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Hair Cortisol Concentrations in High- and Low-Stress Mother-Daughter Dyads

Sarah J. Ouellette, *The University of Western Ontario*

HAIR CORTISOL CONCENTRATIONS IN HIGH- AND LOW-STRESS MOTHER-DAUGHTER DYADS

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by

Sarah J. Ouellette

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The School of Graduate and Postdoctoral Studies
The University of Western Ontario
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Abstract

Hair cortisol concentrations (HCC) are receiving increased attention as a novel biomarker of psychophysiological responses to chronic stress. I examined the validity of HCC as a marker of psychosocial stress in mother-daughter dyads characterized by high ($n = 30$) or low ($n = 30$) maternal chronic stress. Additionally, I examined whether early care and daughters' symptoms moderated similarity of HCC levels within dyads. Finally, I examined chronic stress and early caregiving as potential mediators of children's cortisol stability. High-stress mothers had significantly lower HCC compared to low-stress mothers. Further, HCC in daughters were significantly associated with previously assessed salivary cortisol reactivity. Mother-daughter HCC associations were significantly moderated by negative parenting styles and children's internalizing symptoms. Results did not support the mediating roles of either chronic stress or caregiving in the stability of children's cortisol. Findings overall indicate that HCC may be a useful marker of cortisol responses to chronic stress.

Keywords: Hair cortisol, HPA axis, chronic stress, mother-daughter dyads, caregiving

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Hair Cortisol in High- and Low-Stress Mother-Daughter Dyads

The hypothalamic-pituitary adrenocortical (HPA) axis is one of the body's main physiological systems for responding to stress. Perception of a stressor triggers the release of corticotrophin-releasing factor from the hypothalamus, which in turn leads to secretion of adrenocorticotrophic hormone from the pituitary gland, initiating secretion of several hormones from the adrenal glands (Mason, 1968; Miller, Chen, & Zhou, 2007; Selye, 1936). One of the most studied of the HPA end products is cortisol, a glucocorticoid. Following HPA axis activation, cortisol travels throughout the body via the bloodstream to act on a number of body regions, including the gastrointestinal, immune, and cardiovascular systems, ultimately activating the peripheral nervous system to initiate physical changes associated with the fight-or-flight response (Levine, Zagoory-Sharon, Feldman, Lewis, & Weller, 2007). Additionally, cortisol influences a number of brain structures, particularly the prefrontal cortex and the hippocampus, where the density of glucocorticoid receptors is high (Young, 2004). Cortisol also acts on the hypothalamus and the pituitary gland to regulate HPA axis output via negative feedback loops, terminating the stress response after the threat has passed (Levine et al., 2007).

Dysregulated HPA activity has been linked to an array of negative physical and mental health outcomes, including hypertension (Esler et al., 2008), obesity (Wang, 2005), depression (Dowlati et al., 2010; Gerber et al., 2013; Vammen et al., 2013; Young, 2004), generalized anxiety disorder (Staufenbiel, Penninx, Spijker, Elzinga, & van Rossum, 2013; Steudte et al., 2011a), and post-traumatic stress disorder (Steudte et al., 2013; Steudte et al., 2011b). Particularly for mood and anxiety disorders, symptoms have been linked to both HPA hyperactivity (e.g., Bhagwagar, Hafizi, & Cowen, 2005;

Mantella et al., 2008; Nemeroff & Vale, 2005) as well as hypoactivity, or "blunting" (e.g., Hori et al., 2014; Suzuki, Belden, Apitznagal, Dietrich, & Luby, 2013). Typically found in individuals experiencing high levels of chronic stress, this blunting of HPA activity is thought to arise from downregulation of mineral corticoid and glucocorticoid receptors in the brain (Checkley, 1996).

Cortisol can be examined by plasma, urine, and saliva assays (see Levine et al., 2007 and Nicolson, 2007 for reviews). One of the earliest methods of analyzing cortisol levels involved assaying cortisol in blood, which typically requires the presence of a trained medical professional to obtain the blood sample (Levine et al., 2007). Blood plasma may also need special handling before it can be assayed, as it can be particularly biohazardous relative to other tissues (Levine et al., 2007). There are other disadvantages associated with this method, not least of which is its invasiveness. Venipuncture is unpleasant for many participants, which may dissuade some from participating in research in which this procedure is a component. Further, the procedure itself may elicit increases in cortisol (Levine et al., 2007), thus introducing an extraneous influence on assays and complicating interpretation of results. For these reasons, although total plasma cortisol is frequently used in medical settings for diagnostic purposes (Levine et al., 2007), it is less commonly used in behavioural or developmental research. Newer methods of blood sampling avoid these issues by forgoing traditional venipuncture procedures for finger-prick blood spot sampling (Nicolson, 2007). Because little blood is required for each assessment, repeated sampling is more feasible (Nicholson, 2007). Despite these advantages over traditional methods, some shortcomings remain. First, blood spot measures may still require experimenter supervision to ensure use of proper

sampling techniques (Nicholson, 2007). Secondly, they may still be unpleasant,

especially for younger participants, potentially reducing participation rates (Nicholson,

2007). Lastly, neither blood sampling method is a practical tool for assessing HPA

functioning in response to long-term stressors, as they provide point estimates of

responses to acute stressors (Russell, Koren, Rieder, & Van Uum, 2012).

To circumvent some of these issues, cortisol function in developmental research is

most commonly indexed via salivary cortisol (Baum & Grunberg, 1995; Nicholson,

2007); this method has a number of advantages that make it especially appropriate for

such work. First, collection of saliva samples is a relatively noninvasive process

compared to that required for other types of samples (e.g., plasma), making it easier to

elicit participant compliance with collection procedures (Nicolson, 2007). Furthermore,

the collection process itself is simple; participants typically saturate a cotton swab,

sponge or dental roll with saliva, which is stored in a plastic tube and refrigerated or

frozen until ready to be assayed (Nicolson, 2007; Salimetrics, PA, USA). Analysis of

salivary cortisol levels can yield a number of useful metrics of stress response, including

total cortisol output over the course of a day (e.g., Fries, Hesse, Hellhammer, &

Hellhammer, 2005; Gunnar & Vazquez, 2001), diurnal variation in cortisol profiles (e.g.,

Bower et al., 2005; Posener et al., 2000), individual, trait-like differences in basal cortisol

levels (e.g., El-Sheikh, Erath, Buckhalt, Granger, Mize, 2008; Williams et al., 2013),

increases in cortisol levels in response to an immediate stressor (reactivity; e.g.,

Dickerson & Kemeny, 2004), and rates of decline in cortisol levels after exposure to an

acute stressor (recovery; e.g., Hollocks, Howlin, Papadopoulos, Khondoker, & Simonoff,

2014).

