




The practical utility of the Welch Emotional Connection Screen for rating parent–infant relational health

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Abstract

Emotional Connection (EC) measured by the Welch Emotional Connection Screen (WECS) was related to the Parent–Infant Interaction Rating System (PIIRS), a 5-point adaptation of the rating system developed for the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (e.g., NICHD Early Child Care Research Network, 1999, *Developmental Psychology*, 35, 1399). Parent–infant dyads ($n = 49$ mothers; 43 fathers) were videotaped during face-to-face interaction at infant age 6 months; interactions were coded with both the WECS and PIIRS. At age 3, mothers completed the Child Behavior Checklist. WECS ratings of EC were associated with PIIRS rating items for both mother–infant and father–infant dyads. Mother–infant EC related positively to maternal sensitivity and positive regard for child, child positive mood and sustained attention, and dyadic mutuality, and negatively with maternal intrusiveness. Father–infant EC related positively to fathers' positive regard for child, child positive mood and sustained attention, and dyadic mutuality. Mother–infant EC predicted child behavior problems at age 3 better than mother–infant PIIRS ratings

of dyadic mutuality. With fathers, neither EC nor dyadic mutuality ratings predicted mother-reported child behavior problems. Findings highlight the practical utility of the WECS for identifying potentially at-risk dyads and supporting early relational health.

1 | INTRODUCTION

Early parent–child relationship quality is important for healthy developmental outcomes. High-quality maternal caregiving behavior in infancy is related to more optimal biobehavioral development across early childhood (Hane, Henderson, Fox, & Reeb-Sutherland, 2010), and sensitive caregiving may support co-regulation between parent and child, buffering children from the negative effects of stress (Ha & Granger, 2016). Implications of early relationships for later behavioral and emotional well-being make apparent the need to focus on promoting healthy interaction patterns from birth. Moreover, the dynamic and bi-directional nature of relationships requires that we recognize both parent *and* child as contributors to early interaction and relationship quality (Beebe et al., 2016). However, most observational assessments of relationship quality tend to focus on individual contributions (e.g., parent; child), rather than on dyadic-level behaviors (Bornstein, Suwalsky, & Breakstone, 2012).

The observational rating system developed for the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD Early Child Care Research Network, 1999, 2000; Owen, 1992) represents one influential approach to rating parent–child interaction. Five-point adaptations (e.g., Cox & Crnic, 2002; Owen, 2006) of this system have been widely used in research (e.g., The Family Life Project, Dallas Preschool Readiness Project, Wirral Study of Child Health and Development) and applied to both mothers and fathers, and across infancy and early childhood. For the sake of clarity and brevity, we refer to these 5-pt adaptations of the NICHD scales as the parent–infant interaction rating system (PIIRS).

Ratings on the PIIRS have been associated with a range of child outcomes, including greater vocabulary at 2½ years (Peredo, Owen, Rojas, & Caughy, 2015), and fewer internalizing (e.g., Wagner, Propper, Gueron-Sela, & Mills-Koonce, 2016) and externalizing (e.g., Sulik, Blair, Mills-Koonce, Berry, & Greenberg, 2015) behavior problems. Use of the PIIRS, however, is constrained by the time-intensive nature of the coding protocol and required training to achieve acceptable interrater reliability. Given the number of unique rating items of parent and child behaviors in the PIIRS, coders must view the interaction multiple times to code each item reliably.

In contrast, the Welch Emotional Connection Screen (WECS) was developed as a rapid screening tool for relational health (Hane et al., 2019) that can be completed in approximately 5 min, after observing as few as 2 min of face-to-face interaction between parent and child. The WECS differs from other observational rating systems in that it views parent–infant interaction through the lens of calming cycle theory (CCT; Welch, 2016; Welch & Ludwig, 2017a; Welch & Ludwig, 2017b). CCT hypothesizes an open co-regulatory feedback system between mother and infant where vagal tone and heart rate are co-modulated, creating a co-regulatory parasympathetic calming reflex (Ludwig & Welch, 2019). Consequently, proximity-seeking behavior within the dyad is viewed as environmentally

shaped, established in utero, and contributing to parent–infant emotional connection (EC) after birth (Ludwig & Welch, 2019).

