researchers plan on utilizing the measure in non-Western countries and/or within subcultures. For example, the Mutual Regulation Scales, PCERA and MICS have not been used in non-Western samples while the PCI Scales, AMSS, MBQS, and EA Scales demonstrate evidence of cross-cultural applicability. While the majority of assessment tools described here focused on the mother-infant relationship, the PCI Scales, Ainsworth's Sensitivity Scales and EAS have been used to evaluate father-infant relationships as well. This represents a limitation in these other approaches especially since father-infant relationship quality, while different from mother-infant relationship quality, is equally important to healthy child development (Paquette, 2004; Paquette & Bigras, 2010). Future directions for research involving these measures should include validation with both parents simultaneously—which will help to identify mothers' and fathers' unique contributions to children's development.

Recommendations

This review provides information for researchers and clinicians who are interested in assessing early caregiving relationships; however, determining which of these assessments is the single universal standard for measuring caregiver-child interaction remains challenging.

Nonetheless, the PCI Scales may offer the most feasibility and flexibility of use in comparison to the other assessment procedures. For example, cost for training and use of the tool is relatively low, the scales are brief to administer (10 minutes for the Teaching Scale and 30 minutes for the Feeding Scale) and score, and scoring can be done from live observations as well as video-recordings. The PCI Scales have the most complete psychometric information and have been used in a wide variety of contexts including screening, clinical practice, and research with diverse groups. Information on training is readily available from www.ncast.org. The PCI Scales are the only tool discussed which has been normed on a large population (i.e., NCAST Database). The highly structured scoring system of the PCI Scales offers an advantage over the other tools, which employ either a Likert-scale or micro-analysis and, thus, are more susceptible to observer interpretation and coder drift.

Practical considerations

Given that each of the measures discussed assesses different (albeit conceptually parallel) aspects of the caregiver-child relationship, it is reasonable to conclude that no "perfect" tool exists for definitively quantifying the quality

of early caregiving relationships (Crittenden, 2005). The measurements described differ with regards to feasibility of use, degree of training required, ease of administration, complexity of analysis, and overall purpose of assessment. Thus, no one tool can necessarily be recommended above the others for universal application.

First, investigators and clinicians must consider what assessment or outcome information is required for their specific purpose—be it screening, differentiating between low-risk and high-risk dyads, or assessing the efficacy of an intervention—and which dimension of caregiving is of paramount interest (i.e., caregiver sensitivity, contiguity of response, dyadic synchrony, and communication). A number of additional factors should be deliberated prior to selecting an assessment strategy, including the measurement's conceptual foundations, psychometrics, feasibility and cost of training, equipment and setting required to administer, length of time to code/interpret results, financial requirements (i.e., measurement copyright, equipment, setting, cost of coder training), and previous use in caregiver and infant populations (i.e., fathers, ethnic groups, high-risk mothers, high-risk infants). Measurements must also be utilized in a manner consistent with intended design. For instance, using a tool for one age range in earlier or later ages, or incorporating new measures, procedures, and coding systems into a pre-existing tool without prior validation must be discouraged.

Conclusion

Caregiving is a vitally important social role: Successful caregiving is a principal factor in promoting children's emotional, cognitive, and psychosocial development which, in turn, influences the mental health of the next generation (Bowlby, 1988). There is considerable value in understanding and identifying how certain caregiver-child interaction characteristics may put children at risk for significant challenges later in life. Assessment tools designed to evaluate different aspects of relationships within the context of interaction quality may be useful tools for professionals seeking to support caregivers and children with problematic relationships. Indeed, caregiver-child interaction and attachment should be assessed early in children's development when interventions for improving the dyad's relational harmony can be implemented most effectively. Rather than provide a definitive answer to the question of which measure to choose, the purpose of this review was to present information to clinicians and researchers seeking to integrate dyadic observational strategies for assessing early caregiving relationships. Selection of an assessment strategy should be directed by the specific purpose for which the assessment information will be used, as well as by other contextual factors (e.g., psychometrics, training requirements, and administration procedures).