Salivary cortisol measures have contributed much to the literature; however, they are not without limitations. First, salivary cortisol levels are influenced by a number of factors such as the time of day at which samples are collected (Staufenbiel et al., 2013), which complicates studies in which responses to laboratory stressors are being assessed, as time-of-day effects must be treated as a covariate. In some research programs, this diurnal variation is of substantive interest as cortisol secretion within the first hour of wakening, when cortisol levels are highest (i.e., the cortisol awakening response; Wüst, Federenko, Hellhammer, & Kirschbaum, 2000), has been linked to an array of negative health outcomes (Clow, Thorn, Evans, & Hucklebridge, 2004). However, the cortisol awakening response is affected by such confounding factors as the day of the week (workdays versus weekends), presence and amount of light in the bedroom, as well as the age and gender of the participant (Clow et al., 2004). Participant noncompliance with the collection procedures used in studies of waking cortisol also appears especially problematic (Smith & Dougherty, 2013). Despite the relative simplicity of its collection procedures, measurement error may be a concern if participants are collecting the samples themselves without strict adherence to timing instructions (Staufenbiel et al., 2013). Finally, and crucially, like cortisol samples derived from blood plasma, salivary cortisol measures in all forms are considered point estimates of HPA activity at a given time, making them less useful for assessing longer-term stress responses (Staufenbiel et al., 2013). As such, alternative methods of cortisol assessment have been called for to better capture chronic stress and its effect on health outcomes (Hammen, 2005).

A newer method of assessing HPA function that may address some of these issues involves assessing cortisol concentrations in hair. This approach has not been widely used

in developmental psychopathology research, despite its potential benefits. Free, unbound cortisol becomes incorporated into hair shafts as they grow outward from the scalp, and these hair cortisol levels are generally regarded as stable for at least the most proximal 6 cm of hair, corresponding to the most recent 6 months (Russell et al., 2012). Thus, by knowing the concentration of cortisol present in a given segment of hair, hair cortisol concentrations (HCC) can retrospectively index cortisol responses to stress over more extended periods of time (Russell et al., 2012), given that hair grows at a rate of approximately 1 cm per month (Wennig, 2000). Further, collection of hair samples is a noninvasive and painless process (Russell et al., 2012). As HCC are thought to offer an objective measure of cortisol output over time, they may provide the best index of cortisol function under conditions of chronic stress.

A number of potential benefits are associated with HCC measures. Perhaps most importantly, depending on the length of hair available for assays, HCC have the unique potential to provide long-term, retrospective biomarkers of physiological responses to chronic stress (Stalder & Kirschbaum, 2012). This may be crucial for those interested in disorders for which chronic stress is an important contributing factor, such as depression (Hammen, 2005). Speaking to this importance, Brown and Rosellini (2011) found that both acute and chronic stress uniquely predicted severity of depressive symptoms in a sample of outpatients; however, only chronic stress was related to symptom improvement at follow-up, and other studies suggest that chronic stress may be a stronger predictor of depressive symptoms than acute stressors (e.g., McGonagle & Kessler, 1990).

Additionally, HCC have the advantage of eliminating problems of situational confounding that can complicate interpretation of salivary cortisol measures (Stalder &

Kirschbaum, 2012). More specifically, because cortisol is gradually incorporated into hair shafts, and because the procedure itself is relatively noninvasive, HCC are unaffected by transient increases in cortisol levels which can occur during sample collection in other methods (Russell et al., 2012). Hair collection procedures are simple enough to be conducted without the aid of medical professionals (Stalder & Kirschbaum, 2012). Lastly, cortisol concentrations in hair samples are stable at room temperature for years, making storage procedures simpler than those required for other HPA measures, such as blood plasma (Russell et al., 2012).

The small extant literature on HCC shows preliminary support for its validity as an index of HPA activity. HCC levels were first validated in a sample of rhesus monkeys exposed to relocation stress (Davenport, Lutz, Tiefenbacher, Novak, & Meyer, 2008), and have since been examined in humans in a number of contexts. For example, in a sample of pregnant women, HCC levels were correlated with salivary cortisol concentrations over the course of pregnancy (D'Anna-Hernandez, Ross, Natvig, & Laudenslager, 2011). Additionally, HCC reliably distinguish healthy controls from patients with Cushing's syndrome, a disorder characterized by hypercortisolemia (Thomson et al., 2010). Consistent with the idea that HCC are a marker of physiological responses to chronic stress, studies have noted relatively greater HCC in adults with chronic pain (Van Uum et al., 2008) long-term unemployment (Dettenborn, Tietze, Bruckner, & Kirschbaum, 2010), and chronic stress related to caregiving (Stalder et al., 2014). However, conflicting findings have also been reported; for example, Gerber et al. (2013) found that HCC were significantly negatively correlated with perceived stress, although group differences in HCC between low- and high-stress participants were not statistically significant.

Unfortunately, only a few studies have examined HCC and measures of psychosocial stress, especially in children. One study reported that children experiencing protracted stress related to school entry had elevated HCC (Groeneveld et al., 2013). Another team assessed the influence of parenting and maternal psychopathology on 1-year-old infants' HCC and socioemotional problems (Palmer et al., 2013). They found that greater parenting stress (reflecting both mothers' stress related to parenting and their use of negative parenting practices), lower maternal depression, and higher child socioemotional problems were all uniquely associated with children's elevated HCC. More recently, Gao and colleagues (2014) found elevated HCC in adult and adolescent earthquake survivors, compared to their respective control groups. Interestingly, in the exposed adult sample, greater HCC were also associated with increases in depressive and anxious symptoms, although this was not observed in the adolescent cohort (Gao et al., 2014).

In light of the potential advantages of HCC, as well as the promising albeit small body of extant research, more work is needed to validate this measure as a biomarker of physiological responses to chronic stress in both children and adults. In particular, whether compliance with hair sampling procedures is a concern with young children is unclear; if compliance is high, yet another benefit to sampling cortisol via hair will be evident, as compliance rates with other measures of cortisol function in children are variable and often lower than desirable (e.g., Blair et al., 2008; Lewis & Ramsay, 2002; Mills, Imm, Walling, & Weiler, 2008; Smith & Dougherty, 2014).

To address these gaps in knowledge, I sought to validate hair cortisol as a marker of psychophysiological stress reactivity by relating HCC to chronic stress, salivary

cortisol levels, internalizing symptoms, and personality, examining these issues in a community sample of young girls and their mothers. First, given associations between stress and cortisol found for other methods of cortisol assessment (e.g., Elzinga et al., 2008; Tsumura & Shimada, 2012) and in past studies of hair cortisol (e.g., Stalder et al., 2012; Vanaelst et al., 2013), I planned to examine differences in HCC in mother-daughter dyads who differed in levels of chronic stress. On this matter, I held no a priori expectations regarding whether HCC levels would be relatively high or low under conditions of high chronic stress, as evidence for both hyper- (e.g., Bhagwagar, Hafizi, & Cowen, 2005; Mantella et al., 2008; Nemeroff & Vale, 2005) and hypocortisolemia (e.g., Hori et al., 2014; Suzuki et al., 2013) in chronic stress have been reported in the literature.

