Journal of Pediatric Nursing 40 (2018) 47–57

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

# Nursing Child Assessment Satellite Training Parent-Child Interaction Scales: Comparing American and Canadian Normative and High-Risk Samples

Nicole L. Letourneau [a,*], Panagiota D. Tryphonopoulos [b], Jason Novick [c], J. Martha Hart [a], Gerald Giesbrecht [d], Monica L. Oxford [e]

[a] Faculty of Nursing and Cumming School of Medicine (Pediatrics, Community Health Sciences & Psychiatry), University of Calgary, Alberta , Canada
[b] Faculty of Health Studies, Brandon University, Brandon, Manitoba Canada
[c] Cumming School of Medicine (Pediatrics), University of Calgary, Calgary, Alberta Canada
[d] Cumming School of Medicine (Pediatrics and Community Health Sciences), Faculty of Arts (Psychology), University of Calgary, Alberta Canada
[e] Center on Human Development & Disability, School of Nursing (Family & Child Nursing), Washington University, Seattle, WA United States

ARTICLE INFO

*Article history:*
Received 14 July 2017
Revised 6 February 2018
Accepted 26 February 2018

*Keywords:*
Nursing Child Assessment Satellite Training
Parent-child interaction
Parent-child relationships
Post-partum depression
Intimate partner violence
Aboriginal people
Low-income
Immigrant
Canadian

ABSTRACT

*Purpose:* Many nurses rely on the American Nursing Child Assessment Satellite Training (NCAST) Parent-Child Interaction (PCI) Teaching and Feeding Scales to identify and target interventions for families affected by severe/chronic stressors (e.g. postpartum depression (PPD), intimate partner violence (IPV), low-income). However, the NCAST Database that provides normative data for comparisons may not apply to Canadian families. The purpose of this study was to compare NCAST PCI scores in Canadian and American samples and to assess the reliability of the NCAST PCI Scales in Canadian samples.
*Methods:* This secondary analysis employed independent samples *t*-tests ($p < 0.005$) to compare PCI between the American NCAST Database and Canadian high-risk (families with PPD, exposure to IPV or low-income) and community samples. Cronbach's alphas were calculated for the Canadian and American samples.
*Results:* In both American and Canadian samples, belonging to a high-risk population reduced parents' abilities to engage in sensitive and responsive caregiving (i.e. healthy serve and return relationships) as measured by the PCI Scales. NCAST Database mothers were more effective at executing caregiving responsibilities during PCI compared to the Canadian community sample, while infants belonging to the Canadian community sample provided clearer cues to caregivers during PCI compared to those of the NCAST Database. Internal consistency coefficients for the Canadian samples were generally acceptable.
*Conclusions:* The NCAST Database can be reliably used for assessing PCI in normative and high-risk Canadian families.
*Practical implications:* Canadian nurses can be assured that the PCI Scales adequately identify risks and can help target interventions to promote optimal parent-child relationships and ultimately child development.


## Introduction

It is well recognized that sensitive, responsive caregiving is crucial to children's healthy development (National Scientific Council on the Developing Child, 2006; National Scientific Council on the Developing Child, 2010). Indeed, this concept is so well translated into common parlance and understanding, that the metapohors of healthy "serve and return relationships" as foundational to children's developing "brain architecture" are used in many regions of Canada and the United States of America (USA) (Palix Foundation, 2015). Serve and return relationships involve parents being sensitive and responsive to the cues and needs of their children and demonstrating consistent response patterns to them through mutually adaptive and nurturant parent-child interactions (PCIs) (Ainsworth, Blehar, Waters, & Wall, 1978; Bohr & BinNoon, 2014). Sensitive caregiving contributes to the development of attachment security between a caregiver and a child (McElwain & Booth-LaForce, 2006), which subsequently enhances cognitive and social developmental outcomes among children (Singer et al., 2003). Overall, favourable PCI quality during day-to-day interactions such as feeding (Britton, Britton, & Gronwaldt, 2006; Bigelow et al., 2014) and teaching child-relevant activities (i.e. turning pages in a children's book during reading, squeezing a squeak toy during play) (Duggan, Berlin, Cassidy, Burrell, & Tandon, 2009; Rispoli, McGoey, Koziol, &

* Corresponding author at: Nicole L. Letourneau.
*E-mail address:* nicole.letourneau@ucalgary.ca (N.L. Letourneau).

https://doi.org/10.1016/j.pedn.2018.02.016
0882-5963/

Schreiber, 2013) have been identified as essential components which promote secure parent-child attachment. Indeed, nurses commonly assess PCI in order to identify risks and develop targeted interventions to support healthy serve and return relationships and healthy child development. Internationally, to assess PCI, nurses often rely on the "gold standard" Nursing Child Assessment Satellite Training (NCAST) PCI Teaching and Feeding Scale assessments; however the degree to which these PCI Scales' normative data may be applied to non-American samples, such as Canadian families, is unclear.

### *Parent-Child Relationships Among High-risk Populations*

A common finding in nursing research is that socioeconomic hardship and severe/chronic stress, such as intimate partner violence (IPV) and postpartum depression (PPD), reduces the quality of parent-child relationships (Letourneau, Stewart et al., 2011; Letourneau, Morris, Secco, & Hughes, 2013; Mortensen & Mastergeorge, 2014). Indeed, belonging to a high-risk population impairs PCI quality during typical, daily teaching (Sumner & Spietz, 1994a) and feeding interactions (Reid & Meadows-Oliver, 2007). Caregivers who are exposed to stressful circumstances are characteristically less responsive to infants' and children's cues and distress (Letourneau, 1997; Riesch, Anderson, Pridham, Lutz, & Becker, 2010; Spieker, Oxford, Kelly, Nelson, & Fleming, 2012). Given the paramount importance of sensitive, responsive PCIs to children's development, chronic environmental or parental stress that negatively impacts PCIs is widely considered "toxic" to children's development (National Scientific Council on the Developing Child, 2005, 2006, 2008/2012, 2009, 2012; Shonkoff et al., 2012), Moreover, Barlow et al. (2016) assert that socioeconomic adversity interacts synergistically with severe/chronic stress to impair parent-child attachment throughout childhood. Living in a low-income neighborhood (Sadler et al., 2013) or even immigration from a low-income country may undermine the security of a child's attachment to his or her caregiver (Magai et al., 2001). Similarly, diminished family functioning and intimate partner violence contributes to developmental problems in children over time, such as externalizing and internalizing behavioral problems (Davies, Cummings, & Winter, 2004).

### *Parent-Child Interaction (PCI) Teaching and Feeding Scales*

To support sensitive, responsive caregiving, and by extension healthy PCI, health professionals rely on assessment tools to identify areas of strength and difficulty for follow-up intervention with families (Kelly, Zuckerman, & Rosenblatt, 2008). Internationally, among the most commonly employed measures are the PCI Teaching and Feeding Scales (Sumner & Spietz, 1994a, 1994b) available from the NCAST Program at the University of Washington, Seattle. The origin of the scales began in the early 1970s, when the Division of Nursing of the United States Public Health Service created the Nursing Child Assessment Project team. This collaboration with Dr. Kathryn Barnard's research team at the University of Washington's School of Nursing aimed to develop a method for the discernment of children who were at risk for developmental problems (Sumner & Spietz, 1994a, 1994b). The PCI Scales were based on the concepts elucidated in the Barnard Model (Barnard, Booth, Mitchell, & Telzrow, 1988), in which optimal parent-child relationships were characterized as mutually adaptive, positive interactions that promote optimal child development and crucially, in which both parents and children have important roles. Parents must demonstrate affectionate caregiving by being sensitive and responsive to infant/child needs and infants/children must provide clear cues so that caregivers can respond appropriately. Barnard's additional theoretical work described environmental or parental stressors that can undermine the quality of PCI (Barnard, Eyres, Lobo, & Snyder, 1983).

The original NCAST PCI Teaching and Feeding Scales were developed in 1972 (Oxford & Findlay, 2013) and were revised in 1979 to improve feasibility within research and clinical settings (Oxford & Findlay, 2013). While minor revisions have been undertaken since, the PCI scales have largely remained unchanged.

The NCAST PCI Teaching and Feeding Scales are reliable and valid measures for assessing PCI quality in typical daily interactions (Badr, Bookheimer, Purdy, & Deeb, 2009; Fowles & Horowitz, 2006; Speltz et al., 2000), during feeding or meal consumption (Sumner & Spietz, 1994b), and that of teaching a specific task (Sumner & Spietz, 1994a). The feasibility for using these scales cross-culturally to study PCI quality has been demonstrated by studies that were conducted in, for example, Bangladesh (Frith, Naved, Ekström, Rasmussen, & Frongillo, 2009), Japan, (Teramoto, Hirose, & Bakeman, 2010) and among Canadian Aboriginal (Letourneau, Hungler, & Fisher, 2005) and Mexican American samples (Kolobe, 2004). They have been widely used for the examination of PCI among a wide range of high-risk populations, such as infants/children suffering from a suspected brain injury (Badr, Garg, & Kamath, 2006), exposed to maternal substance abuse (Suchman et al., 2010), socioeconomic hardship (Schiffman, Omar, & McKelvey, 2003) and neglect/abuse (Huebner, 2002). With these tools, health professionals in clinical and research centers have a greater capacity for identifying less than optimal caregiving and can plan interventions appropriately (Bryanton, Gagnon, Hatem, & Johnston, 2009).