Emotional connection has been associated with more positive maternal and child functioning (Frosch et al., 2019; Hane et al., 2019; Porges et al., 2019). Emotionally connected dyads are *mutually* responsive, attracted, and communicative with each other. What remains unclear, however, is how WECS ratings of EC relate to ratings on other established observational coding systems. Demonstrating the utility of the WECS is an important first step to providing researchers and practitioners with a valid, efficient, and practical screening tool for identifying dyads potentially at-risk for adverse outcomes.

1.1 | Current study

The goals are to (a) demonstrate construct validity of the WECS as a tool for rating mother–infant and father–infant interactions and (b) examine the contributions of both WECS ratings of EC and PIIRS ratings of dyadic mutuality in the prediction of child behavioral problems at age 3 years. Informed by research on co-regulation of parasympathetic responses in infancy (Doiron & Stack, 2017), we test two hypotheses. First, we expected positive associations between WECS ratings of EC and PIIRS ratings of dyadic mutuality. We also examine how EC relates to the individual parent and infant rating items of the PIIRS. Second, a rating of EC requires sustained attraction and sharing of emotion, affection, and sensitivity between parent and infant. Consequently, we expect that ratings of EC will make a significant, independent contribution to the prediction of 3-year behavior problems, over and above PIIRS ratings of dyadic mutuality which may include parent–child joint attention and coordination and enjoyment of shared activity.

2 | METHOD

2.1 | Participants

The current study involved secondary analysis of 57 families who participated in a longitudinal study of family interaction. Moreover, the current study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by the Institutional Review Board at the University of North Texas. Participating families lived in a Midwestern university town; the majority of parents identified as Caucasian. Infants were 6 months old at the time of observation (51.1% male; 54% firstborn). From the original recruited sample, complete 6-month videotaped interaction and 3-year maternal report data were available for 49 mother–infant and 43 father–infant dyads.

2.2 | Procedure

When infants were 6 months of age, families were visited at home. Parent–infant dyads were videotaped during brief, 2-min face-to-face interactions, counterbalanced across mothers and fathers. Separate teams of coders were utilized for each parent and rating system, creating a total of four unique coding pairs (two WECS/two PIIRS; eight individual coders). When children were 3 years of age, mothers completed the Child Behavior Checklist.

TABLE 1 Descriptive statistics by mother and father

Variables	Mothers (<i>n</i> = 49)	Fathers (<i>n</i> = 43)
	Mean (<i>SD</i>)	Mean (<i>SD</i>)
PIIRS		
Sensitivity/Responsiveness	3.88 (0.95)	3.42 (0.91)
Intrusiveness	2.39 (1.22)	1.91 (0.97)
Detachment	1.39 (0.81)	1.21 (0.60)
Positive regard	3.76 (0.80)	3.40 (0.79)
Negative regard	1.61 (0.81)	1.07 (0.26)
Animation	3.98 (0.84)	2.93 (1.01)
Positive mood	2.88 (1.13)	2.49 (1.05)
Negative mood	2.14 (1.12)	1.95 (1.00)
Sustained attention	3.31 (0.94)	2.56 (1.00)
Dyadic mutuality	3.43 (1.02)	3.02 (0.96)
EC+	36.7% (18)	60.5% (26)
Child behavior checklist		
Internalizing behavior problems	6.23 (3.60)	5.79 (3.23)
Externalizing behavior problems	10.20 (5.43)	9.65 (5.01)
Total behavior problems	28.69 (13.33)	27.20 (11.70)
Parent age	34.12 (4.68)	36.16 (5.38)
Female children	51.0% (25)	48.8% (21)

Abbreviations: EC+, Emotionally Connected Dyads; PIIRS, Parent-Infant Interaction Rating System.