Second, I aimed to relate HCC to previously collected indices of children's salivary cortisol responses to a laboratory stressor. Individuals show significant stability in cortisol levels over time (Shirtcliff et al., 2012). Further, Stalder and colleagues (2012) found that baseline HCC were strongly correlated with HCC collected at a follow-up occurring 1 year later, and structural equation modeling revealed a trait-like component to single hair cortisol measures that explained a large proportion of variance (59 - 82%) in HCC (Stalder et al., 2012). Although salivary and hair cortisol concentrations index different aspects of stress reactivity, research indicates that they are positively correlated with one another in animal studies (Bennett & Hayssen, 2010; Davenport et al., 2006). Thus, I anticipated that girls' cortisol stress reactivity, indexed via saliva, and HCC would be moderately correlated. If so, I planned to explore potential mediators of stability in cortisol levels over time. One plausible mediator of this stability is chronic stress, given

the well-established finding that subjective experiences of stress elicit cortisol release in response to stressors (Miller, Chen, & Zhou, 2007). Further, some research suggests that intraindividual stability in cortisol levels is associated with greater perceived stress (Stalder et al., 2012). I therefore planned to explore two different indices of chronic stress (operationalized as interview ratings of chronic family stress and quality of caregiving) as potential mediators of cortisol stability from age 3 to 7.

I also planned to relate children's HCC to emerging symptoms of psychopathology. Previous work has linked elevated cortisol levels to depression in older children and adolescents (e.g., Goodyer, Herbert, Altham, Pearson, Secher, & Shiers, 1996), whereas associations between cortisol and externalizing symptoms in childhood have tended to be nonsignificant or mixed (Alink, van IJzendoorn, Bakermans-Kranenburg, Mesman, Juffer, & Koot, 2008). Based on this work, I anticipated that children's HCC would be positively correlated with their emerging anxious and depressive symptoms, and unrelated to attention problems.

Regarding mothers' HCC, I planned to examine their associations with two indices of maternal well-being and mental health: internalizing symptoms and personality traits that are known to increase vulnerability to such symptoms. Given recent findings suggesting that cortisol in general (Joyce, Mulder, & Cloninger, 1994) and HCC in particular may be elevated in depressed women, at least during the initial phase of illness (Wei et al., 2015; Wester & van Rossum, 2015), I expected that HCC would be related to mothers' symptoms. I also chose to examine related personality traits that have been found to be associated with internalizing symptoms; because HCC is presumed to index long-term stress responses (Russell et al., 2012), it could be more closely related to

enduring, trait-like tendencies to be stress reactive, especially in nonclinical samples where rates of psychiatric symptoms may be low. Thus, I chose to include measures of behavioral inhibition (BIS) and behavioral activation systems (BAS; Carver & White, 1994) in my analyses. BIS activity refers to the tendency to respond with negative affect, wariness, and/or avoidance in the presence of novel or threatening stimuli (Johnson, Turner, & Iwata, 2003). It has been contrasted with the BAS, which is thought to facilitate experiences of positive affect and approach-related responses in the presence of pleasant stimuli (Carver & White, 1994). Elevated BIS activity in particular has been linked to anxiety and depression in adult samples (Johnson, Turner, & Iwata, 2003). While some have theorized that depression is the result of low BAS activity (e.g., Depue, Krauss, & Spoont, 1987), others have not found evidence to support this claim (Johnson, Turner, & Iwata, 2003). Interestingly, some evidence from animal studies suggests that temperamental tendencies toward approach behaviours are associated with lower HCC (e.g., Laudenslager, Jorgensen, Grzywa, & Fairbanks, 2011), though little is known about these relationships in human populations. Given these findings and those linking chronic stress to anxious and depressive symptoms, I expected HCC to be positively correlated with BIS and negatively or perhaps unrelated to BAS in mothers.

I chose to assess mother-daughter dyads as they provided an opportunity to examine HCC levels at different maturational stages, their associations across generations, and the potential family characteristics that moderate dyadic associations. Recent findings suggest that in close pairs such as a mother and child, stressors experienced by one member may also influence the other member's affect and physiological stress reactivity (Waters, West, & Berry Mendes, 2014). Given that such

close pairs may reciprocally influence each other's stress responses, examination of HCC within close dyads may shed additional light onto the mechanisms underlying HPA regulation.

As well, emerging research is beginning to implicate a number of family characteristics as moderators of intra-family cortisol association strength, including parenting styles. For example, Hibel and colleagues (2009) examined salivary cortisol reactivity in 7-month-olds and their mothers, and reported that intra-dyadic cortisol synchrony was greater in dyads characterized by more restrictive and punitive parenting. Subtler types of negative parenting have also been linked to greater cortisol similarity within close dyads. Williams and colleagues (2013) examined several individual and family factors related to salivary cortisol synchrony in pairs of children (aged between 7 and 12 years) and their mothers. Contrary to their expectations, the presence of an anxiety disorder within dyads did not predict cortisol levels. Interestingly, however, they found that participants were more likely to be influenced by their dyad partner's flattened diurnal slope in the context of lower affective responsiveness, a more covert form of negative parenting (Williams et al., 2013). Yet increased similarity of cortisol levels within dyads have not always been consistently linked to negative parenting practices. In fact, the opposite effect linking more sensitive parenting to greater synchrony of salivary cortisol reactivity has also been reported in a study of 1-year-old infants and their parents (van Bakel & Riksen-Walraven, 2008). Despite the somewhat contradictory nature of the growing literature on intra-family cortisol associations, initial results appear to implicate early caregiving as a particularly important moderator of such associations. Thus, I

evaluated a potential moderator of mother-daughter HCC association strength, early caregiving, in dyads with high or low maternal chronic stress.

Additionally, some have postulated that individual stress responses may be influenced by the presence of others' negative affect in the context of close dyads (Waters, West, & Berry Mendes, 2014). Indeed, some initial work supports this idea. For example, Papp, Pendry, and Adam (2009) found that salivary cortisol profiles in mother-adolescent dyads became more similar with increasing displays of negative affect from either dyad member. However, this finding has not been consistently supported in the literature; notably, Williams and colleagues (2013) failed to find any difference in cortisol association strength in anxious dyads compared to non-anxious ones. Given the paucity of research in this area, more work is needed to clarify this issue. Thus, I also evaluated child internalizing symptoms as a potential moderator of mother-daughter HCC associations in the present sample. I focused on girls' symptoms given the increasing evidence implicating child-to-parent influences in child-parent relationships (Reitz, Dekovic, & Meijer, 2006). To my knowledge, this is the first study of HCC synchrony in mother-daughter dyads.