The PCI Teaching and Feeding Scales comprise six subscales for the investigation of caregiver behavior and regulation in infants and young children (Sumner & Spietz, 1994a, 1994b). The Teaching Scale assessment targets caregivers and their infants or young children ranging in age from birth and 36 months and ideally occurs over a period of 1 to 5 minutes (Sumner & Spietz, 1994a). The Feeding Scale assessment targets caregivers and their infants ranging in age between birth and 12 months and typically occurs over a 10 minute period (Sumner & Spietz, 1994b). During feeding and teaching interactions, the execution of caregiver responsibilities is gauged by four subscales examining caregivers' sensitivity to infant cues, alleviation of infant distress, and social-emotional and cognitive growth fostering opportunities provided to the infant or young child (Sumner & Spietz, 1994a, 1994b). In addition, infants and young children make an important contribution to the overall interaction, measured by two subscales examining the clarity of cues the infant or child provides and the child's responsiveness to the caregiver.

The Teaching Scale comprises 73 binary items and the Feeding Scale comprises 76 binary items that assess the occurrence versus non-occurrence of specific behaviors (0 = no, 1 = yes), for total possible scores of 73 and 76 respectively. For the Teaching Scale, the ranges for the subscales are as follows: sensitivity to cues (0—11), response to child's distress (0–11), social-emotional growth fostering (0–11), cognitive growth fostering (0–17), clarity of cues (0—10), and responsiveness to caregiver (0—13). For the Feeding Scale, the ranges for the subscales are as follows: sensitivity to cues (0–16), response to child's distress (0–11), social-emotional growth fostering (0–14), cognitive growth fostering (0–9), clarity of cues (0–10), and responsiveness to caregiver (0–13). A higher score indicates a more favourable PCI quality. The caregiver and child subscales also contain contingency items that indicate whether the actions of one participant evoke the expected response from the other. To be qualified to perform NCAST scoring, attendance at a workshop led by an NCAST-certified instructor is mandatory (Nakamura, Stewart, & Tatarka, 2000). Individuals must attain 85% inter-observer reliability to use the scales in clinical work and 90% for use in research.

Extensive research has established the feasibility of the PCI Scales for examining the quality of caregiver-child interactions (e.g. Bowie, 2005; Banerjee & Tamis-LeMonda, 2007; White-Traut et al., 2013). Advantages include the brief training period (Horowitz, Logsdon, & Anderson, 2005), and the ability to score teaching and feeding interactions from either live observations or video recordings (Byrne & Keefe, 2003). Furthermore the dichotomized scoring scheme of the PCI Scales, based on observable parent and child behaviors, is advantageous

compared with other tools, which are more vulnerable to coding variability as a result of more nuanced scoring with Likert scales or that require interpretation of function/meaning of behavior in interactions (Tryphonopoulos, Letourneau, & Di Tommaso, 2016).

### NCAST Normative Database

A notable advantage of the PCI Teaching Scale is that it has been normed on a large American sample, entitled the NCAST Database, comprised of observations of 1887 children between the ages of 1 and 36 months and their parents (Sumner & Spietz, 1994a; M. Oxford, written communication, June 28, 2016). A normative database also exists for the PCI Feeding Scale, comprised of observations of 1638 children between the ages of 1 and 12 months and their parents (Sumner & Spietz, 1994b). Sumner & Spietz, 1994a and Sumner & Spietz, 1994b established the reliability and validity of these normative databases. While not intended as a representative sample of American caregivers and children, the sample however is diverse with 54% Caucasian, 27% African American and 20% Hispanic families with maternal caregiver education levels ranging from 6 years to 20+ years, and an average of 13 years (Sumner & Spietz, 1994a). Thus the database offers normative data on a variety of risk groups, such as high versus low-education adults, single mothers, and adolescent mothers, as well as different ethnicities, ages, parities and sexes of children. These data allow for comparisons to be made between an individual observation and the normative database for relevant groups. Such comparisons enable health professionals who use the scales to make judgments about the urgency and direction of intervention for families with young children.

The NCAST Database also provides tenth percentile cut-offs for the three American ethnic groups of interest and for children at different ages. Scores below the 10th percentile cut-off are considered high-risk for low-quality PCI in accordance with age and ethnicity. For mixed race and/or mixed-ethnic groups, the 10th percentile score for Caucasian infants should be referred to (Sumner & Spietz, 1994a). Table 1 displays the 10th percentile cut-offs for the PCI Teaching Scale caregiver, child, and caregiver/child total scores respectively for Caucasian, African-American, and Hispanic mothers with children between 1 and 36 months of age who are at least 20 years of age and have attained at least a high school diploma (Sumner & Spietz, 1994a). Table 2 displays the 10th percentile cut-offs for the PCI Feeding Scale caregiver, child, and caregiver/child total scores respectively for Caucasian, African-American, and Hispanic mothers with children between 1 and 12 months of age who are at least 20 years of age and have attained at least a high school diploma (Sumner & Spietz, 1994b). The PCI Teaching and Feeding Scales are thus used in child welfare to assess the quality of caregiving through identifying individuals and samples who are below the 10th percentile cut-offs (Oxford, Marcenko, Fleming, Lohr, & Spieker, 2016). In addition to clinical use, researchers and other interested individuals or agencies are able to attain the dataset electronically for making statistical comparisons to other samples (Sumner & Spietz, 1994a, 1994b). Accordingly, interventions could be planned by agencies for high-risk populations in order to optimize PCI quality (Oxford & Findlay, 2013).

**Table 1**
Teaching scale 10th percentile cutoffs by ethnic group.[a]

| Teaching scales | 10th percentile cutoff score | |
|---|---|---|
| Ethnic group | 1–12 mos. | 13–36 mos. |
| Caregiver total | | |
| Caucasian | 34 | 39 |
| African-American | 30 | 34 |
| Hispanic | 33 | 33 |
| Child total | | |
| Caucasian | 10 | 12 |
| African-American | 10 | 11 |
| Hispanic | 10 | 11 |
| Caregiver/child total | | |
| Caucasian | 47 | 54 |
| African-American | 42 | 48 |
| Hispanic | 44 | 46 |
| N of cases | | |
| Caucasian | 349 | 573 |
| African-American | 194 | 213 |
| Hispanic | 104 | 119 |
| Total | 647 | 905 |

Reprinted with permission from Sumner & Spietz (1994a).
[a] Note: scores based on subsample of mothers who were at least 20 years of age and who had at least 12 years of education.

**Table 2**
Feeding scale 10th percentile cutoffs by ethnic groups.[a]

| Teaching scales | 10th percentile cutoff score | |
|---|---|---|
| Ethnic group | 1–5 mos. | 6–12 mos. |
| Caregiver total | | |
| Caucasian | 36 | 38 |
| African-American | 34 | 35 |
| Hispanic | 34 | 35 |
| Child total | | |
| Caucasian | 15 | 18 |
| African-American | 14 | 18 |
| Hispanic | 14 | 18 |
| Caregiver/child total | | |
| Caucasian | 52 | 57 |
| African-American | 49 | 53 |
| Hispanic | 49 | 54 |
| N of cases | | |
| Caucasian | 352 | 414 |
| African-American | 217 | 166 |
| Hispanic | 111 | 105 |
| Total | 680 | 685 |

Reprinted with permission from Sumner & Spietz (1994b).
[a] Note: scores based on subsample of mothers who were at least 20 years of age and who had at least 12 years of education.

### Need for Canadian Comparative Data

The PCI Scales are used widely in Canada in both research (Letourneau, 2001; Letourneau et al., 2001; Magill-Evans, Harrison, Benzies, Gierl, & Kimak, 2007; Benzies, Magill-Evans, Harrison, MacPhail, & Kimak, 2008) and clinical practice settings, (Bohr & BinNoon, 2014). The PCI Scales have been beneficial for the examination of Canadian high-risk populations characterized by diminished mother-child relationship quality (e.g. Letourneau, Watson et al., 2011). However, the normative databases that Canadian health professionals rely on for making comparisons to 10th percentile cut-offs and to various categories (e.g. high and low education) are drawn from the American data, which may represent different populations (Lasser, Himmelstein, & Woolhandler, 2006) and thus less amenable to comparisons. Importantly, the American normative data largely focused on ethnicity limited to Caucasian, Hispanic and African American sub-samples (Sumner & Spietz, 1994a, 1994b), which may not map well on to Canadian socio-demographics. Canadian socio-demographic interests tend to focus on vulnerabilities such as low-income, immigrant status, exposure to severe/chronic stressors, and Aboriginal ethnicity (McDonald & Kennedy, 2004; Statistics Canada, 2015). These Canadian socio-demographic interests have been exemplified by studies of PCI which compared samples of Aboriginal and non-Aboriginal parent-child dyads (Letourneau, 2005) and which examined samples affected by PPD (Letourneau, Stewart et al., 2011; Letourneau, Watson et al., 2011) and IPV Letourneau et al., 2013).

Given that the normative data provide clinically significant reference points, directing health professionals to focus (or not focus) on given

services and supports for parent-child relationships, there is a need for Canadian normative data to be identified and disseminated for clinical use. Data on high-risk Canadian samples including depressed mothers, mothers affected by IPV, low income Aboriginal and non-Aboriginal parents would be valuable in order to compare PCI Scale scores with a normative sample and to appropriately target interventions. While adolescent mothers are another high-risk group worthy of exploration, limited Canadian data are presented elsewhere (as described by Letourneau et al., 2001; Drummond, Letourneau, Neufeld, Stewart, & Weir, 2008). Importantly, no known studies have compared PCI Scale quality between normative American and Canadian families. Thus, the objectives of this paper are to compare Canadian data from normative and high-risk (depressed mothers, mothers affected by IPV, low-income Aboriginal and non-Aboriginal) samples to the already established NCAST normative database in order to compare PCI quality during teaching and feeding interactions and to assess the reliability of the PCI Scales in Canadian samples in comparison with American NCAST data.