Declaration of Interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of this paper.

References

Ainsworth, M. (1969). *Maternal Sensitivity Scales*. Mimeograph, Johns Hopkins University, Baltimore, revised March 10, 1969. Retrieved from http://www.psychology. sunysb.edu/ewaters/measures/senscoop.html

Ainsworth, M., Bell, S., & Stayton, D. (1974). *Infant mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals*. In M. P. M. Richards (Ed.), The integration of a child into a social world (pp. 99–135). Cambridge: Cambridge University press.

Ainsworth, M., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Altenhofen, S., Clyman, R., Little, C., Baker, M., & Biringen, Z. (2013). Attachment security in three-year-olds who entered substitute care in infancy. *Infant Mental Health Journal*, *34*, 435–445.

Aviezer, O., Sagi, A., Joels, T., & Ziv, Y. (1999). Emotional availability and attachment representations in kibbutz infants and their mothers. *Developmental Psychology*, *35*, 811–821.

Aviezer, O., Sagi, A., & Koren-Karie, N. (2003). Ecological constraints on the formation of infant–mother attachment relations: When maternal sensitivity becomes ineffective. *Infant Behavior and Development*, *26*, 285–299.

Barnard, K., & Eyres, S. J. (1979). *Child health assessment, part 2: The first year of life*. (Publication Number DHEW No. HRA 79–25 ed.). Washington, DC: U.S. Government Printing Office.

Beck, C. T. (1995). The effects of postpartum depression on maternal-infant interaction: A meta-analysis. *Nursing Research*, *44*, 298–304.

Becker, P. T., Englehardt, K. F., Steinmann, M. F., & Kane, J. (1997). Infant age, context, and family system influences on the interactive behavior of mothers of infants with mental delay, *Research in Nursing and Health*. *20*, 39–50.

Benzies, K. M., Magill-Evans, J., Kurilova, J., Nettel-Aguirre, A., Blahitka, L., & Lacaze-Masmonteil, T. (2013). Effects of video-modeling on the interaction skills of first-time fathers of late preterm infants. *Infants & Young Children*, *26*, 333–348.

Biringen, Z. (2005), Training and reliability issues with the Emotional Availability Scales. *Infant Mental Health Journal*, *26*, 404–405.

Biringen, Z. (2008). *The emotional availability* (EA) *scales and the emotional attachment & emotional availability* (EA2) *clinical screener: Infancy/early childhood version; middle childhood/youth versions; therapist/interventionist manual; couple relationship manual* (4th ed.), Boulder. <http://emotionalavailabilty.com>.

Biringen, Z., & Allender, T. (2011). Using evidence-based assessments to evaluate parent–child relationship quality. *Zero to Three Journal*, 36–39.

Biringen, Z., Altenhofen, S., Aberle, J., Baker, M., Brosal, A., Bennett, B.,… Swaim, R, (2012). Emotional availability, attachment, and intervention in center-based child care for infants and toddlers. *Development and Psychopathology*, *24*, 23–34.

Biringen, Z., Derscheid, D., Vliegen, N., Closson, L., & Easterbrooks, M. (2014). Emotional availability (EA): Theoretical background, empirical research using the EA Scales, and clinical applications. *Developmental Review*, *34*, 114– 167.

Black, M. M., Dubowitz, H., Hutcheson, J., Berenson-Howard, J., & Starr, R. H. (1995). A randomized clinical trial of home intervention for children with failure to thrive. *Pediatrics*, *95*, 807–814.

Bordeleau, S., Bernier, A., & Carrier, J. (2012). Maternal sensitivity and children's behavior problems: Examining the moderating role of infant sleep duration. *Journal of Clinical Child & Adolescent Psychology*, *41*, 471–481.

Bornstein, M. H., Gini, M., Putnick, D. L., Haynes, O. M., Painter, K. M. & Suwalsky, J. T. D. (2006). Short-term reliability and continuity of emotional availability in mother-child dyads across contexts of observation. *Infancy*, *10*, 1–16.