Methods

Data collection

Data for this project were collected in three waves: a baseline assessment, a follow-up at which a life stress interview was collected from mothers (these data provided the basis for study recruitment), and the final wave at which hair samples were collected (See Figure 1). Demographic, caregiving, and child salivary cortisol reactivity data were obtained at baseline. At a follow-up occurring an average of 4 years after

baseline, participating dyads were visited in the home by a trained experimenter who obtained the hair samples and administered a questionnaire package to mothers. Hair samples were taken to the laboratory to be analyzed (described in a subsequent section). Shortly after the home visit, mothers completed a one-page survey reporting basic health and lifestyle information for themselves and their daughter, which has been used in previous hair cortisol research (Henley et al., 2013; Appendix A). These factors are known to influence HCC in women and children and include pregnancy, hair-washing frequency, hair dying or bleaching, height, weight, smoking, alcohol consumption, current medical conditions, and current medications (Gow, Thomson, Rieder, Van Uum, & Koren, 2010).

Age 3	Age 5	Age 7
Parenting (Lab Visit; Home Visit; PDSQ)	Chronic family stress (UCLA Life Stress Interviews)	Hair cortisol
Parent personality (BIS/BAS scales)		Mothers' symptoms (IDD; BAI)
Child salivary cortisol reactivity (AUC_G)		Child symptoms (CBCL)
		Health and lifestyle factors questionnaire
Time 1	Time 2	Time 3

Figure 1. Timeline of data collection. PDSQ = Parenting Styles and Dimensions Questionnaire. BIS/BAS = Behavioral Inhibition System / Behavioral Activation System. AUC_G = Area under the curve with respect to ground. IDD = Inventory to Diagnose Depression. BAI = Beck Anxiety Inventory. CBCL = Child Behavior Checklist.

Participants

Participants were 60 mother- (M_{age} = 37.87 years, SD = 4.14 years) daughter (M_{age} = 7.62 years, SD = 0.66 years) dyads from southwestern Ontario recruited from a larger longitudinal, multi-wave study of children's emotional development that began when children were three-year-olds (e.g., Kryski, Smith, Sheikh, Singh, & Hayden, 2011). Seventy-four dyads were selected based on mothers' levels of chronic stress at a follow-up assessment (described in a later section entitled "Age 5 Follow-up") that occurred when children were approximately 5 years old. Recruitment for the hair cortisol component of the study was restricted to families in which the mother was listed as the primary caregiver and in which the target child was female to maximize the probability that ample hair lengths would be available for sampling. As the following are known to influence assay results (e.g., Thomson et al., 2010), dyads were deemed ineligible for participation based on initial screening if either the mother or daughter a) used steroid-based medications, b) was diagnosed with a major systemic disease, c) was diagnosed with a disease related to hypocortisolemia (adrenal insufficiency) or hypercortisolemia (Cushing's syndrome). Both dyad members also needed to have hair longer than 14 cm in length. Given these criteria, 67 were eligible to participate out of the 74 dyads contacted for participation. Four eligible dyads declined to participate due to scheduling concerns (two dyads), apprehension regarding cortisol analysis in general (one dyad), and apprehension regarding hair sampling (one dyad). Of the remaining 63 dyads, two were unable to reschedule home visits, preventing collection of their hair samples. An additional dyad recruited for participation was excluded from analyses as both mother and daughter provided hair samples that were in dreadlocks, which cannot be accurately

assayed, leaving a final sample of 60. An equal number of dyads from the high- ($n = 30$)

and low-stress ($n = 30$) groups participated. Mothers and daughters provided informed

consent and assent, respectively, during the home visit. Families were compensated

$50.00 for their participation.

Baseline Assessment

As mentioned previously, participants were part of a larger, longitudinal study

comprised of 409 families, which began when children were 3 years of age. At this first

time point, measures of parenting and child stress reactivity were obtained. Briefly,

children and their primary caregivers participated in various tasks designed to elicit

parent-child interactions during laboratory and home visits.   Parents also provided self-

reports of their personality and parenting styles (described below).

Parenting. At baseline, parenting was assessed with self-ratings and observed

ratings of parenting style. During a laboratory visit, dyads completed a parent-child

interaction task in the laboratory based on the Teaching Tasks battery (Egeland et al.,

1995), and required the caregiver and child to work together to solve a puzzle. Dyads

were instructed to use the puzzle blocks to reproduce images on a set of cards provided.

Approximately two weeks later ($M = 15.85$ days, $SD = 8.83$ days) during a home visit,

parent-child dyads completed two tasks including a three-bag task, developed from a

protocol created by the National Institute of Child Health and Human Development

(1997) and later modified by Ispa and colleagues (2004). Parents and children were

instructed to play together with three bags of toys, containing a book, toy kitchen tools,

and a toy farmhouse. Dyads were instructed to play with the toys for approximately 10

minutes. The second task, referred to as the prohibition task, was designed to elicit

negative parenting behaviours. Parents and children were presented with two boxes of

toys, one containing several appealing toys (e.g., a toy electronic guitar), and the other

containing uninteresting and age-inappropriate toys (e.g., toys missing pieces or

batteries). Parents were instructed to prevent their child from playing with the appealing

toys and to encourage play with the uninteresting toys for 3 minutes. Following this,

caregivers were instructed to allow their child to play with toys in either bin for 6

minutes. Parents then told the child to clean up the toys for 5 minutes.

Trained graduate and undergraduate students coded video-recordings of the three

parenting tasks using a manual based on the Teaching Tasks coding manual (Weinfield,

Egeland, & Ogawa, 1998) and the Qualitative Ratings for Parent-Child Interactions scale

(Cox & Crnic, 2003; see Appendix B). Raters were trained to an intraclass correlation

of .80 with a master coder at the graduate level, after which point reliability checks were

conducted on 15% of all recordings. Parenting tasks were coded on a total of 9 Likert

scales: sensitivity, detachment, supportive presence, intrusiveness, hostility, confidence,

quality of instruction (only coded for the teaching task), positive affect, and negative

affect. Interrater reliability for each task was high (three bag ICC = .86, N = 51;

prohibition ICC = .87, N = 57; teaching task ICC = .90, N = 24).