## Methods

For this secondary analysis, descriptive statistics, including means and standard deviations were employed to compare Canadian normative and high-risk samples to the NCAST Database. Unless otherwise specified (i.e. comparing differences between mothers who were affected by IPV and the NCAST Database of low and high education mothers), we included data from the full NCAST Database for comparison with Canadian samples. Independent samples *t*-tests were undertaken to identify significant differences between the Canadian samples and the NCAST Database. In order to decrease the possibility of obtaining type I errors with 11 *t*-tests being conducted simultaneously on the same datasets (Bland & Altman, 1995; Napierala, 2012), a Bonferroni corrected *p* value of 0.005 provided a more conservative significance level. (For ease of interpretation, a Bonferroni corrected *p* value of $0.05/10 = 0.005$ was used). The assumption of equality of variances was investigated for each of the *t*-tests conducted. Effect sizes were also calculated using Cohen's *d* (Cohen, 1992). Values of 0.20, 0.50, and 0.80 are representative of small, medium, and large effect sizes, respectively. In addition, the 10th percentile cut-offs for the PCI Teaching Scale were visually compared between participants from the NCAST Database who were at least 20 years of age and participants from the normative Canadian community sample who had attained at least 12 years of education. Finally, additional comparisons between the American and Canadian samples as well as assessment of the internal consistency reliability of the PCI Scales in the Canadian samples were attained via Cronbach's alphas. Due to data limitations, the internal consistency for the low-income Aboriginal and non-Aboriginal samples could not be assessed. As this paper draws upon data from multiple studies, ethics approvals were obtained from the institutional review boards relevant to each study. All participants provided informed consent prior to data collection. For comparison with the NCAST Database, Canadian data were drawn from four studies examining: (1) normative families (Kaplan et al., 2014); (2) mothers affected by PPD symptoms (Letourneau, Stewart et al., 2011; Letourneau, Watson et al., 2011); (3) mothers affected by IPV (Letourneau et al., 2013); and (4) low-income Aboriginal and non-Aboriginal parents (Letourneau et al., 2005).

### *NCAST Database Samples*

The samples of mothers and their 1–36 month old infants for the NCAST Teaching Scale Database ($n = 1887$) and sample of mothers and their 1–12 month old infants for the NCAST Feeding Scale Database ($n = 1638$) were collected throughout the USA from 1979 to 1994 (Sumner & Spietz, 1994a, 1994b; M. Oxford, written communication, June 28, 2016) (see above for more details).

### *Canadian Normative Data*

These data were drawn from the Alberta Pregnancy Outcomes and Nutrition (APrON) cohort study, a normative community sample recruited from Calgary, Alberta (Kaplan et al., 2014). Leung, McDonald, Kaplan, Giesbrecht, and Tough (2013) demonstrated that the APrON sample was representative of families with young children residing in Canadian urban areas through a comparison with the Maternity Experiences Survey (Public Health Agency of Canada, 2009). For the sake of simplicity, this normative sample will be referred to as the 'Canadian community sample' throughout this paper. This sample was recruited from mothers who: were between 6 and 22 weeks pregnant; abstained from smoking, alcohol, recreational drugs, and steroid medications during pregnancy; and did not have any known pregnancy or fetal complications. A subsample of 274 mother-infant dyads completed the PCI Scales at approximately 6 months postpartum and mothers who spoke English as a first language ($n = 262$) were included for analysis. Subsamples were additionally drawn for immigrants, defined as participants who weren't born in Canada ($n = 59$) and high-education parents, defined as those who completed a high school diploma or greater ($n = 258$).

### *Mothers With PPD*

Baseline data were employed from a sample of 58 English-speaking mother-infant dyads affected by PPD who were originally recruited into a randomized controlled trial of peer support for PPD (Letourneau, Stewart et al., 2011). Mothers were eligible to participate if their infant was a singleton birth, <9 months of age, and did not have a major health concern. In addition, to be eligible, mothers were required to score >12 on the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987) and live within or nearby the research cities of Fredericton and Moncton, New Brunswick and Edmonton, Alberta. For the current study, we examined the NCAST scores for participants belonging to the control and intervention groups prior to the intervention.

### *Mothers Affected by IPV*

A sample of 44 English-speaking mother-infant dyads affected by IPV who were recruited from New Brunswick, Nova Scotia, and Prince Edward Island (Letourneau et al., 2013) for a cross-sectional observational study were employed. Mothers were eligible if they were subjected to IPV when the participating infant was younger than 12 months of age, if the participating child was 3 years of age or less, and if they were no longer in the abusive relationship or staying in the relationship but obtaining services related to IPV.

### *Low-income Aboriginal and Non-Aboriginal Parents*

A sample of English speaking low-income Aboriginal and non-Aboriginal parents were recruited from Edmonton, Alberta (Letourneau et al., 2005) for an observational study of the influence of welfare-to-work policies on child development. To be eligible, parents had to report family income that was less than or equal to the Statistics Canada low-income cut-offs (Letourneau et al., 2005). The low-income Aboriginal database consisted of 11 mothers and 1 father, and the low-income non-Aboriginal database consisted of 47 mothers and 1 father.

## Results

Table 3 reveals differences between the full normative NCAST Database and the Canadian community sample for the PCI Teaching Scale. At the alpha level of 0.005, the independent samples *t*-tests of difference reveal that, on average, mothers belonging to the NCAST Database were more sensitive to infant cues, responded more effectively to infant distress, and provided increased levels of opportunities for growth

**Table 3**
NCAST Database PCI Teaching Scale comparisons with Canadian normative data.

| NCATS Subscale | Canadian community sample ($n = 262$) M (SD) | NCAST Database ($n = 1887$) M (SD) | $p$ value[a] | Cohen's $d$[b] | Canadian community sample Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 8.91 (1.13) | 9.41 (1.55) | 0.000 | 0.37 | 0.26 | 0.52 |
| Response to distress | 9.94 (0.93) | 10.19 (1.63) | 0.000 | 0.19 | 0.44 | 0.80 |
| Social-emotional growth fostering | 7.05 (1.94) | 9.24 (1.67) | 0.000 | 1.20 | 0.62 | 0.58 |
| Cognitive growth fostering | 10.86 (2.80) | 13.07 (3.21) | 0.000 | 0.73 | 0.75 | 0.78 |
| Caregiver total | 36.76 (5.19) | 41.92 (6.39) | 0.000 | 0.89 | 0.81 | 0.87 |
| Clarity of cues | 8.66 (1.10) | 8.07 (1.48) | 0.000 | 0.45 | 0.37 | 0.51 |
| Responsiveness to caregiver | 7.45 (2.45) | 7.69 (3.12) | 0.136 | 0.09 | 0.71 | 0.77 |
| Child total | 16.09 (3.40) | 15.75 (4.20) | 0.143 | 0.09 | 0.79 | 0.81 |
| Caregiver/child total | 52.85 (7.83) | 57.67 (8.64) | 0.000 | 0.58 | 0.88 | 0.88 |
| Mother contingency | 13.35 (2.84) | 16.70 (3.44) | 0.000 | 1.06 | 0.73 | 0.82 |
| Child contingency | 6.90 (2.14) | 6.98 (2.91) | 0.611 | 0.03 | 0.66 | 0.76 |

[a] A Bonferroni corrected $p$ value <0.005 was used.
[b] For the independent samples $t$-tests of difference between the Canadian community sample (group 1) and the NCAST Database (group 2).

fostering situations compared with the Canadian community sample. However, infants belonging to the Canadian community sample provided clearer cues to caregivers compared with NCAST Database infants. Large effect sizes were observed for social-emotional growth fostering ($d = 1.20$), the caregiver total score ($d = 0.89$), and the mother contingency total score ($d = 1.06$), favouring the NCAST Database mothers and children. For the NCAST Database, all total scores (caregiver, child and caregiver/child), the mother contingency and child contingency total scores, and the response to distress, cognitive growth fostering, and responsiveness to caregiver subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70. For the Canadian community sample, all total scores (caregiver, child and caregiver/child), the mother contingency total score, and the cognitive growth fostering and responsiveness to caregiver subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70.

Table 4 reveals differences between the high education categories (≥grade 12) of the NCAST Database and the Canadian community sample for the PCI Teaching Scale. Insufficient data were available from the Canadian community sample to compare with mothers who have less than a high school education. On average, NCAST Database mothers with high education were more sensitive to infant cues, responded more effectively to infant distress, and provided increased levels of opportunities for growth fostering situations compared with the Canadian community sample. However, infants belonging to the Canadian community sample provided clearer cues compared with NCAST Database infants. Large effect sizes were observed for social emotional growth fostering ($d = 1.35$), cognitive growth fostering ($d = 0.89$), the caregiver total score ($d = 1.07$), and the mother contingency total score ($d = 1.24$), favouring the NCAST Database mothers and children. For the NCAST Database, all total scores (caregiver, child and caregiver/child) as well as three subscales (response to distress, cognitive growth fostering, and responsiveness to caregiver) demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70. For high education mothers within the Canadian community sample, all total scores (caregiver, child and caregiver/child), the mother contingency total score, and the cognitive growth fostering and responsiveness to caregiver subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70.

Table 5 reveals differences between the full NCAST Database and immigrants within the Canadian community sample for the PCI Teaching Scale. On average, NCAST Database mothers were more sensitive to infant cues and provided increased levels of opportunities for growth fostering situations compared to immigrants from the Canadian community sample. Large effect sizes were observed for social emotional growth fostering ($d = 1.35$), cognitive growth fostering ($d = 1.18$), the caregiver total score ($d = 1.21$), the caregiver/child total score ($d = 0.88$), and the mother contingency total score ($d = 1.38$), favouring the NCAST Database mothers and children. For immigrants within the Canadian community sample, all total scores (caregiver, child and caregiver/child), the mother contingency total score, and the cognitive growth fostering and responsiveness to caregiver subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70.