2.3 | Measures

2.3.1 | Welch emotional connection screen (WECS)

The WECS is a brief, relational health screening tool. Four mutual subscales (attraction, vocal communication, facial communication, and sensitivity/reciprocity) are rated on a 3-point continuous scale (1 = *low*; 3 = *high*) in .25 increments (Hane et al., 2019). Based on the overall pattern of interaction, a clinical assessment rating of EC+ (connected) or EC- (not connected) is then assigned. After establishing interrater reliability with the WECS creators at 0.80, separate teams of two coders independently scored either the mother–infant or father–infant interactions. To calculate interrater reliability, individuals within coding pairs overlapped on approximately 30% of the episodes. To maintain coding fidelity, coding pairs met weekly to review and resolve all discrepancies. ICCs, based on pre-conferencing, individual scores, ranged from 0.91 to 0.93 ($M = 0.92$) for fathers and 0.78 to 0.92 ($M = 0.91$) for mothers. Cohen's kappa for the dichotomous rating of EC+ versus EC- was 0.95 for fathers and 0.93 for mothers.

2.3.2 | Parent–infant interaction rating system (PIIRS)

The PIIRS represents a 5-point adaptation of the rating system developed for the NICHD SECCYD (NICHD ECCRN, 1999; Owen, 2006). Parental items rated were as follows: sensitivity/responsivity,

intrusiveness, detachment, positive regard for child, negative regard for child, and animation. Child items rated were as follows: positive mood, negative mood, and sustained attention. Finally, dyadic mutuality was rated (shared focus; shared experience). Interrater reliability was established in the same way as with the WECS coding. For mothers, ICCs ranged from 0.93 to 1.00 ($M = 0.98$). For fathers, ICCs ranged from 0.86 to 0.98 ($M = 0.91$).

2.3.3 | Child behavior checklist (CBCL)

The CBCL is a 99-item questionnaire concerning child behavior problems (Achenbach, 1992). Mothers rated children on internalizing, externalizing, and other behavior problems using 3-point scale items (0 = *not true*; 2 = *very true*). Coefficient alphas were 0.77 for internalizing and 0.88 for externalizing.

3 | RESULTS

Variables were assessed for normality, homogeneity, outliers, and missing values with descriptive statistics presented in Table 1. Two outliers were identified on CBCL behavior problems (one on externalizing; one on internalizing) and winsorized.

3.1 | Mother–infant interaction

Correlations between WECS and PIIRS ratings were examined to understand the relationship between the two coding systems (Table 2). Mother–infant EC was significantly related to higher PIIRS ratings of maternal sensitivity/responsiveness, positive regard for child, child positive mood and sustained attention, and dyadic mutuality. EC related negatively to maternal intrusiveness.

Next, hierarchical regressions were conducted for child behavior problems using EC and PIIRS ratings of dyadic mutuality (Table 3). Dyadic mutuality was entered first and was not predictive of externalizing, $F(1, 47) = 3.206$, $p = .080$, $R^2 = .064$, internalizing, $F(1, 47) = 1.075$, $p = .305$, $R^2 = .022$, or total behavior problems, $F(1, 47) = 2.565$, $p = .116$, $R^2 = .052$. However, when EC was added in the second step, the externalizing behavior model, $F(2, 46) = 3.771$, $p = .030$, $R^2 = .141$, $\Delta R^2 = .077$, and total behavior problems model, $F(2, 46) = 4.382$, $p = .018$, $R^2 = .160$, $\Delta R^2 = .108$, became statistically significant. Furthermore, EC explained a majority of the variance in maternal reports of internalizing ($r_s^2 = .96$), externalizing ($r_s^2 = .92$), and total ($r_s^2 = .97$) behavior problems, in comparison with dyadic mutuality (internalizing $r_s^2 = .19$; externalizing $r_s^2 = .45$; total $r_s^2 = .19$).

3.2 | Father–infant interaction

Correlational analyses indicated significant associations between father–infant EC and higher PIIRS ratings of paternal positive regard for child and animation, child positive mood and sustained attention, and dyadic mutuality (Table 4). EC was unrelated to PIIRS ratings of paternal intrusiveness and child negative mood.

Next, hierarchical regressions predicting behavior problems were conducted using father–infant EC and PIIRS ratings of dyadic mutuality (Table 5). Father–infant dyadic mutuality was not a significant predictor of internalizing, externalizing, or total behavior problems. Moreover, when father–infant EC was added to each model, it was not a significant predictor of child behavior problems.