Bowlby, J. (1988). *A secure-base: Parent-child attachment and healthy human development*. New York, NY: Basic Books.

Britton, H., Gronwaldt, V., & Britton, J. (2001). Maternal postpartum behaviors and mother-infant relationship during the first year of life. *The Journal of Pediatrics*, *138*, 905–909.

Brophy-Herb, H. E., Gibbons, C., Omar, M. A., & Schiffman, R. F. (1999). Low-income fathers and their infants: Interactions during teaching episodes. *Infant Mental Health Journal*, *20*, 305–321.

Bryne, M., & Keefe, M. (2003). Comparison of two measures of parent-child interaction. *Nursing Research*, *52*, 34–41.

Bryne, M., Lobo, M. L., & Barnard, K. (1998). Feeding interactions in a cross section of HIV-exposed infants. *Western Journal of Nursing Research*, *20*, 409–430.

Burns, K., Chethik, L., Burns, W., & Clark, R. (1991). Dyadic disturbances in cocaine-abusing mothers and their infants. *Journal of Clinical Psychology*, *47*, 316–319.

Bystrova, K., Ivanova, V., Edhborg, M., Matthiesen, A. S., Ransjö-Arvidson, A. B., Mukhamedrakhimov, R.,… & Widström, A. M. (2009). Early contact versus separation: effects on mother–infant interaction one year later. *Birth*, *36*, 97–109.

Cabrera, N. J., Shannon, J. D., & La Taillade, J. J. (2009), Predictors of co-parenting in Mexican American families and links to parenting and child social emotional development. *Infant Mental Health Journal*, *30*, 523–548.

Campbell, J., & Johnston, C. (2009). Emotional availability in parent-child dyads where children are blind. *Parenting: Science & Practice*, *9*, 216–227.

Cassidy, J., & Shaver, P. (Eds.). (2008). *Handbook of attachment: Theory, research, and clinical applications* (2nd ed.). New York, NY: Guilford Press.

Chaudhuri, J. H., Easterbrooks, M., & Davis, C. R. (2009). The relation between emotional availability and parenting style: Cultural and economic factors in a diverse sample of young mothers. *Parenting: Science & Practice*, *9*, 277–299.

Chivanon, N., & Wacharasin, C. (2012), Factors influencing Thai parent–child interaction in a rapidly changing industrial environment. *International Journal of Nursing Practice*, *18*, 8–17.

Clark, R. (1999). The parent-child relational assessment: A factorial validity study. *Educational and Psychological Measurement*. *59*, 821–846.

Clark, R., Hyde, J. S., Essex, M. J., & Klein, M. H. (1997). Length of maternity leave and quality of mother-infant interactions. *Child Development*, *68*, 364–383.

Crittenden, P. (2005). Der CARE-index als hilfsmittel für früherkennung, intervention und forschung. Frühförderung Interdisziplinär (Early Interdisciplinary Intervention), Special Issue: *Bindungsorientierte Ansätze in Der Praxis Der Frühförderung*, *24*, 99–106.

Crittenden, P. (2008). *Raising parents: Attachment, parenting and child safety*. Willian Publishing.

De Falco, S., Venuti, P., Esposito, G., & Bornstein, M. H. (2009). Mother-child and father-child emotional availability in families of children with Down Syndrome. *Parenting: Science & Practice*, *9*, 198–215.

De Wolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, *68*, 571.

Ding, Y. H., Xu, X., Wang, Z. Y., Li, H. R., & Wang, W. P. (2012). Study of mother–infant attachment patterns and influence factors in Shanghai. *Early Human Development*, *88*, 295–300.

Dolev, S., Oppenheim, D., Koren-Karie, N., & Yirmiya, N. (2009). Emotional availability in mother-child interaction: the case of children with Autism Spectrum Disorders. *Parenting: Science & Practice*, *9*, 183–197.