Table 6 reveals differences between mothers who were affected by IPV and the NCAST Database of low education mothers (<grade 12) between 19 and 25 years of age for the PCI Teaching Scale. Differences in parent-child teaching interactions were compared in this manner due

**Table 4**
NCAST Database PCI Teaching Scale comparisons with Canadian normative data based on high education.

| NCATS Subscale | Canadian community sample ($n = 258$) M (SD) | NCAST Database ($n = 1606$) M (SD) | $p$ value[a] | Cohen's $d$[b] | Canadian community sample Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 8.90 (1.13) | 9.56 (1.41) | 0.000 | 0.52 | 0.27 | 0.47 |
| Response to distress | 9.95 (0.93) | 10.24 (1.53) | 0.000 | 0.23 | 0.45 | 0.79 |
| Social-emotional growth fostering | 7.05 (1.95) | 9.40 (1.52) | 0.000 | 1.35 | 0.62 | 0.54 |
| Cognitive growth fostering | 10.84 (2.82) | 13.42 (2.97) | 0.000 | 0.89 | 0.75 | 0.75 |
| Caregiver total | 36.74 (5.20) | 42.62 (5.73) | 0.000 | 1.07 | 0.81 | 0.85 |
| Clarity of cues | 8.65 (1.10) | 8.10 (1.43) | 0.000 | 0.43 | 0.37 | 0.50 |
| Responsiveness to caregiver | 7.43 (2.45) | 7.83 (3.01) | 0.019 | 0.15 | 0.71 | 0.76 |
| Child total | 16.07 (3.40) | 15.93 (4.06) | 0.538 | 0.04 | 0.73 | 0.80 |
| Caregiver/child total | 52.82 (7.82) | 58.55 (7.78) | 0.000 | 0.73 | 0.88 | 0.86 |
| Mother contingency | 13.36 (2.83) | 17.06 (3.12) | 0.000 | 1.24 | 0.73 | 0.80 |
| Child contingency | 6.90 (2.14) | 7.10 (2.81) | 0.172 | 0.08 | 0.66 | 0.80 |

[a] A Bonferroni corrected $p$ value <0.005 was used.
[b] For the independent samples $t$-tests of difference between high education mothers of the Canadian community sample (group 1) and the NCAST Database (group 2).

**Table 5**
NCAST Database PCI Teaching Scale comparisons with Canadian normative data (immigrants).

| NCATS Subscale | Canadian community sample ($n = 59$) M (SD) | NCAST Database ($n = 1887$) M (SD) | $p$ value[a] | Cohen's $d$[b] | Canadian community sample Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 8.51 (1.34) | 9.41 (1.55) | 0.000 | 0.62 | 0.27 | 0.52 |
| Response to distress | 9.98 (1.04) | 10.19 (1.63) | 0.291 | 0.15 | 0.44 | 0.80 |
| Social-emotional growth fostering | 6.81 (1.91) | 9.24 (1.67) | 0.000 | 1.35 | 0.62 | 0.58 |
| Cognitive growth fostering | 9.34 (3.13) | 13.07 (3.21) | 0.000 | 1.18 | 0.75 | 0.78 |
| Caregiver total | 34.64 (5.57) | 41.92 (6.39) | 0.000 | 1.21 | 0.81 | 0.87 |
| Clarity of cues | 8.36 (1.39) | 8.07 (1.48) | 0.117 | 0.20 | 0.37 | 0.51 |
| Responsiveness to caregiver | 6.98 (2.75) | 7.69 (3.12) | 0.123 | 0.24 | 0.71 | 0.77 |
| Child total | 15.34 (4.00) | 15.75 (4.20) | 0.553 | 0.10 | 0.79 | 0.81 |
| Caregiver/child total | 49.98 (8.84) | 57.67 (8.64) | 0.000 | 0.88 | 0.88 | 0.88 |
| Mother contingency | 12.42 (2.74) | 16.70 (3.44) | 0.000 | 1.38 | 0.73 | 0.82 |
| Child contingency | 6.51 (2.41) | 6.98 (2.91) | 0.296 | 0.18 | 0.66 | 0.76 |

[a] A Bonferroni corrected $p$ value <0.005 was used.
[b] For the independent samples $t$-tests of difference between immigrants within the Canadian community sample (group 1) and the NCAST Database (group 2).

to the heterogeneity of the sample of mothers who were affected by IPV, of whom 29% have low educational attainment (<grade 12) and 71% have high educational attainment (≥grade 12). On average, mothers who were affected by IPV were more sensitive to infant cues and provided increased levels of opportunities for cognitive growth fostering situations compared with NCAST Database mothers. Furthermore, infants of mothers who were affected by IPV provided clearer cues and demonstrated higher levels of response to the caregiver's interactive attempts compared with NCAST Database infants. Large effect sizes were observed for responsiveness to caregiver ($d = 0.81$) and the child total score ($d = 0.80$), favouring the sample of mothers and children affected by IPV. In contrast to the NCAST Database, in which all total scores and three subscales attained acceptable Cronbach's alpha reliability coefficients (α) >0.70; only the child total score did in the IPV sample.

Table 7 reveals differences between mothers who were affected by IPV and the NCAST Database of high education mothers (≥grade 12) 19–25 years of age for the PCI Teaching Scale. Differences in parent-child teaching interactions were compared in this manner due to the heterogeneity of education level of the sample of mothers who were affected by IPV. On average, NCAST Database mothers responded more effectively to infant distress compared with mothers who were affected by IPV. Furthermore, infants of mothers who were affected by IPV demonstrated higher levels of response to the caregiver's interactive attempts compared with NCAST Database infants. The strongest effect size was observed for social-emotional growth fostering ($d = 0.71$), of medium strength, favouring the NCAST Database mothers and children. Again, in contrast to the NCAST Database, in which all total scores and three subscales (response to distress, cognitive growth fostering, and responsiveness to caregiver) attained acceptable Cronbach's alpha reliability coefficients (α) >0.70; only the child total score reached an acceptable level in the IPV sample.

Table 8 reveals differences between mothers affected by PPD and the NCAST Database for the PCI Teaching Scale. On average, NCAST Database mothers provided increased levels of opportunities for growth fostering situations compared with depressed mothers. Large effect sizes were observed for cognitive growth ($d = 1.21$), the caregiver total score ($d = 1.10$), the caregiver/child total score ($d = 0.92$), and the mother contingency total score ($d = 1.15$), favouring the NCAST Database mothers and children. For mothers affected by PPD, all total scores (caregiver, child and caregiver/child), the mother contingency and child contingency total scores, and the response to distress and responsiveness to caregiver subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70.

Table 9 reveals differences between mothers affected by PPD and the full NCAST Database for the PCI Feeding Scale. On average, NCAST Database infants demonstrated higher levels of response to the caregiver's interactive attempts compared with the infants of depressed mothers. A large effect size was observable for responsiveness to caregiver ($d = 0.99$) and the mother contingency total score ($d = 1.03$), favouring the NCAST database mothers and children. For mothers affected by PPD, the response to distress subscale and the child and caregiver/child total scores demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70. For the NCAST Database, all total scores (caregiver, child and caregiver/child), the mother and child contingency total scores, and and the response to distress and cognitive growth fostering subscales demonstrated acceptable internal consistency, having achieved Cronbach's alpha reliability coefficients (α) >0.70.

**Table 6**
Low education NCAST Database PCI Teaching Scale comparisons with mothers affected by IPV.

| NCATS Subscale | Mothers affected by IPV ($n = 44$) M (SD)[a] | NCAST Database ($n = 122$) M (SD) | $p$ value[b] | Cohen's $d$[c] | Mothers affected by IPV Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 9.59 (1.13) | 8.55 (1.82) | 0.000 | 0.69 | 0.20 | 0.58 |
| Response to distress | 8.91 (1.67) | 9.88 (1.93) | 0.004 | 0.54 | 0.65 | 0.82 |
| Social-emotional growth fostering | 7.86 (1.23) | 8.20 (2.02) | 0.203 | 0.20 | 0.14 | 0.64 |
| Cognitive growth fostering | 13.31 (2.23) | 11.15 (3.49) | 0.000 | 0.74 | 0.53 | 0.80 |
| Caregiver total | 39.65 (3.45) | 37.77 (7.40) | 0.028 | 0.33 | 0.50 | 0.89 |
| Clarity of cues | 8.64 (1.08) | 7.84 (1.59) | 0.000 | 0.59 | 0.26 | 0.52 |
| Responsiveness to caregiver | 9.09 (2.14) | 6.70 (3.59) | 0.000 | 0.81 | 0.66 | 0.81 |
| Child total | 17.73 (2.99) | 14.53 (4.78) | 0.000 | 0.80 | 0.72 | 0.83 |
| Caregiver/child total | 57.38 (4.85) | 52.30 (10.38) | 0.000 | 0.63 | 0.63 | 0.90 |
| Mother contingency | 14.93 (2.14) | 14.58 (4.23) | 0.486 | 0.10 | 0.43 | 0.85 |
| Child contingency | 8.27 (1.93) | 6.11 (3.36) | 0.000 | 0.79 | 0.69 | 0.80 |

[a] Reprinted with persmission from Letourneau et al., 2013.
[b] A Bonferroni corrected $p$ value <0.005 was used.
[c] For the independent samples $t$-tests of difference between mothers affected by IPV (group 1) and low education mothers of the NCAST Database (group 2).