Self- and informant-reported parenting. Mothers self-reported their parenting

styles on the abbreviated, 32-item Parenting Styles and Dimensions Questionnaire

(PSDQ; Robinson, Mandelco, Olsen, & Hart, 1995; see Appendix C), rating the

frequency with which they employed certain parenting strategies on a 5-point Likert scale

ranging from 1 (*never*) to 5 (*always*). The PSDQ yields scores for the following 3

dimensions of parenting: authoritative, authoritarian, and permissive, which are further

divided into 7 subscales: Connection, Regulation, Autonomy Granting, Physical Coercion, Verbal Hostility, Non-reasoning Punitive, and Indulgence. Informant reports on the PDSQ were also obtained ($N = 369$) from an individual who lived with the mother during the child's lifetime, usually the child's father ($N = 357$, 96.7%). In the present sample, the PSDQ scales had moderate to good internal consistency (αs = .74 - .92 for informant reports, .68-.87 for self-reports).

Data reduction. An aggregate measure of parenting quality was created by standardizing and combining relevant parenting scales. Two scales were created to reflect positive and negative parenting styles. The positive parenting scale ($\alpha = .82$) was comprised of sensitivity, supportive presence, confidence, and positive affect from the three bag, prohibition, and puzzle tasks, quality of instruction from the teaching task, and the connection, autonomy, and regulation subscales from the self- and informant-reports on the PSDQ. The negative parenting scale ($\alpha = .78$) was comprised of detachment, hostility, intrusiveness, and negative affect from the three bag, prohibition, and puzzle tasks; and the verbal hostility, physical coercion, non-reasoning/punitive, and indulgence subscales from the self and informant reports on the PSDQ. Due to the strong negative correlation between the negative and positive parenting scales ($r = -.70$, $p < .001$), these factors were combined to make a single parenting dimension. Positive parenting scores were reverse-coded and added to negative parenting scores to produce a new aggregate variable, referred to as "poor parenting."

Salivary Cortisol Reactivity to Stress. Children's cortisol reactivity to stress was assessed as previously described by Kryski and colleagues (2011), using a developmentally appropriate task that incorporated aspects of uncontrollable failure and

social evaluation. In brief, during a home visit occurring between 12:00 pm and 3:30pm (to control for diurnal variation in cortisol levels), children participated in a stress task in which they were asked to match chips of a specific color to animal icons displayed on a board. Children were instructed to match all of the stickers with the correct animals before time ran out, as indicated by a toy traffic stoplight, in order to receive a small prize. Prior to beginning the task, an experimenter explained the activity to the child, noting that the task was easy and that even "little kids" could finish in time (Kryski et al., 2011). While the children worked to complete the task, the experimenter surreptitiously controlled the traffic light to ensure that it turned red before the child could finish. Saliva samples were collected at baseline (following 30 minutes of quiet play, prior to the stress task) and at 10, 20, 30, 40, and 50 minutes post-stressor. Baseline samples were collected following 30 minutes of quiet play to allow any cortisol increases due to the arrival of study personnel to decrease prior to initial sampling. The quiet playtime also served to encourage minimal activity, as physical activity influences cortisol levels (Wellhoener, Born, Fehm, & Dodt, 2004). Samples were assayed in duplicate for cortisol using a high sensitivity salivary cortisol enzyme-linked immunoassay (ELISA) kit (Salimetrics, PA, USA).

In support of the validity of this task, children showed an increase in negative affectivity during the stress task and the expected pattern of cortisol activity during the stress and recovery phases (i.e., an increase followed by a decrease; Kryski et al., 2011). For each child, measures of total cortisol output with respect to ground (AUC_G) were calculated based on log-transformed cortisol data (Fekedulegn et al., 2007). AUC_G reflects total cortisol levels expressed across the period of assessment (Levine et al.,

2007) and is believed to be an integrated measure of total cortisol output over time

(Stalder & Kirschbaum, 2012). Because AUC_G and HCC are both integrated measures of

cortisol output (i.e., they reflect both basal cortisol levels and cortisol output in response

to stress), they are conceptually similar to one another. I therefore chose to use AUC_G as

my salivary cortisol measure for all subsequent analyses to increase interpretability of

any comparisons made between it and my other cortisol measure, HCC.

Parent personality. Mothers completed the BIS/BAS Scales (Carver & White,

1994; Appendix D) to assess personality dimensions of behavioural inhibition (BIS) and

behavioural activation (BAS). This 24-item survey assesses an individual's sensitivity to

aversive stimuli (corresponding to BIS) and to appetitive stimuli (corresponding to BAS),

which have been implicated in anxiety and depression vulnerability, respectively

(Johnson et al., 2003). Mothers rated their agreement with statements on a scale from 1

to 4, where 1 = *very true for me*, 2 = *somewhat true for me*, 3 = *somewhat false for me,*

and 4 = *very false for me*. The scale produces separate scores for BIS and BAS, with

higher scores reflecting greater avoidance or approach motivation, respectively. In the

current sample, both the BIS (α = .80) and BAS (α = .82) subscales had adequate internal

consistency.

Age 5 Follow-up

UCLA Life Stress Interview. UCLA Life Stress Interviews occurred over the

phone, approximately 2.5 years after the baseline assessment (M = 2.46 years, SD = 0.59

years), and were the basis for study eligibility as described in the next paragraph. The

UCLA Life Stress Interview (Adrian & Hammen, 1993) is a semi-structured interview

assessing acute and chronic stressors occurring over the past 6 months. Interviewers

(graduate students in a doctoral-level clinical psychology program) assessed mothers' chronic stress over the previous 6 months in eight domains: quality of intimate relationship, close friendships, relationships with children, social life, finances, work, health of self, and health of family members. For each of the domains, the interviewer probed for specific information relating to relevant ongoing difficulties, and rated the degree of stress/difficulties related to the domain on a 5-point scale. Scales were anchored with specific domain-relevant behaviours, such that 1 represented superior circumstances/low chronic stress, and 5 represented extremely poor circumstances/high chronic stress. Total chronic stress ratings were created by summing all individual domain ratings. The UCLA life stress interview has been used widely in studies of stress (Adrian & Hammen, 1993; Hammen, 2003; Kim, Miklowitz, Biuckians, & Mullen, 2007). Interrater reliability for the current sample was generally good for the chronic stress domain ratings (mean ICC = .83; range: .57- .93; N = 13).

Total chronic stress ratings were used to identify high- and low-stress mothers for further participation in the current study. Families were ranked in terms of primary caregivers' total chronic stress, and participating families were recruited from the highest and lowest octiles to represent high and low chronic stress groups. In total, 51 families in the low-stress octile and 70 families in the high-stress octile were eligible to be contacted for study participation, having both a girl who was the study participant and a primary caregiver who was the mother. From these families, the sample of 60 was recruited as described at the beginning of the "Method" section.

Age 7 Follow-Up and Hair Cortisol Collection

This follow-up occurred 5 years ($M = 5.04$ years, $SD = 0.61$ years) from the baseline assessment and approximately 1.5 years ($M = 1.56$ years, $SD = 0.59$ years) from the chronic stress assessment. Mothers completed a set of questionnaires to assess their own symptoms and those of their daughters, concurrent to the hair cortisol collection.