Drummond, J. E., Letourneau, N., Neufeld, S. M., Stewart, M., & Wei, A. (2008). Effectiveness of teaching an early parenting approach within a community-based support service for adolescent mothers. *Research in Nursing and Health*, *31*, 12–22.

Easterbrooks, M. A., Biesecker, G., & Lyons-Ruth, K. (2000). Infancy predictors of emotional availability in middle childhood: The roles of attachment security and maternal depressive symptomatology. *Attachment and Human Development*, *2*, 170–187.

Easterbrooks, M. A., & Biringen, Z. (2000). Mapping the terrain of emotional availability and attachment. *Attachment and Human Development*, *2*, 123–129.

Easterbrooks, M., Bureau, J. F., & Lyons-Ruth, K. (2012). Developmental correlates and predictors of emotional availability in mother–child interaction: A longitudinal study from infancy to middle childhood. *Development and Psychopathology*, *24*, 65–78.

Easterbrooks, M. A., Lyons- Ruth, K., Biesecker, G., & Carper, A. (1996, April). Infancy predictors of emotional availability in middle childhood: The role of attachment and maternal depression. Paper presented at the 10th biennial meeting of the International Conference of Infant Studies, Providence, RI, USA.

Emde, R. N., & Easterbrooks, M. A. (1985). *Assessing emotional availability in early development*. In W. K. Frankenburg, R. N. Emde & J. W. Sullivan (Eds.), Early identification of children at risk: An international perspective (pp. 79–101). New York, NY: Plenum.

Emmen,R., Malda, M., Mesman, J., Ekmekci, H., & van IJzendoorn, M. (2012). Sensitive parenting as a cross-cultural ideal: Sensitivity beliefs of Dutch, Moroccan, and Turkish mothers in the Netherlands, *Attachment & Human Development*, *14*, 601–619.

Essex, M., Klien, M., Cho, E., & Kalin, N. (2002). Maternal stress beginning in infancy may sensitize children to later stress exposure: Effects on cortisol and behavior. *Society of Biological Psychiatry*, *52*, 776–784.

Evans, E., Moran, G., Bento, S., & Pederson, D. (2007). *Assessing maternal sensitivity from videotaped recordings: Validity and practical applications psychology presentations*. Available at: http://works.bepress.com/gregmoran/37

Evrard, D., Charollais, A., Marret, S., Radi, S., Rezrazi, A., & Mellier, D. (2011). Cognitive and emotional regulation developmental issues in preterm infants 12 and 24 months after birth. *European Journal of Developmental Psychology*, *8*, 171–184.

Faugli, A., Aamodt, G., Bjørnland, K., Emblem, R., & Diseth, T. H. (2005). Assessment of early mother-child relation in infants with oesophageal atresia. *Psychiatry*, *59*, 498–503.

Foss, G. F. (2001). Maternal sensitivity, posttraumatic stress, and acculturation in Vietnamese and Hmong mothers. *MCN American Journal of Maternal Child Nursing*, *26*, 257–63.

Frith, A. L., Naved, R. T., Ekström, E. C., Rasmussen, K. M., & Frongillo, E. A. (2009). Micronutrient supplementation affects maternal-infant feeding interactions and maternal distress in Bangladesh. *The American Journal of Clinical Nutrition*, *90*, 141–148.

Fuertes, M., Faria, A., Soares, H., & Crittenden, P. (2009). Developmental and evolutionary assumptions in a study about the impact of premature birth and low income on mother-infant interaction. *Acta Ethilogica*, *12*, 1–11.

Gaffney, K. F., Kodadek, M. P., Meuse, M. T., & Jones, G. B. (2001). Assessing infant health promotion: a cross-cultural comparison. *Clinical Nursing Research*, *10*, 102–116.

Goodman, J. H. (2008). Influences of maternal postpartum depression on fathers and on father-infant interaction. *Infant Mental Health Journal*, *29*, 624–643.