**Table 7**
High education NCAST Database PCI Teaching Scale comparisons with mothers affected by IPV.

| NCATS Subscale | Mothers affected by IPV ($n = 44$) M (SD)[a] | NCAST Database ($n = 420$) M (SD) | $p$ value[b] | Cohen's $d$[c] | Mothers affected by IPV Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 9.59 (1.13) | 9.15 (1.61) | 0.020 | 0.32 | 0.20 | 0.47 |
| Response to distress | 8.91 (1.67) | 10.03 (1.75) | 0.000 | 0.65 | 0.65 | 0.79 |
| Social-emotional growth fostering | 7.86 (1.23) | 8.96 (1.80) | 0.000 | 0.71 | 0.14 | 0.54 |
| Cognitive growth fostering | 13.31 (2.23) | 12.45 (3.37) | 0.024 | 0.30 | 0.53 | 0.75 |
| Caregiver total | 39.65 (3.45) | 40.58 (6.70) | 0.136 | 0.17 | 0.50 | 0.85 |
| Clarity of cues | 8.64 (1.08) | 8.02 (1.52) | 0.001 | 0.47 | 0.26 | 0.50 |
| Responsiveness to caregiver | 9.09 (2.14) | 7.47 (3.14) | 0.000 | 0.50 | 0.66 | 0.76 |
| Child total | 17.73 (2.99) | 15.49 (4.28) | 0.000 | 0.61 | 0.72 | 0.80 |
| Caregiver/child total | 57.38 (4.85) | 56.07 (8.80) | 0.127 | 0.18 | 0.63 | 0.86 |
| Mother contingency | 14.93 (2.14) | 16.04 (3.58) | 0.003 | 0.38 | 0.43 | 0.80 |
| Child contingency | 8.27(1.93) | 6.79 (2.93) | 0.000 | 0.60 | 0.69 | 0.80 |

[a] Reprinted with permission from Letourneau et al., 2013.
[b] A Bonferroni corrected $p$ value <0.005 was used.
[c] For the independent samples $t$-tests of difference between mothers affected by IPV (group 1) and high education mothers of the NCAST Database (group 2).

In Table 10, comparisons for the PCI Teaching Scale scores were made between low-income Aboriginal and non-Aboriginal parents. The corresponding subscale and total scores for Caucasian members of the NCAST Database are also presented for reference. There were no significant differences between non-Aboriginal and Aboriginal parents.

Table 11 reveals differences between low-income Aboriginal parents and the NCAST Database of low education mothers (<grade 12) between 19 and 25 years of age for the PCI Teaching Scale. On average, low education NCAST Database caregivers demonstrated higher efficacy at executing their responsibilities compared with the sample of low-income Aboriginal caregivers. A large effect size was observable for cognitive growth fostering ($d = 0.89$), the caregiver total score ($d = 0.84$), and the caregiver contingency total score ($d = 1.16$), the caregiver total score ($d = 0.84$), favouring the NCAST Database parents.

Table 12 reveals differences between low-income non-Aboriginal parents and the NCAST Database of low education mothers (<grade 12) between 19 and 25 years of age for the PCI Teaching Scale. On average, NCAST Database mothers with low education responded more effectively to infant distress and provided increased levels of opportunities for social-emotional growth fostering situations compared with the sample of low-income non-Aboriginal parents. However, infants belonging to the sample of low-income non-Aboriginal parents provided clearer cues compared with NCAST Database infants. A large effect size was observable for clarity of cues ($d = 0.93$), responsiveness to caregiver ($d = 0.80$), and the child total score ($d = 0.91$), favouring the non-Aboriginal children.

Finally, 10th percentile cut-offs for the PCI Teaching Scale caregiver, child, and caregiver/child total scores were calculated from a subsample of Canadian community participants who were at least 20 years of age and compared to a subsample of participants from the NCAST Database (Sumner & Spietz, 1994a) who were at least 20 years of age. The following findings emerged. First, the Canadian community sample's 10th percentile PCI Teaching Scale caregiver total score was lower (30) compared with Caucasian children (34) and Hispanic children (33) between 1 and 12 months of age, and equal to African-American children (30) between 1 and 12 months of age from the NCAST Database. Second, the Canadian community sample's 10th percentile PCI Teaching Scale child total score was higher (12) compared with Caucasian children (10), Hispanic children (10), and African-American children (10) between 1 and 12 months of age from the NCAST Database. Third, the Canadian community sample's 10th percentile PCI Teaching Scale caregiver/child total score was lower (43) compared with Caucasian children (47) and Hispanic children (44) between 1 and 12 months of age, but higher compared with African-American children (42) between 1 and 12 months of age from the NCAST Database.

## Discussion

The purpose of this research was to compare PCI quality between the normative American NCAST Database, Canadian community and Canadian high-risk samples as well as assess the reliability of the PCI Scales in Canadian samples. The following prominent findings emerged from this investigation. First, NCAST Database mothers were generally more efficacious at demonstrating the caregiver responsibilities within teaching and feeding interactions compared with the Canadian community sample. Second, infants belonging to the Canadian community sample and infants belonging to highly educated mothers within the Canadian community sample provided clearer cues to caregivers within teaching interactions compared with NCAST Database infants. Third, NCAST

**Table 8**
NCAST Database for PCI Teaching Scale comparisons with the sample of depressed mothers.

| NCATS Subscale | Mothers affected by PPD ($n = 58$) M (SD) | NCAST Database ($n = 1887$) M (SD) | $p$ value[a] | Cohen's $d$[b] | Mothers affected by PPD Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 8.81 (1.81) | 9.41 (1.55) | 0.015 | 0.36 | 0.57 | 0.52 |
| Response to distress | 9.19 (2.90) | 10.19 (1.63) | 0.011 | 0.43 | 0.72 | 0.80 |
| Social-emotional growth fostering | 8.17 (1.33) | 9.24 (1.67) | 0.000 | 0.71 | 0.12 | 0.58 |
| Cognitive growth fostering | 9.09 (3.36) | 13.07 (3.21) | 0.000 | 1.21 | 0.68 | 0.78 |
| Caregiver total | 34.12 (7.96) | 41.92 (6.39) | 0.000 | 1.10 | 0.79 | 0.87 |
| Clarity of cues | 8.66 (3.91) | 8.07 (1.48) | 0.258 | 0.20 | 0.45 | 0.51 |
| Responsiveness to caregiver | 7.55 (6.92) | 7.69 (3.12) | 0.761 | 0.03 | 0.74 | 0.77 |
| Child total | 14.66 (4.20) | 15.75 (4.20) | 0.050 | 0.26 | 0.78 | 0.81 |
| Caregiver/child total | 49.22 (9.74) | 57.67 (8.64) | 0.000 | 0.92 | 0.84 | 0.88 |
| Mother contingency | 12.10 (4.46) | 16.70 (3.44) | 0.000 | 1.15 | 0.75 | 0.82 |
| Child contingency | 5.95 (2.56) | 6.98 (2.91) | 0.008 | 0.38 | 0.72 | 0.76 |

[a] A Bonferroni corrected $p$ value <0.005 was used.
[b] For the independent samples $t$-tests of difference between mothers affected by PPD (group 1) and the NCAST Database (group 2).

**Table 9**
NCAST Database PCI Feeding Scale comparisons with the sample of depressed mothers.

| NCAFS subscale | Mothers affected by PPD ($n = 55$) M (SD) | NCAST Database ($n = 1638$) M (SD) | $p$ value[a] | Cohen's $d$[b] | Mothers affected by PPD Cronbach's alpha (α) | NCAST Database Cronbach's alpha (α) |
|---|---|---|---|---|---|---|
| Sensitivity to cues | 12.15 (3.03) | 13.63 (2.05) | 0.001 | 0.57 | 0.19 | 0.59 |
| Response to distress | 9.73 (3.19) | 10.00 (1.48) | 0.525 | 0.11 | 0.71 | 0.70 |
| Social-emotional growth fostering | 10.78 (2.33) | 11.91 (2.07) | 0.001 | 0.51 | 0.67 | 0.68 |
| Cognitive growth fostering | 5.91 (2.28) | 6.55 (2.12) | 0.028 | 0.29 | 0.42 | 0.71 |
| Caregiver total | 38.05 (7.80) | 42.09 (5.95) | 0.000 | 0.58 | 0.66 | 0.85 |
| Clarity of cues | 12.67 (4.96) | 12.77 (1.95) | 0.887 | 0.03 | 0.65 | 0.60 |
| Responsiveness to caregiver | 5.73 (2.01) | 7.78 (2.11) | 0.000 | 0.99 | 0.68 | 0.62 |
| Child total | 17.58 (4.25) | 20.55 (3.64) | 0.000 | 0.75 | 0.75 | 0.76 |
| Caregiver/child total | 55.29 (12.27) | 62.64 (8.51) | 0.000 | 0.70 | 0.84 | 0.88 |
| Mother contingency | 9.24 (3.84) | 12.58 (2.48) | 0.000 | 1.03 | 0.44 | 0.68 |
| Child contingency | 1.35 (1.41) | 1.83 (0.77) | 0.015 | 0.42 | – | 0.76 |

[a] A Bonferroni corrected $p$ value <0.005 was used.
[b] For the independent samples $t$-tests of difference between mothers affected by PPD (group 1) and the NCAST Database (group 2).

Database mothers were more efficacious at providing social-emotional and cognitive growth-fostering situations within teaching interactions and normative infants demonstrated higher levels of responsiveness to the caregiver's interactive attempts within feeding interactions compared with families headed by mothers who experienced PPD. Finally, the Canadian tenth percentile cut-off for the PCI Teaching Scale caregiver/child total score was lower when compared to the NCAST Database Caucasian and Hispanic samples, and equal when compared to the NCAST Database African-American sample.