TABLE 2 Correlation matrix for PIIRS and EC for mothers

	1	2	3	4	5	6	7	8	9	10	11
Mother											
Sensitivity/Responsiveness ^a	–										
Intrusiveness ^a	–.784**	–									
Detachment ^a	–.343*	.202	–								
Positive regard ^a	.696**	–.559**	–.649**	–							
Negative regard ^a	–.685**	.617**	.138	–.499**	–						
Animation ^a	.420**	–.218	–.611**	.774**	–.416**	–					
Child											
Positive mood ^a	.471**	–.312*	–.333*	.585**	–.189	.375**	–				
Negative mood ^a	–.513**	.508**	.075	–.192	.430**	–.137	–.283*	–			
Sustained attention ^a	.650**	–.741**	–.268	.570**	–.387**	.304*	.546**	–.419**	–		
Dyadic mutuality ^a	.700**	–.637**	–.356*	.765**	–.474**	.430**	.697**	–.274	.707**	–	
Emotional connection ^b	.325*	–.419**	–.262	.447**	–.159	.229	.613**	–.098	.568**	.431**	–

Note: Correlations involving emotional connection are point-biserial correlations.

Abbreviations: EC, Emotional Connection; PIIRS, Parent-Infant Interaction Rating System.

^aPIIRS.

^bEC.

* $p < .05$.

** $p < .01$.

TABLE 3 Hierarchical regression models of mother dyadic mutuality and emotional connection on maternal reports of behavior problems

	Externalizing				Internalizing				Total						
	R^2	b	β	r_s^2	p	R^2	b	β	r_s^2	p	R^2	b	β	r_s^2	p
Step 1	.064				.080	.022				.305	.052				.116
Dyadic mutuality		-1.33	-0.25	1	.080		-0.53	-0.15	1	.305		-2.97	-0.23	1	.116
Step 2	.141				.030*	.061				.238	.160				.018*
Dyadic mutuality		-0.64	-0.12	.45	.432		-0.20	-0.06	.19	.724		-0.92	-0.07	.19	.641
Emotional connection		-3.43	-0.31	.92	.048*		-1.60	-0.22	.96	.178		-9.98	-0.37	.97	.019*
ΔR^2	.077				.048*	.038				.178	.108				.019*

Abbreviations: b , unstandardized regression coefficients; β , standardized regression coefficients; r_s^2 , squared structure coefficients.

* $p < .05$.

TABLE 4 Correlation matrix for PIRS and EC for fathers

	1	2	3	4	5	6	7	8	9	10	11
Father											
Sensitivity/Responsiveness ^a	–										
Intrusiveness ^a	–.550**	–									
Detachment ^a	–.296	–.170	–								
Positive regard ^a	.627**	–.106	–.580**	–							
Negative regard ^a	–.437**	.502**	–.097	–.138	–						
Animation ^a	.658**	–.177	–.486**	.841**	–.164	–					
Child											
Positive mood ^a	.429**	–.187	–.241	.591**	–.041	.547**	–				
Negative mood ^a	–.057	.192	–.023	.024	.013	–.074	–.226	–			
Sustained attention ^a	.521**	–.067	–.356*	.643**	.030	.648**	.701**	–.210	–		
Dyadic mutuality ^a	.534**	–.201	–.503**	.581**	–.007	.614**	.645**	–.073	.772**	–	
Emotional connection ^b	.166	–.177	–.196	.348*	.221	.373*	.561**	–.038	.549**	.519**	–

Note: Correlations involving emotional connection are point-biserial correlations.

Abbreviations: EC, Emotional Connection; PIRS, Parent-Infant Interaction Rating System.

^aPIRS.

^bEC.

* $p < .05$.