Grace, S. L., Evindar, A., & Stewart, D. E. (2003). The effect of postpartum depression on child cognitive development and behavior: A review and critical analysis of the literature. *Archives of Women's Mental Health*, *10*, 263–274.

Grych, J. H., & Clark, R. (1999). Maternal employment and development of the father–infant relationship in the first year. *Developmental Psychology*, *35*, 893–903.

Haidet, K. K., Tate, J., Divirgilio-Thomas, D., Kolanowski, A. and Happ, M. B. (2009), Methods to improve reliability of video-recorded behavioral data. *Research in Nursing and Health*, *32*, 465–474.

Horodynski, M. A., & Gibbons, C. (2004). Rural low-income mothers' interactions with their young children. *Pediatrics*, *30*, 299–306.

Howes, C., & Obregon, N. B. (2009). Emotional availability in Mexican-heritage low-income mothers and children: Infancy through preschool. *Parenting: Science & Practice*, *9*, 260–276.

John, A., Morris, A. S., & Halliburton, A. L. (2012). Looking beyond maternal sensitivity: Mother–child correlates of attachment security among children with intellectual disabilities in urban India. *Journal of Autism and Developmental Disorders*, *42*, 2335–2345.

Joosen, K. J., Mesman, J., Bakermans-Kranenburg, M. J., Pieper, S., Zeskind, P. S., & van IJzendoorn, M. H. (2013). Physiological reactivity to infant crying and observed maternal sensitivity. *Infancy*, *18*, 414–431.

Kalinauskiene, L., Cekuoliene, D., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., & Kusakovskaja, I. (2009). Supporting insensitive mothers: The Vilnius randomized control trial of video-feedback intervention to promote maternal sensitivity and infant attachment security. *Child: Care, Health and Development*, *35*, 613–623.

Keefe, M. R., Froese-Fretz, A., & Kotzer, A. M. (1997). The REST regimen: An individualized nursing intervention for infant irritability. *MCN, American Journal of Maternal Child Nursing. 22*, 16–20.

Koniak-Griffin, D., Anderson, N. L. R., Brecht, M., Verzemnieks, I., Lesser, J., & Kim, S. (2002). Public health nursing care for adolescent mothers: Impact on infant health and selected maternal outcomes at 1 year post-birth. *Journal of Adolescent Health*, *30*, 44–54.

Koren-Karie, N., Oppenheim, D., Dolev, D., Yirmiya, N. (2009). Mothers of securely attached children with autism spectrum disorder are more sensitive than mothers of insecurely attached children. *Journal of Child Psychology and Psychiatry. 50*, 643–650.

Korja, R., Savonlahti, E., Ahlqvist-Björkroth, S., Stolt, S., Haataja, L., Lapinleimu, H., & Lehtonen, L. (2008). Maternal depression is associated with mother–infant interaction in preterm infants. *Acta Paediatrica, International Journal of Pediatrics*, *97*, 724–730.

Kusaka, R., Ohgi, S., Gima, H., & Fujimoto, T. (2007). Short-term effects of the neonatal behavioral assessment scale-based intervention for infants with developmental disabilities. *Journal of Physical Therapy Science*, *19*, 1–8.

Lambermon, M. W., & van IJzendoorn, M. H. (1989). Influencing mother-infant interaction through videotaped or written instruction: Evaluation of a parent education program. *Early Childhood Research Quarterly*, *4*, 449–458.

LeCuyer-Maus, E. A. (2003). Stress and coping in high-risk mothers: Difficult life circumstances, psychiatric-mental health symptoms, education, and experiences in their families of origin. *Public Health Nursing*, *20*, 132–145.

Letourneau, N. (2001). Improving adolescent parent-infant interactions: A pilot study. *Journal of Pediatric Nursing*, *16*, 53–62.

Letourneau, N. L., Hungler, K. M., & Fisher, K. (2005). Low-income Canadian aboriginal and non-aboriginal parent–child interactions. *Child: Care, Health and Development*, *31*, 545–554.