With respect to the reliability, the PCI Teaching Scales were generally reliable measures in the Canadian community sample, including those with higher education and immigrants, as well as those affected by PPD. However, it was unclear how reliable the measure may be for mothers affected by IPV. For the PCI Feeding Scales, acceptable reliability coefficients were attained for the sample affected by PPD.

In examining our comparison of the NCAST Database to the sample of mothers affected by IPV, Canadian abused mothers demonstrated greater total scores and most of the subscale scores on the PCI Teaching Scale. This finding might be explained by compensatory parenting behavior that often accompanies exposure to IPV and contributes to the observation that exposed infants also provide clearer cues and are more responsive to their mothers in interactions than the norms would suggest (Letourneau et al., 2013). It is also possible that sample characteristics could have contributed to this difference, with abused mothers who volunteered to participate in a study of PCI potentially having a priori interests in healthier PCI. In either case, in the absence of any other data, these Canadian PCI data may be useful for the clinical comparison of PCI Teaching Scale scores to other mothers exposed to IPV.

With the exception of this group exposed to IPV, the scores of Canadian normative, depressed and low-income families were generally lower than that of the NCAST Database, with a few exceptions. First, infants of high-education Canadian community mothers provided clearer cues to caregivers compared with infants of high education NCAST Database mothers. Second, while there were no significant differences between low-income Aboriginal and non-Aboriginal families, infants belonging to the sample of low-income non-Aboriginal parents provided clearer cues compared with NCAST Database infants. This suggests that while culture may play a role in the overall appearance of PCIs (e.g. more or less verbalness, eye contact, or hand gestures during PCIs), these standardized observational assessments reveal that overall, the NCAST PCI Scales are not culturally biased and may appropriately evaluate a range of cultures (Oxford & Findlay, 2013).

For clinicians, this information suggests that whether normative or high-risk, comparisons of Canadian families' data to the NCAST Database will provide reasonable benchmarks. In other words, as the average Canadian family tends to score below the comparison NCAST Database of American families on the quality of PCI, using the cut-offs, means and standard deviations for determining the need for further intervention will ensure that Canadian families are not missed in the screening process. From this perspective, Canadian clinicians may miss some families at risk for poor PCI (i.e. false negatives), but the likelihood of failing to identify Canadian families with lower quality PCI is low. The reverse may be true for the families affected by IPV.

Notably, this study represents the first comparison of the quality of PCI in teaching and feeding interactions between the NCAST Database and Canadian normative and high-risk samples. In congruence with previous research that has established the pervasiveness of relationship

**Table 10**
PCI Teaching Scale comparisons between low-income Aboriginal and non-Aboriginal parents.[a]

| NCATS Subscale | Aboriginal database ($n = 12$) M (SD)[b] | Non-Aboriginal ($n = 48$) M (SD)[b] | NCAST Database ($n = 963$) M (SD)[b] | $p$[c,d] | Cohen's $d$[e] |
|---|---|---|---|---|---|
| Sensitivity to cues | 7.67 (1.50) | 8.06 (1.25) | 9.72 (1.30) | 0.348 | 0.28 |
| Response to distress | 8.67 (1.83) | 8.48 (1.85) | 10.30 (1.53) | 0.754 | 0.10 |
| Social-emotional growth fostering | 7.75 (3.47) | 6.96 (1.56) | 9.56 (1.37) | 0.455 | 0.29 |
| Cognitive growth fostering | 8.42 (2.54) | 10.50 (2.81) | 13.82 (2.64) | 0.026 | 0.78 |
| Caregiver total | 32.50 (4.82) | 34.00 (5.11) | 43.40 (5.09) | 0.375 | 0.30 |
| Clarity of cues | 8.92 (1.31) | 9.10 (1.06) | 8.20 (1.34) | 0.603 | 0.15 |
| Responsiveness to caregiver | 8.25 (2.42) | 9.02 (1.97) | 7.95 (2.88) | 0.252 | 0.35 |
| Child total | 17.20 (3.54) | 18.10 (2.84) | 16.20 (3.84) | 0.324 | 0.28 |
| Caregiver/child total | 49.70 (6.98) | 51.10 (6.13) | 59.56 (6.95) | 0.240 | 0.21 |
| Caregiver contingency | 10.50 (2.65) | 12.00 (3.14) | 17.40 (2.90) | 0.144 | 0.52 |
| Child contingency | 7.58 (2.11) | 8.17 (1.96) | 7.21 (2.68) | 0.367 | 0.29 |

[a] Due to data limitations, it was not possible to calculate Cronbach's alpha values for the low-income Aboriginal and non-Aboriginal study samples.
[b] Reprinted with permission from Letourneau et al., 2005.
[c] For the difference between study samples (Aboriginal and non-Aboriginal).
[d] A Bonferroni corrected $p$ value <0.005 was used.
[e] For the independent samples $t$-tests of difference between low-income Aboriginal parents (group 1) and non-Aboriginal parents (group 2).

**Table 11**
Low education NCAST Database PCI Teaching Scale comparisons with low-income Aboriginal parents.[a]

| NCATS Subscale | Aboriginal database ($n = 12$) M (SD)[b] | NCAST Database ($n = 122$) M (SD)[b] | $p$ value[c,d] | Cohen's $d$ |
|---|---|---|---|---|
| Sensitivity to cues | 7.67 (1.50) | 8.55 (1.82) | 0.110 | 0.53 |
| Response to distress | 8.67 (1.83) | 9.88 (1.93) | 0.040 | 0.64 |
| Social-emotional growth fostering | 7.75 (3.47) | 8.20 (2.02) | 0.504 | 0.16 |
| Cognitive growth fostering | 8.42 (2.54) | 11.15 (3.49) | 0.010 | 0.89 |
| Caregiver total | 32.50 (4.82) | 37.77 (7.40) | 0.000 | 0.84 |
| Clarity of cues | 8.92 (1.31) | 7.84 (1.59) | 0.025 | 0.74 |
| Responsiveness to caregiver | 8.25 (2.42) | 6.70 (3.59) | 0.149 | 0.51 |
| Child total | 17.20 (3.54) | 14.53 (4.78) | 0.063 | 0.63 |
| Caregiver/child total | 49.70 (6.98) | 52.30 (10.38) | 0.402 | 0.29 |
| Caregiver contingency | 10.50 (2.65) | 14.58 (4.23) | 0.001 | 1.16 |
| Child contingency | 7.58 (2.11) | 6.11 (3.36) | 0.141 | 0.52 |

[a] Due to data limitations, it was not possible to calculate Cronbach's alpha values for the Aboriginal and non-Aboriginal study samples.
[b] Reprinted with permission from Letourneau et al., 2005.
[c] For the independent samples $t$-tests of difference between low-income Aboriginal parents (group 1) and low education mothers of the NCAST Database (group 2).
[d] A Bonferroni corrected $p$ value <0.005 was used.

challenges between vulnerable mothers and their children (Goodman, 2008; Meadows-Oliver, Sadler, Swartz, & RyaKrause, 2007), the current study also underscores the imperativeness of assessing PCI and intervening appropriately in families affected by severe/chronic stress. Based on assessments of PCI, programs such as Keys to Caregiving are widely available and successfully improve PCI quality (Letourneau et al., 2001). Overall, our results highlight the importance and availability of comparable data to help ensure that nursing and public policy initiatives aimed at PCI and child development in normative and high-risk families can have impacts internationally.

### *Limitations*

Despite the benefits associated with comparing PCI quality between multiple samples, and the study strength in utilizing strict Bonferroni corrections to protect against Type 1 error, there are several methodological issues that limit the conclusions drawn from this study. First, a lack of available data precluded the ability to examine differences in feeding interactions between the NCAST Database, mothers affected by IPV, and the Canadian community sample. Thus, these findings are most appropriate for generalization to use of the PCI Teaching Scale. A second methodological limitation involves the small sample sizes that characterize the Canadian high-risk samples. This limitation is particularly evident with regard to several $t$-tests failing to meet the equality of variances assumption. The limitation of small sample sizes is also evident with regard to the PCI Teaching Scale comparisons that were conducted between low-income Aboriginal and non-Aboriginal parents. However, given the limited availability of data on low-income Aboriginal parents, even limited data were deemed worthwhile to share. Moreover, as pointed out by Letourneau et al., 2013, families that agreed to participate in the study of IPV may be different from families that chose not to in participate in ways that may have contributed to their scores on the NCAST measure. Moreover, families who had the time and resources to participate in a study may also be families with less stress and more social support, which could have contributed to their significantly higher scores on the NCAST measures than the NCAST Database. As well, the variety of samples employed varying recruitment methods (e.g. targeted or convenience sampling) that may have introduced bias, as suggested above. A final methodological issue concerns the homogeneity of the Canadian community sample with regard to urban residence and the potential for underrepresenting lower income and younger mothers. This limitation signifies that the higher PCI teaching quality characterizing the NCAST normative sample in comparison with the Canadian community sample cannot be generalized to Canadian rural families, although this analysis does not preclude the use of PCI as either a research or clinical tool in those settings.