Inventory to Diagnose Depression. The Inventory to Diagnose Depression (IDD; Zimmerman & Coryell, 1987; Appendix E) is a self-report scale of depressive symptoms, based on DSM-III criteria for a major depressive episode. Mothers respond to the 22 items on a 5-point scale with scores ranging from 0 to 4, indicating none/low to increasingly severe levels of symptom severity. The IDD has demonstrated good validity and reliability (Goldston, O'Hara, & Schartz, 1990; Hodgins, Dufour, & Armstrong, 2000). Internal consistency in the current sample was good (Cronbach's $\alpha = .93$).

Beck Anxiety Inventory. The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) is a 21-item self-report measure of symptoms of anxiety. Respondents rate the degree to which they were affected by both psychological and physical symptoms over the past week, on a scale from 0 (*Not at all*) to 3 (*Severely – I could barely stand it*). Total scores therefore range from 0 to 63, with higher scores indicating greater severity of symptoms. The BAI has been shown to have high internal consistency (Cronbach's $\alpha = .93$ in the current sample) and adequate test-retest reliability ($r(81) = .75$; Beck et al., 1988).

Child Behavior Checklist 6-18. The 6- to 18-year-old version of the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) was used to assess emotional and behavioural problems in participating daughters. The CBCL consists of 113 items

describing child behaviours related to internalizing and externalizing problems. Mothers rated the degree to which the statements typified their daughters on a scale from 0 to 2, where 0 = *Not True (as far as you know),* 1 = *Somewhat or Sometimes True*, and 2 = *Very True or Often True*. The CBCL produces scores on eight subscales corresponding to somatic complaints, withdrawn/depressed symptoms, anxious/depressed symptoms, social problems, thought problems, attention problems, rule-breaking behaviour, and aggressive behaviour. For the purposes of the current study, the anxious/depressed subscale was used to examine internalizing symptoms, and the attention problems subscale was used to examine whether HCC were associated with children's externalizing symptoms, although such associations were not necessarily expected to exist (Alink et al., 2008). The CBCL has good internal consistency, with Cronbach's α = .80 for the anxious/depressed subscale and α = .81 for the attention problems subscale in the current sample.

Hair Sampling. Both members of dyads provided hair samples during a home visit occurring 5 years (*M* = 5.04 years, *SD* = 0.61 years) from the baseline assessment. An experimenter separated hair from the posterior vertex region of the participant's head into an approximately 1 cm square section, and cut it as close to the scalp as possible. The posterior vertex was chosen for its low proportion of hairs in the telogen growth phase and because hairs in this area tend to grow at the same rate (Pragst, & Balikova, 2006; Villain, Cirimele, & Kintz, 2004). Hair samples were successfully collected from all mother and child participants, and no child distress was observed in the collection the samples from participants. Samples were stored in an envelope in the dark at room temperature until assayed (Henley et al., 2013).

Quantification of Hair Cortisol. The details of the hair cortisol analysis procedures have been described elsewhere (Henley et al., 2013). The most proximal 3 cm portion of hair was severed from the sample and placed in a glass vial. This smaller sample was then washed 3 times with isopropyl alcohol to remove external contaminants. After the sample had dried (at least 5 hours later), hair was finely minced in 1 mL of HPLC grade methanol. Sealed vials were incubated for 16 hours at 50˚C and 100 RPM. Following incubation, vials cooled to room temperature and the methanol solution was transferred to test tubes. Tubes were heated to 50˚C under a stream of nitrogen gas to evaporate the methanol. Next, 250 µL of phosphate-buffered saline solution (pH 8.0) were added to the samples and vortexed.

Cortisol quantification was then conducted using the ELISA salivary cortisol kit according to the manufacturer's instructions (Alpco Diagnostics, Salem, NH), with the exception that the assay was shaken at 100 RPM instead of 200 RPM. Assays were completed on flat-bottomed antibody coated 96-well plates. Absorption was set at 450 nm and read on a Vmax plate reader (Molecular Devices, Sunnyvale CA). The ELISA kit's limit of detection is 1.14 ng/mL (Alpco Diagnostics, Salem, NH). These interpolated concentrations were then corrected to the mass of hair analyzed. As is typical for cortisol data, raw HCC were not normally distributed. Raw scores were Log10-transformed to reduce skewness and kurtosis, and these log-transformed scores were used in all subsequent analyses.

Data Analysis

Independent sample t-tests were used to compare HCC and major demographic and lifestyle factors between high- and low-stress groups. Bivariate correlations were used to examine intra-dyadic associations in HCC in both stress groups.

Multiple regression was used to test whether mothers' early caregiving and daughters' symptoms moderated the strength of HCC associations within dyads using standard procedures for testing interaction in multiple regression (Aiken & West, 1991). Predictor variables were mean-centered prior to running the regression. First, maternal HCC and poor parenting were included as predictors of child HCC. Following this step, the product of maternal HCC and poor parenting was added to the model to test their interaction. For these analyses, the high- and low-stress dyads were combined to increase power after verifying that there was no significant three-way interaction between stress group, mother HCC, and parenting, and that the overall pattern of effects did not change when group was treated as a covariate ($ps > .150$).

Finally, I planned to test the mediating roles of early caregiving and chronic family stress on the stability of children's cortisol levels over time using Preacher and Hayes' (2008) INDIRECT macro for SPSS. Briefly, the 'c' pathway, in which the criterion (Y) is regressed onto the predictor (X), is first tested using simple regression. Next, the 'a' pathway (in which the mediator, M, is regressed on X) is tested, followed by the 'b' pathway (Y is regressed on M). Finally, assuming that all three of these pathways are significant, the full model (in which both X and M are included as predictors of Y) is then tested. Mediation is evident when the effect of M on Y remains significant after controlling for the effect of X on Y in the full model.

Results

Demographics and Life Style Factors

See Table 1 for a comparison of demographic and lifestyle factors by stress group.

Overall, most participants were Caucasian, which is consistent with population

demographics of the region of Ontario from which families were recruited. Compared to

the low-stress mothers, high-stress mothers reported significantly lower household

incomes, educational attainment, and hair washing frequency, as well as significantly

greater weight. There were no significant differences between the high- and low-stress

groups in terms of maternal age and overall parenting quality. Compared to low-stress

children, high-stress girls had significantly greater symptoms of anxiety/depression and

attention problems on the CBCL (described below). There were no significant group

differences in terms of girls' age, PPVT scores (a proxy for IQ), weight, or hair washing

frequency.