Letourneau, N., Stewart, M., Dennis, C., Hegadoren, K., Duffett-Leger, L., & Watson, B. (2011). Effect of home-based peer support on maternal-infant interactions among women with postpartum depression: A randomized, controlled trial. *International Journal of Mental Health Nursing*, *20*, 345–357

Lewis, S. N., West, A. F., Stein, A., Malmberg, L.-E., Bethell, K., Barnes, J., … The Families, Children and Child Care (FCCC) project team (2009), A comparison of father–infant interaction between primary and non-primary care giving fathers. *Child: Care, Health and Development*, *35*, 199–207.

Lindhiem O, Bernard K, & Dozier M. (2011). Maternal sensitivity: Within-person variability and the utility of multiple assessments. *Child Maltreatment*, *16*, 41–50.

Little, C., & Carter, A. S. (2005). Negative emotional reactivity and regulation in 12-month-olds following emotional challenge: Contributions of maternal-infant emotional availability in a low-income sample. *Infant Mental Health Journal*, *26*, 354–368.

Lobo, M. L. (2001). Mother-child interaction in the presence of maternal HIV infection. *Journal of the Associations of Nurses in AIDS Care*, *12*, 40–51.

Lovas, G. S. (2005). Gender and patterns of emotional availability in mother-toddler and father-toddler dyads. *Infant Mental Health Journal*, *26*, 327–353.

Lowe, J., Handmaker, N., & Aragon, C. (2006). Impact of mother interactive style on infant affect among babies exposed to alcohol in utero. *Infant Mental Health Journal*, *27*, 371–382.

Meins, E., Fernyhough, C., Fradley, E., & Tuckey, M. (2001). Rethinking maternal sensitivity: Mothers' comments on infants' mental processes predict security of attachment at 12 months. *Journal of Child Psychology and Psychiatry*, *42*, 637–648.

Mesman, J., & Emmen, R. A. (2013). Mary Ainsworth's legacy: A systematic review of observational instruments measuring parental sensitivity. *Attachment & Human Development*, *15*, 485–506.

Mesman, J., van IJzendoorn, M., & Bakermans-Kranenburg, M. (2009). The many faces of the still-face paradigm: A review and meta-analysis. *Developmental Review*, *29*, 120–162.

Miljkovitch, R., Moran, G., Roy, C., Jaunin, L., Forcada-Guex, M., Pierrehumbert, B.C.,… Borghini, A. (2013). Maternal interactive behavior as a predictor of preschoolers' attachment representations among full term and premature samples. *Early Human Development*, *89*, 49–354.

Moran, G., Pederson, D., & Bento, S. (2009). Maternal Behavior Q-Sort (MBQS)—Overview, available materials and support. *The Selected Works of Greg Moran* Available at: http://works.bepress.com/gregmoran/48

Moran, G., Pederson, D., Pettit, P., & Krupka, A. (1992). Maternal sensitivity and infant-mother attachment in a developmentally delayed sample. *Infant Behavior and Development*, *15*, 427–442.

Mörelius, E., Nelson, N., & Gustafsson, P. A. (2007). Salivary cortisol response in mother-infant dyads at high psychosocial risk. *Child: Care, Health and Development*, *33*, 128–136.

Murray-Kolb, L. E., & Beard, J. L. (2009). Iron deficiency and child and maternal health. *American Journal of Clinical Nutrition*, *89*, 946–950.

Ostrov, J., & Hart, E. (2013). Observational Methods. In T. D. (Eds.), *The Oxford handbook of quantitative methods, volume 1: Foundations* (pp. 285–303). Oxford, UK: Oxford University Press.

Paquette, D. (2004). Theorizing the father-child relationship: Mechanisms and developmental outcomes. *Human Development*, *47*, 193–219.

Paquette, D., & Bigras, M. (2010). The risky situation: A procedure for assessing the father-child activation relationship. *Early Child Development and Care*, *180*, 33–50.