**Table 12**
Low education NCAST Database PCI Teaching Scale comparisons with low-income non-Aboriginal parents.[a]

| NCATS Subscale | Non-Aboriginal ($n = 48$) M (SD)[b] | NCAST Database ($n = 122$) M (SD)[b] | $p$ Value[c,d] | Cohen's $d$ |
|---|---|---|---|---|
| Sensitivity to cues | 8.06 (1.25) | 8.55 (1.82) | 0.091 | 0.31 |
| Response to distress | 8.48 (1.85) | 9.88 (1.93) | 0.000 | 0.74 |
| Social-emotional growth fostering | 6.96 (1.56) | 8.20 (2.02) | 0.000 | 0.69 |
| Cognitive growth fostering | 10.50 (2.81) | 11.15 (3.49) | 0.549 | 0.20 |
| Caregiver total | 34.00 (5.11) | 37.77 (7.40) | 0.001 | 0.59 |
| Clarity of cues | 9.10 (1.06) | 7.84 (1.59) | 0.000 | 0.93 |
| Responsiveness to caregiver | 9.02 (1.97) | 6.70 (3.59) | 0.023 | 0.80 |
| Child total | 18.10 (2.84) | 14.53 (4.78) | 0.632 | 0.91 |
| Caregiver/child total | 51.10 (6.13) | 52.30 (10.38) | 0.109 | 0.14 |
| Caregiver contingency | 12.00 (3.14) | 14.58 (4.23) | 0.000 | 0.69 |
| Child contingency | 8.17 (1.96) | 6.11 (3.36) | 0.000 | 0.75 |

[a] Due to data limitations, it was not possible to calculate Cronbach's alpha values for the Aboriginal and non-Aboriginal study samples.
[b] Reprinted with permission from Letourneau et al., 2005.
[c] For the independent samples $t$-tests of difference between low-income non-Aboriginal parents (group 1) and low education mothers of the NCAST Database (group 2).
[d] A Bonferroni corrected $p$ value <0.005 was used.

### *Conclusions*

The scores of Canadian normative, depressed and low-income families were generally lower than the American NCAST Database scores. Thus, in our view, the NCAST Database represents reasonable estimates of PCI quality, and we can conclude that the PCI Scales can be reliably used for screening purposes in these Canadian populations. The current study also demonstrated that normative populations were characterized by healthier PCIs compared with high-risk populations in Canada, suggesting that belonging to a high-risk population reduced the ability for parents to fully sustain sensitive and responsive caregiving, with the exception of the sample of mothers affected by IPV who demonstrated greater sensitivity to cues and provided an increased level of opportunities for cognitive growth situations. Given the benefits associated with utilizing the NCAST interaction assessment to target interventions to promote healthy child development, it is essential for future research to continue to investigate the quality of PCIs among Canadian normative and high-risk families. This information is essential to ensure that assessments of PCI at baseline and post-intervention are in line with the expectations drawn from Canadian data.

The NCAST Teaching and Feeding scales remain a gold standard for measuring PCI throughout both the USA and Canada in both clinical practice and research. Using any standard measurement tool across implementation methods and samples will result in some error in measurement. However, the NCAST tools have withstood such variation with numerous published studies across methods and samples, continuing to show predictive value in the research setting and clinical value in the practice setting. Because there is a larger research base derived from American samples, we conclude that it remains optimal for researchers and clinicians to continue to reference American norms. However, researchers may also benefit from comparison to the Canadian samples we report. So, while clinical providers may benefit similarly from both sets of data, we recommend utilizing the American sample first.

## Acknowledgements

Conflicts of interest: none.

Funding: the studies from which this paper draws upon data obtained funding from the Canadian Institutes of Health Research, New Brunswick Innovation Foundation, Social Science and Humanities Research Council, Alberta Heritage Foundation for Medical Research, March of the Dimes, Harrison McCain Foundation, the Alberta Centre for Child Family & Community Research, and Alberta Innovates - Health Solutions. None of these funders had any involvement in the study designs; in the collection, analysis, and interpretation of data; in the writing of any papers; and the decision to submit articles for publication.

## References

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

Badr, L. K., Bookheimer, S., Purdy, I., & Deeb, M. (2009). Predictors of neurodevelopmental outcome for preterm infants with brain injury: MRI, medical and environmental factors. *Early Human Development*, *85*, 279–284. https://doi.org/10.1016/j.earlhumdev.2008.11.005.

Badr, L. K., Garg, M., & Kamath, M. (2006). Intervention for infants with brain injury: Results of a randomized controlled study. *Infant Behavior & Development*, *29*, 80–90.

Banerjee, P. N., & Tamis-LeMonda, C. S. (2007). Infants' persistence and mothers' teaching as predictors of toddlers' cognitive development. *Infant Behavior & Development*, *30*, 479–491. https://doi.org/10.1016/j.infbeh.2006.12.001.

Barlow, J., Schrade-McMillan, A., Axford, N., Wrigley, Z., Sonthalia, S., Wilkinson, T., ... Coad, J. (2016). Attachment and attachment-related outcomes in preschool children - a review of recent evidence. *Child and Adolescent Mental Health*, *21*, 11–20. https://doi.org/10.1111/camh.12138.

Barnard, K. E., Booth, C. L., Mitchell, S. K., & Telzrow, R. W. (1988). Newborn nursing models: A test of early intervention to high-risk infants and families. In E. D. Hibbs (Ed.), *Infancy in prevention* (pp. 61–81). New York, NY: International Universities Press.

Barnard, K., Eyres, S., Lobo, M., & Snyder, C. (1983). An ecological paradigm for assessment and intervention. In T. B. Brazelton, & B. M. Lester (Eds.), *New approaches to developmental screening of infants* (pp. 200–218). New York, NY: Elsevier Science Publishing Co.

Benzies, K., Magilll-Evans, J., Harrison, M. J., MacPhail, S., & Kimak, C. (2008). Strengthening New Fathers' Skills in Interaction with Their 5-Month-Old Infants: Who Benefits From a Brief Intervention? *Public Health Nursing*, *25*, 431–439. https://doi.org/10.1111/j.1525-1446.2008.00727.x.

Bigelow, A. E., Power, M., Gillis, D. E., Maclellan-Peters, J., Alex, M., & McDonald, C. (2014). Breastfeeding, skin-to-skin contact, and mother-infant interactions over infants first three months. *Infant Mental Health Journal*, *35*, 51–62. https://doi.org/10.1002/imhj.21424.

Bland, J. M., & Altman, D. G. (1995). Multiple significance tests: The Bonferroni method. *British Medical Journal*, *310*, 170. https://doi.org/10.1136/bmj.310.6973.170.

Bohr, Y., & BinNoon, N. (2014). Enhancing sensitivity in adolescent mothers: Does a standardized, popular parenting intervention work with teens? *Child care in Practice*, *20*, 286–300. https://doi.org/10.1080/13575279.2014.905454.

Bowie, B. H. (2005). Interventions to improve interactions between drug abusing mothers and their drug-exposed infants: A review of the research literature. *Journal of Addicitons Nursing*, *15*, 153–161. https://doi.org/10.1080/10884600490888349.

Britton, J. R., Britton, H. L., & Gronwaldt, V. (2006). Breastfeeding, sensitivity, and attachment. *Pediatrics*, *118*, e1436–e1443. https://doi.org/10.1067/mpd.2001.113358.

Bryanton, J., Gagnon, A. J., Hatem, M., & Johnston, C. (2009). Does perception of the childbirth experience predict women's early parenting behaviors? *Research in Nursing & Health*, *32*, 191–203. https://doi.org/10.1002/nur.20314.

Byrne, M. W., & Keefe, M. R. (2003). Comparison of two measures of parent-child interaction. *Nursing Research*, *52*, 34–41. https://doi.org/10.1097/00006199-200301000-00005.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159. https://doi.org/10.1037/0033-2909.112.1.155.

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry*, *150*, 782–786. https://doi.org/10.1192/bjp.150.6.782.

Davies, P. T., Cummings, E. M., & Winter, M. A. (2004). Pathways between profiles of family functioning, child security in the interparental subsystem, and child psychological problems. *Development and Psychopathology*, *16*, 525–550.

Drummond, J. E., Letourneau, N., Neufeld, S. M., Stewart, M., & Weir, A. (2008). Effectiveness of teaching an early parenting approach within a community-based support service for adolescent mothers. *Research in Nursing & Health*, *31*, 12–22. https://doi.org/10.1002/nur.20235.

Duggan, A. K., Berlin, L. J., Cassidy, J., Burrell, L., & Tandon, S. D. (2009). Examining maternal depression and attachment insecurity as moderators of the impacts of home visiting for at-risk mothers and infants. *Journal of Consulting and Clinical Psychology*, *77*, 788–799.

Fowles, E. R., & Horowitz, J. A. (2006). Clinical assessment of mothering during infancy. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *35*, 662–670. https://doi.org/10.1111/j.1552-6909.2006.00090.x.

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. https://doi.org/10.3945/ajcn.2008.26817.

Goodman, J. H. (2008). Influences of maternal postpartum depression on fathers and on father–infant interaction. *Infant Mental Health Journal*, *29*, 624–643. https://doi.org/10.1002/imhj.20199.

Horowitz, J. A., Logsdon, M. C., & Anderson, J. K. (2005). Measurement of maternal-infant interaction. *Journal of the American Psychiatric Nurses Association*, *11*, 164–172. https://doi.org/10.1177/1078390305278788.

Huebner, C. E. (2002). Evaluation of a clinic-based parent education program to reduce the risk of infant and toddler maltreatment. *Public Health Nursing*, *19*, 377–389.

Kaplan, B. J., Giesbrecht, G. F., Leung, B. M., Field, C. J., Dewey, D., Bell, R. C., ... Martin, J. W. (2014). The Alberta Pregnancy Outcomes and Nutrition (APrON) cohort study: rationale and methods. *Maternal & Child Nutrition*, *10*, 44–60. https://doi.org/10.1111/j.1740-8709.2012.00433.x.

Kelly, J. F., Zuckerman, T., & Rosenblatt, S. (2008). Promoting First Relationships: A Relationship-Focused Early Intervention Approach. *Infants & Young Children*, *21*, 285–295. https://doi.org/10.1097/01.IYC.0000336541.37379.0e.