Table 1

Comparisons of Family Demographic Variables, Mother, and Child Characteristics in Low- and High-Stress Groups

	Low-Stress Group		High-Stress Group		Group Comparisons		
	M (*SD*)/ Frequency	n	M (SD)/ Frequency	n	t	χ^2	p
Maternal HCC (ng/g)	2.13 (0.41)	30	1.90 (0.43)	30	2.16	-	.035*
Child HCC (ng/g)	1.55 (0.48)	30	1.63 (0.54)	30	-0.64	-	.525
Race	28 white 2 other	30	27 white 3 other	30	-	0.22	>.999
Family Income	1.62 (.73)	29	3.15 (1.16)	30	-5.95	-	< .001***
Mother's Education	2 HS/GED 8 college 11 bachelors 7 masters 2 doctoral	30	3 HS/GED 18 college 8 bachelors 1 masters 0 doctoral	30	-	11.02	.026*

Maternal Age (years)	38.19 (3.18)	30	37.54 (5.16)	30	0.77	-	.446
Maternal Depressive Symptoms (IDD)	7.75 (7.21)	28	12.90 (14.26)	30	-1.72	-	.092
Maternal Anxious Symptoms (BAI)	3.86 (4.39)	28	6.43 (9.73)	30	-1.28	-	.204
Poor Parenting	-.211 (.89)	30	-.059 (.89)	30	-0.67	-	.504
Maternal Hair Wash Frequency (per week)	5.17 (1.87)	29	4.07 (1.64)	30	2.42	-	.019*
Maternal Weight (lbs)	153.75 (38.92)	29	180.30 (52.53)	30	-2.21	-	.031*
Child Age (years)	7.49 (0.66)	30	7.74 (0.67)	30	-1.44	-	.155
Child IQ (PPVT)	114.21 (12.07)	29	112.27 (14.33)	30	0.56	-	.577
Child Internalizing Symptoms (CBCL)	1.93 (2.34)	28	3.70 (3.59)	30	-2.21	-	.031*
Child Attention Problems (CBCL)	1.71 (2.43)	28	3.33 (3.33)	30	2.52	-	.040*
Child Hair Wash Frequency (per week)	3.36 (1.68)	29	2.87 (1.33)	30	1.26	-	.214
Child Weight (lbs)	51.62 (7.70)	29	54.36 (9.88)	30	-1.19	-	.241

Note. Log-transformed HCC values are presented here. Family Income scores were based on primary caregivers' ratings of total yearly household incomes, on a scale from 1 to 5, where 1 = < $20,000; 2 = $20,000 – $40,000; 3 = $40,001 - $70,000; 4 = $70,001 – $100,000; 5 = > $100,000. Scores were then reverse coded such that higher scores reflect a lower income. IDD = Inventory to Diagnose Depression. BAI = Beck Anxiety Inventory. PPVT = Peabody Picture Vocabulary Test. CBCL = Child Behavior Checklist.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Comparisons by Stress Group

Mean cortisol values were compared between the mothers and daughters in the high- and low-stress groups. Mothers in the high-stress group had significantly lower log-transformed HCC than did those in the low-stress group, $t (28) = 2.16$, $p = .035$, an effect of moderate size (Cohen's $d = 0.57$; see Table 1). Consistent with previous findings (Gerber et al., 2013; Hori et al., 2014; Suzuki et al., 2013), this indicates that cortisol responses were attenuated in the high chronic stress group. Differences in daughters' HCC between the low- and high-stress groups did not reach significance, $t (28) = - 0.64$, $p = .525$, $d = 0.17$ (See Table 1 for log-transformed HCC data). However, post-hoc

analyses conducted using G*Power3 revealed that I was underpowered to detect group differences in HCC for both mothers ($1-\beta^{1}$ = .58) and daughters ($1-\beta$ = .10). Given the modest effect size observed for group differences in girls' HCC, a total of 1090 girls would have been required to obtain statistical power at the recommended .80 level (Cohen, 1988).

Associations between Mothers' and Daughters' HCC

Bivariate correlations for all major study variables are provided in Table 2 for maternal HCC, and in Table 3 for children's HCC. Because the sample was based on two groups selected for extreme scores on chronic stress, separate correlations are provided for the high- and low-stress groups, although overall correlations for the groups combined are reported in some cases as noted. Although mothers' HCC were not significantly related to either symptoms of anxiety or depression, BIS was significantly and positively correlated with maternal HCC, albeit in the high-stress group only. Although not a focus of the current study, unexpectedly, BAS and anxious symptoms were moderately positively correlated with one another in the low-stress group. Regarding correlations between children's HCC and other variables, correlations with AUC_G were of small to moderate magnitude and in the expected direction for both groups, albeit nonsignificant when considering groups separately; this correlation for the groups combined was fully significant (r = .30, p = .021). Anxious/depressed symptoms were not significantly associated with children's HCC; however, this may be because some internalizing symptoms (e.g., most depressive symptoms) are rare in community samples of children this age (Tandon, Cardeli, & Luby, 2009). Ratings of attention problems were also unrelated to children's HCC, as expected.

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[1] Note: β here represents the type II error rate; thus, 1-β is the statistical power to detect an effect.

Table 2

Bivariate Correlations of Maternal Hair Cortisol Concentrations (HCC) and Indices of Depression, Anxiety, and Personality in Low- and High-Stress Groups

		1	2	3	4	5
1. Maternal HCC	*r*	1	.16	.26	.46*	-.11
	p		.389	.162	.011	.562
	N	30	30	30	30	30
2. IDD	*r*	-.18	1	.82***	.32	-.23
	p	.358		<.001	.082	.232
	N	28	28	30	30	30
3. BAI	*r*	.11	.70***	1	.32	-.14
	p	.571	<.001		.086	.456
	N	28	28	28	30	30
4. BIS	*r*	.08	.39*	.36	1	.07
	p	.675	.041	.062		.721
	N	30	28	28	30	30
5. BAS	*r*	.34	.14	.41*	.19	1
	p	.070	.470	.032	.316	
	N	30	28	28	30	30

Note. Correlations for low-stress mothers are displayed in the lower left half of the matrix; those for high-stress mothers are in the upper right half. BAI = Beck Anxiety Inventory. IDD = Inventory to Diagnose Depression. BIS = Behavioural Inhibition System. BAS = Behavioural Activation System.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3

Bivariate Correlations of Daughters' Hair Cortisol Concentrations (HCC), Salivary Cortisol, and Symptoms in Low- and High-Stress Groups

		1	2	3	4
1. Children's HCC (Age 7)	*r*	1	.30	-.14	-.27
	p		.105	.477	.158
	N	30	30	30	30
2. Children's AUC$_G$ (Age 3)	*r*	.27	1	-.10	-.29
	p	.143		.582	.123
	N	30	30	30	30
3. Anxious/Depressed Symptoms (CBCL)	*r*	-.07	.04	1	.71***
	p	.725	.834		<.001
	N	28	28	28	30
4. Attention Problems (CBCL)	*r*	.01	.28	.68***	1
	p	.980	.143	<.001	
	N	28	28	28	28

Note. Correlations for low-stress daughters are displayed in the lower left half of the matrix; those for high-stress daughters are in the upper right half. AUC$_G$ measures were taken during a social evaluative stressor task at age 3. Symptom measures were taken from the Child Behavior Checklist (CBCL) for ages 6-18.