Pederson, D., & Moran, G. (1995). A categorical description of attachment relationships in the home and its relation to q-sort measures of infant-mother interaction. In E. Waters, B.

Vaughn, G. Monographs of the Society for Research in Child Development, vol. 60, no. 2/3, *Caregiving, Cultural, and Cognitive Perspectives on Secure-Base Behavior and Working Models: New Growing Points of Attachment Theory and Research*, p. 111–132.

Pederson, D., Moran, G., & Bento, S. (1999). *Maternal behavior Q-sort manual*. version 3.1. Retrieved from www.ssc.uwo.ca/psychology/faculty/pedmor/mbqmanual.html

Pederson, D. R., Moran, G., Sitko, C., Campbell, K., Ghesquire, K., & Acton, H. (1990). Maternal sensitivity and the security of infant-mother attachment: A q-sort study. *Child Development*, *61*, 1974–1983.

Poehlmann, J., Schwichtenberg, A., Shlafer, R., Hahn, E., Bianchi, J-P., & Warner, R. (2011). Emerging self–regulation in toddlers born preterm or low birth weight: Differential susceptibility to parenting? *Development and Psychopathology*, *23*, 177–193.

Posada, G., Gao, Y., Wu, F., Posada, R., Tascon, M., Schoelmerich, A., … Synnevaag, B. (1999). The secure-base phenomenon across cultures: Children's behavior, mothers' preferences, and experts' concepts. *Monographs of the Society for Research in Child Development*, *60*, 27–48.

Pridham, K. F., Brown, R., Shondel, S., Clark, R., & Green, C. (2001). Effects of biologic and experimental conditions on the pattern and growth in weight of premature and full term infants. *Research in Nursing and Health*, *24*, 283–297.

Raack, C. B. (1989). *MICS* (Mother/Infant communication screening): *The manual*. Schaumburg, IL: Community Therapy Services.

Robinson, J., & Spieker, S. (1996). *Adolescent mothers and their children: Early predictors of emotional availability at age four*. Paper presented at the International Conference on Infant Studies, Providence, RI.

Sadler, L. S., Swartz, M. K., & Ryan-Krause, P. (2003). Supporting adolescent mothers and their children through a high school-based child care center and parent support program. *Journal of Pediatric Health Care*, *17*, 109–117.

Sagi, A., Koren-Karie, N., Gini, M., Ziv, Y., & Joels, T. (2002). Shedding further light on the effects of various types and quality of early child care on infant–mother attachment relationships: The Haifa study of early child care. *Child Development*, *73*, 1166–1186.

Salo, S., Kivisto, K., Korja, R., Biringen, Z., Tupola, S., Kahila, H., & Kivitie-Kallio, S. (2009). Emotional availability, parental self-efficacy beliefs, and child development in caregiver-child relationships with buprenorphine-exposed 3-year-olds. *Parenting: Science & Practice*, *9*, 244–259.

Schiffman, R. F., Omar, M. A., & McKelvey, L. M. (2003). Mother-infant interaction in low-income families. *The American Journal of Maternal Child Nursing*, *28*, 246–251.

Smith, G. A. (1986). Observer drift: A drifting definition. *The Behavior Analyst*, *9*, 127–128.

Sroufe, A. L., & Sampson, M. (2000). Attachment theory and systems concepts. *Human Development*. *43*, 321–326.

Stiles, A. (2004). Measuring maternal sensitivity in teen mothers: reliability and feasibility of two instruments. *Journal of Nursing Measurement*, *12*, 195–214.

Suchman, N., DeCoste, C., Castiglioni, N., McMahon, T., Rounsaville, B., & Mayes, L. (2010). The Mothers and Toddlers Program, an attachment-based parenting intervention for substance using women: Post-treatment results from a randomized clinical pilot. *Attachment & Human Development*, *12*, 483–504.

Sumner, G., & Spietz, A. (1994a). *NCAST caregiver/parent child interaction feeding manual*. Seattle, WA: NCAST Publications.