Kolobe, T. H. (2004). Childrearing practices and developmental expectations for Mexican-American mothers and the developmental status of their infants. *Physical Therapy*, *84*, 439–453. https://doi.org/10.1093/ptj/84.5.439.

Lasser, K. E., Himmelstein, D. U., & Woolhandler, S. (2006). Access to care, health status, and health disparities in the United States and Canada: Results of a cross-national population-based survey. *American Journal of Public Health*, *96*, 1300–1307. https://doi.org/10.2105/AJPH.2004.059402.

Letourneau, N. (1997). Fostering resiliency in infants and young children through parent-child interaction. *Infants & Young Children*, *9*, 36–45.

Letourneau, N. (2001). Improving adolescent parent-infant interactions: A pilot study. *Journal of Pediatric Nursing: Nursing Care of Children and Families*, *16*, 53–62. https://doi.org/10.1053/jpdn.2001.20554.

Letourneau, N., Drummond, J., Fleming, D., Kysela, G., McDonald, L., & Stewart, M. (2001). Supporting parents: Can intervention improve parent-child relationships? *Journal of Family Nursing*, *7*, 159–187. https://doi.org/10.1177/107484070100700203.

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. https://doi.org/10.1111/j.1365-2214.2005.00549.x.

Letourneau, N., Morris, C., Secco, L., & Hughes, J. (2013). Mothers and infants exposed to intimate partner violence compensate. *Violence and Victims*, *28*, 571–586. https://doi.org/10.1891/0886-6708.VV-D-12-00077.

Letourneau, N., Stewart, M., Dennis, C. L., 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. https://doi.org/10.1111/j.1447-0349.2010.00736.x.

Letourneau, N., Watson, B., Duffett-Leger, L., Hegadoren, K., & Tryphonopoulos, P. (2011). Cortisol patterns of depressed mothers and their infants are related to maternal–infant interactive behaviours. *Journal of Reproductive and Infant Psychology*, *29*, 439–459. https://doi.org/10.1080/02646838.2011.649474.

Leung, B. M., McDonald, S. W., Kaplan, B. J., Giesbrecht, G. F., & Tough, S. C. (2013). Comparison of sample characteristics in two pregnancy cohorts: Community-based versus population-based recruitment methods. *BMC Medical Research Methodology*, *13*, 149.

Magai, C., Cohen, C., Milburn, N., Thorpe, B., McPherson, R., & Peralta, D. (2001). Attachment styles in older European American and African American adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *56*, S28–S35.

Magill-Evans, J., Harrison, M. J., Benzies, K., Gierl, M., & Kimak, C. (2007). Effects of parenting education on first-time fathers' skills in interactions with their infants. *Fathering*, *5*, 42–57. https://doi.org/10.3149/fth.0501.42.

McDonald, J. T., & Kennedy, S. (2004). Insights into the 'healthy immigrant effect': Health status and health service use of immigrants to Canada. *Social Science & Medicine*, *59*, 1613–1627. https://doi.org/10.1016/j.socscimed.2004.02.004.

McElwain, N. L., & Booth-LaForce, C. (2006). Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *Journal of Family Psychology*, *20*, 247–255. https://doi.org/10.1037/0893-3200.20.2.247.

Meadows-Oliver, M., Sadler, L. S., Swartz, M. K., & RyaKrause, P. (2007). Sources of stress and support and maternal resources of homeless teenage mothers. *Journal of Child*

*and Adolescent Psychiatric Nursing, 20*, 116–125. https://doi.org/10.1111/j.1744-6171.2007.00093.x.

Mortensen, J. A., & Mastergeorge, A. M. (2014). A meta-analytic review of relationship-based interventions for low-income families with infants and toddlers: Facilitating supportive parent–child interactions. *Infant Mental Health Journal, 35*, 336–353. https://doi.org/10.1002/imhj.21451.

Nakamura, W. M., Stewart, K. B., & Tatarka, M. E. (2000). Assessing father–infant interactions using the NCAST Teaching Scale: A pilot study. *American Journal of Occupational Therapy, 54*, 44–51. https://doi.org/10.5014/ajot.54.1.44.

Napierala, M. A. (2012). What is the Bonferroni correction? *Journal of the American Academy of Orthopaedic Surgeons, 6*, 40.

National Scientific Council on the Developing Child (2005). *Excessive stress disrupts the architecture of the developing brain: Working paper #3.* Boston, MA: Center on the Developing Child at Harvard University.

National Scientific Council on the Developing Child (2006). *Young children develop in an environment of relationships: Working Paper #1.* Boston, MA: Center on the Developing Child at Harvard University.

National Scientific Council on the Developing Child (2008/2012). *Establishing a level foundation for life: Mental health begins in early childhood.* Boston, MA: Center on the Developing Child at Harvard University.

National Scientific Council on the Developing Child (2009). *Maternal depression can undermine the development of young children: Working Paper 8.* Boston, MA: Center on the Developing Child at Harvard University.

National Scientific Council on the Developing Child (2010). *The foundations of lifelong health are built in early in childhood.* Boston, MA: Center on the Developing Child at Harvard University.

National Scientific Council on the Developing Child (2012). *The science of neglect: The persistent absence of responsive care disrupts the developing brain: Working paper 12.* Boston, MA: Center on the Developing Child at Harvard University.

Oxford, M., & Findlay, D. (2013). *Caregiver/parent-child interaction teaching manual* (2nd ed.). Seattle, WA: NCAST Programs.

Oxford, M., Marcenko, M., Fleming, C. B., Lohr, M. J., & Spieker, S. J. (2016). Promoting birth parents' relationships with their toddlers upon reunification: Results from Promoting First Relationships® home visiting program. *Children and Youth Services Review, 61*, 109–116. https://doi.org/10.1016/j.childyouth.2015.12.004.

Palix Foundation (2015). *How Brains are Built: The Core Story of Brain Development.* Calgary, AB: Palix Foundation.

Public Health Agency of Canada (2009). What mothers say: The Canadian Maternity Experiences Survey. Retrieved from http://www.phac-aspc.gc.ca/rhs-ssg/pdf/survey-eng.pdf.

Reid, V., & Meadows-Oliver, M. (2007). Postpartum depression in adolescent mothers: An integrative review of the literature. *Journal of Pediatric Health Care, 21*, 289–298.

Riesch, S. K., Anderson, L. S., Pridham, K. A., Lutz, K. F., & Becker, P. T. (2010). Furthering the Understanding of parent–child relationships: A nursing scholarship review series. Part 5: Parent–adolescent and teen parent–child relationships. *Journal for Specialists in Pediatric Nursing, 15*, 182–201. https://doi.org/10.1111/j.1744-6155.2009.00228.x.

Rispoli, K. M., McGoey, K. E., Koziol, N. A., & Schreiber, J. B. (2013). The relation of parenting, child temperament, and attachment security in early childhood to social competence at school entry. *Journal of School Psychology, 51*, 643–658.

Sadler, L. S., Slade, A., Close, N., Webb, D. L., Simpson, T., Fennie, K., & Mayes, L. C. (2013). Minding the baby: Enhancing reflectiveness to improve early health and relationship outcomes in an interdisciplinary home-visiting program. *Infant Mental Health Journal, 34*, 391–405.

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

Shonkoff, J. P., Garner, A. S., Siegel, B. S., Dobbins, M. I., Earls, M. F., Garner, A. S., ... Wood, D. L. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics, 129*, e232–e246.

Singer, L. T., Fulton, S., Davillier, M., Koshy, D., Salvator, A. N. N., & Baley, J. E. (2003). Effects of infant risk status and maternal psychological distress on maternal-infant interactions during the first year of life. *Journal of Developmental & Behavioral Pediatrics, 24*, 233–241. https://doi.org/10.1097/00004703-200308000-00003.

Speltz, M. L., Endriga, M. C., Hill, S., Maris, C. L., Jones, K., & Omnell, M. L. (2000). Brief report: Cognitive and psychomotor development of infants with orofacial clefts. *Journal of Pediatric Psychology, 25*, 185–190. https://doi.org/10.1093/jpepsy/25.3.185.

Spieker, S. J., Oxford, M. L., Kelly, J. F., Nelson, E. M., & Fleming, C. B. (2012). Promoting first relationships: Randomized trial of a relationship-based intervention for toddlers in child welfare. *Child Maltreatment, 17*, 271–286. https://doi.org/10.1177/1077559512458176.

Statistics Canada (2015, December). Aboriginal statistics at a glance: 2nd edition. Retrieved from http://www.statcan.gc.ca/pub/89-645-x/89-645-x2015001-eng.pdf.

Suchman, N. E., DeCoste, C., Castiglioni, N., McMahon, T. J., 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. https://doi.org/10.1080/14616734.2010.501983.

Sumner, G., & Spietz, A. (1994a). *Caregiver/parent-child teaching manual.* Seattle, WA: NCAST-AVENUE Publications.

Sumner, G., & Spietz, A. (1994b). *Caregiver/parent-child interaction feeding manual.* Seattle, WA: NCAST-AVENUE Publications.

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*, 209–220. https://doi.org/10.11480/jmds.570403.

Tryphonopoulos, P. D., Letourneau, N., & Di Tommaso, E. (2016). Caregiver-infant interaction quality: A review of observational assessment tools. *Comprehensive Child and Adolescent Nursing, 39*, 107–138. https://doi.org/10.3109/01460862.2015.1134720.

White-Traut, R., Norr, K. F., Fabiyi, C., Rankin, K. M., Li, Z., & Liu, L. (2013). Mother–infant interaction improves with a developmental intervention for mother–preterm infant dyads. *Infant Behavior and Development, 36*, 694–706. https://doi.org/10.1016/j.infbeh.2013.07.