** $p < .01$.

TABLE 5 Hierarchical regression models of father dyadic mutuality and emotional connection on maternal reports of behavior problems

	Externalizing					Internalizing					Total				
	R^2	b	β	r^2_s	p	R^2	b	β	r^2_s	p	R^2	b	β	r^2_s	p
Step 1	.015				.438	.089				.052	.032				.252
Dyadic mutuality		0.63	0.12	1	.438		1.01	0.30	1	.052		2.17	0.18	1	.252
Step 2	.020				.665	.096				.132	.037				.375
Dyadic mutuality		0.40	0.08	.47	.679		0.83	0.24	.93	.169		1.63	0.13	.86	.466
Emotional connection		0.90	0.09	.97	.639		0.66	0.10	.54	.575		2.03	0.09	.65	.638
ΔR^2	.005				.639	.007				.575	.005				.638

Abbreviations: b , unstandardized regression coefficients; β , standardized regression coefficients; r^2_s , squared structure coefficients.

4 | DISCUSSION

This study provides three contributions to the literature on parent–infant interaction: (a) identified associations between WECS ratings of parent–infant EC and PIIRS ratings of interaction quality, thereby establishing practical utility for researchers to utilize the WECS with both mother– and father–infant dyads, (b) demonstrated mother–infant EC explained unique variance in later mother-reported child behavior problems, over and above PIIRS ratings of dyadic mutuality, and (c) revealed differential patterns of prediction from EC to maternal reports of problem behavior, depending on parent gender.

Together, these findings suggest the practical utility of the WECS as a less time-intensive approach to assessing quality of parent–infant interactions. For clinicians and practitioners interested in identifying and improving relational health of at-risk dyads, the WECS appears to offer an efficient approach to screening based on very brief observation of face-to-face interaction. Moreover, for researchers interested in incorporating brief assessments of parent–infant interaction into their protocols, the WECS holds promise as a useful tool for rating EC.

Beyond these contributions, this study extends previous research regarding the predictive (Frosch et al., 2019) and concurrent validity (Hane et al., 2019) of the WECS. Moreover, the predictive power of EC measured at 6 months on behavioral problems at age 3 supports the value of viewing parent–child interaction through the lens of relational health and co-regulation, as hypothesized by CCT (Ludwig & Welch, 2019). The nomothetic span of the WECS in relation to the PIIRS provides evidence for the practicality of the WECS, in relation to other observational systems for rating parent–infant interaction.

Finding that 3-year child behavioral outcomes were predicted more strongly by WECS ratings of mother–infant EC, when compared to PIIRS ratings of dyadic mutuality suggests that for mother–infant dyads, EC (although correlated with dyadic mutuality), may be particularly important for understanding maternal reported child behavioral problems. From a theoretical perspective, EC requires mutual attraction, affective communication, and reciprocity, while PIIRS ratings of dyadic mutuality focus on shared experience. Consequently, the WECS may afford a more exacting method for capturing co-regulatory patterns within mother–infant relationships that support later child behavioral functioning. As such, the WECS could become a prominent measure for holistically examining dyadic relationship quality.

In contrast, father–infant EC was unrelated to maternal reported child behavioral problems at 3 years, perhaps due to the informant of behavior problems in this study. Given research showing differential prediction to child outcomes based on maternal versus paternal reports (e.g., Alakortes et al., 2017), future research should incorporate a multi-informant approach to studying child outcomes. Moreover, the lack of association between father–infant EC and later child behavior problems aligns with research indicating that father–infant and mother–infant relationships may be associated differentially with child outcomes. For example, father–infant relationships may promote exploration and risk-taking, more than calming and comforting (Paquette, 2004).

Methodological strengths include utilization of two separate coding systems and four unique coding teams. Furthermore, demonstrating prediction to 3-year behavioral outcomes from mother–infant EC, although with a limited sample size, highlights the practical utility of the WECS for identifying infants who may be at-risk for future behavioral problems.

While limited by use of an existing data set constructed largely of a homogenous, full-term community sample and its reliance on maternal reports of child behavior problems, these findings lay the groundwork for future research. Such work should consider how WECS and PIIRS ratings independently or jointly predict a wider range of child outcomes in more diverse samples. In addition, exploring use of the WECS as a relational health screening tool in clinical and community settings may advance both research and practice.

CONFLICTS OF INTEREST

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