Sumner, G., & Spietz, A. (1994b). *NCAST caregiver/parent child interaction teaching manual*. Seattle, WA: NCAST Publications.

Sutherland, K., Altenhofen, S., & Biringen, Z. (2012). Emotional availability during mother–child interactions in divorcing and intact married families. *Divorce & Remarriage*, *53*, 126–141.

Tarabulsy, G., Provost, M., Bordeleau, S., Trudel-Fitzgerald, C., Moran, G., Pederson, D.,… Pierce, T. (2009). Validation of a short version of the Maternal Behavior Q-set applied to a brief video record of mother-infant interaction. *Infant Behavior and Development*, *32*,132–136.

Teramoto, T., Hirose, T., & Bakeman, R. (2010). A study of the validity of the Japanese Nursing Child Assessment Teaching Scale (JNCATS) utilizing sequential analysis: A second analysis of mother-child teaching interaction. *Journal of Medical and Dental Sciences*, *57*, 209.

Tharner, A., Luijk, M. P., Raat, H., Ijzendoorn, M. H., Bakermans-Kranenburg, M. J., Moll, H. A.,… & Tiemeier, H. (2012). Breastfeeding and its relation to maternal sensitivity and infant attachment. *Journal of Developmental and Behavioral Pediatrics: JDBP*, *33*, 396.

Tronick, E. (1989). Emotions and emotional communication in infants. *American Psychologist*, *44*, 112–119.

Tronick, E., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Academy of Child Psychiatry*, *17*, 1–13.

True, M. M., Pisani, L., & Oumar, F. (2001). Infant-mother attachment among the Dogon of Mali. *Child Development*, *72*, 1451–1466.

Trupe, R. (2010). *Effect of maternal borderline personality disorder on emotional availability in mother-child interactions* . Master's Thesis, University of Tennessee. http://trace.tennessee.edu/utk_gradthes/836

Vliegen, N., Luyten, P., & Biringen, Z. (2009). A multi-method perspective on emotional availability in the postpartum period. *Parenting: Science & Practice*, *9*, 228–243.

Weinberg, M. K., Beeghly, M., Olson, K. L., & Tronick, E. (2008). Effects of maternal depression and panic disorder on mother-infant interactive behavior in the face-to-face still-face paradigm. *Infant Mental Health Journal*, *29*, 472–491.

Weinberg, M. K., Olson, K. L., Beeghly, M., & Tronick, E. (2006). Making up is hard to do, especially for mothers with high levels of depressive symptoms and their infant sons. *Journal of Child Psychology and Psychiatry*, *47*, 670–683.

Weinberg, M. K., & Tronick, E. (1994). Beyond the face: An empirical study of infant affective configurations of facial, vocal, gestural, and regulatory behaviors. *Child Development*, *65*, 1503–1515.

Weinberg, M. K., & Tronick, E. (1998). Emotional characteristics of infants associated with maternal depression and anxiety. *Pediatrics*, *102*, 1298–1304.

Yovsi, R. D., Kaertner, J., Keller, H., Lohaus, A. (2009). Maternal interactional quality in two cultural environments: German middle class and Cameroonian rural mothers. *Journal of Cross-Cultural Psychology*, *40*, 701–707.

Ziv IV, Y., Aviezer, O., Gini, M., Sagi, A., & Koren-Karie, N. (2000). Emotional availability in the mother–infant dyad as related to the quality of infant–mother attachment relationship. *Attachment & Human Development*, *2*, 149–169.

Zhu, H., Loo, K. K., Min, L., Yin, Q., Luo, H., Chen, L., & Ohgi, S. (2007). Relationship between neurobehaviors of Chinese neonates and early mother-infant interaction. *Journal of Reproductive and Infant Psychology*, *25*, 106–121.

Zuzarte, M., Calheiros, M. (2010) Intervention program on interactions parent-child "Developing Smiling"—exploratory study. *Analise Psicologica*, 28, 491–504.