*** $p < .001$.

When analyzed separately, correlations between mothers' and daughters' HCC reached significance for the high-stress dyads (r (28) = .49, p = .007), but not the low-stress dyads (r (28) = .25, p = .192), although small sample sizes limited power to detect effects of moderate size such as these. When the two groups were combined, maternal and child HCC were significantly positively related overall (r (58) = .34, p = .009).

Moderators of Mother-Daughter HCC Associations

      Caregiving. Based on previous research suggesting that parenting styles may moderate intra-family associations in salivary cortisol levels (Hibel et al., 2009; Williams et al., 2013), I examined poor parenting as a moderator of mother-daughter HCC association strength using multiple regression (Aiken & West, 1991). I expected poor parenting to moderate the strength of mother-daughter HCC associations such that dyads characterized by poorer quality parenting would have stronger HCC correlations. Results of the multiple regression analyses showed that both maternal HCC and poor parenting significantly predicted children's HCC in the full model; however, these main effects were qualified by a significant interaction between the two (See Table 4). As hypothesized, and consistent with previous work using salivary indices of cortisol reactivity (Hibel et al., 2009; Williams et al., 2013), HCC associations became stronger as parenting quality became poorer (See Figure 2). Further, this effect appeared strongest at higher levels of maternal HCC; when maternal HCC was low, girls with low, moderate, and high poor parenting appeared comparably low in HCC. At higher levels of maternal HCC, girls' HCC appeared to diverge based on the degree of poor caregiving present.

Table 4

Daughters' Hair Cortisol Concentrations (HCC) predicted by maternal HCC, poor parenting, and their interaction.

Model Predictors	R	(df)F	p	ΔR^2	p	β	t	p
	.49	(3,56) 5.97	.001**	.13	.003**			
Maternal HCC						0.55	4.06	<.001***
Poor Parenting						-2.03	-2.98	.004**
Interaction						2.14	3.08	.003**

Note. * p < .05; ** p <.01; *** p < .001.

Figure 2. Moderation of the association of mother-daughter hair cortisol concentrations (HCC) by Poor Parenting. Low and high poor parenting groups depicted here represent those who were 1 *SD* below and above the mean poor parenting group, respectively.
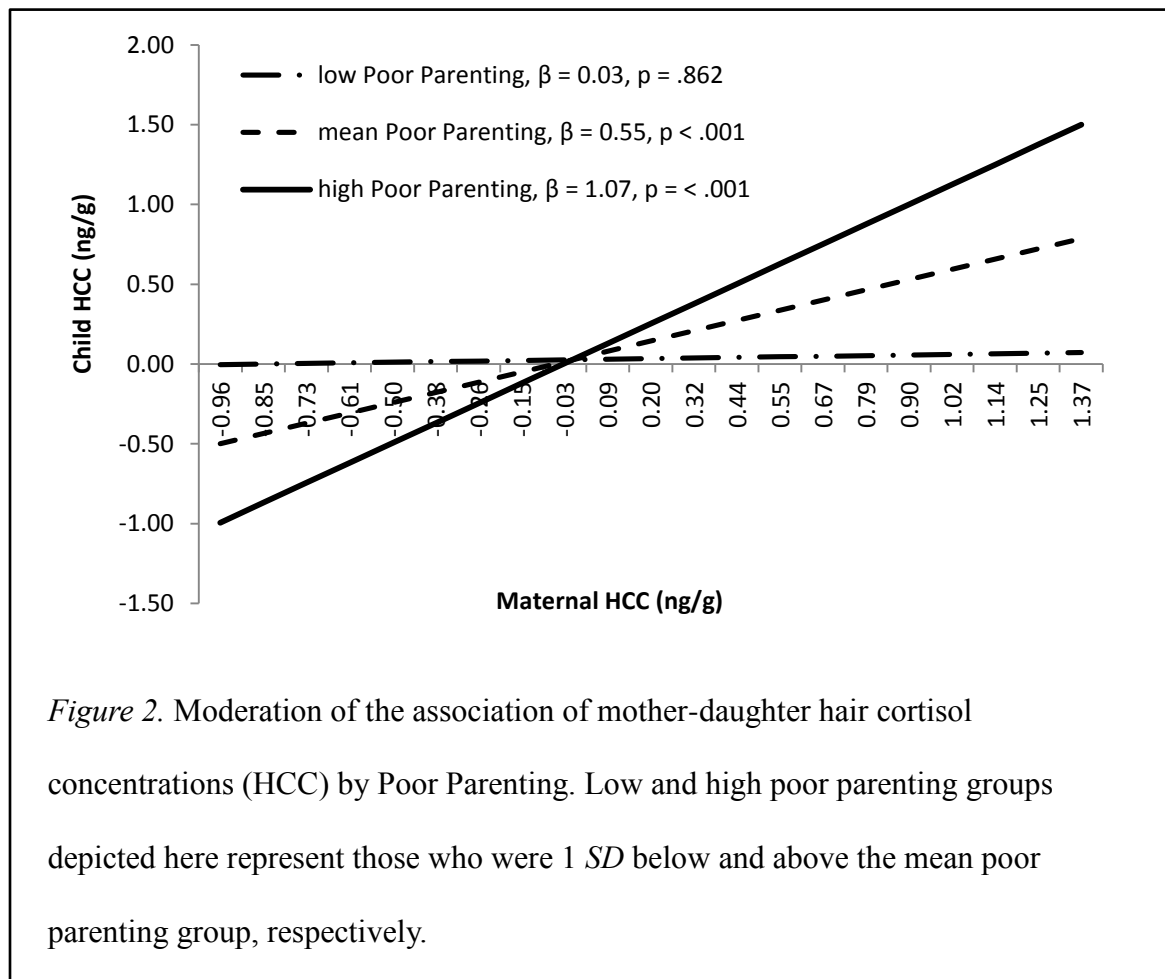
Daughters' Internalizing Symptoms. Previous work suggests that the presence of internalizing symptoms displayed by either member of a close dyad may moderate intra-family associations in salivary cortisol levels (e.g., Williams et al., 2013). Therefore, I also examined children's depressed/withdrawn symptoms on the CBCL as a potential moderator of mother-daughter HCC association strength, following the same general data analysis plan used for the previous moderation analysis (described above). Again, there was no significant three-way interaction between stress group, maternal HCC, and symptoms, and the overall pattern of effects did not change when group was treated as a covariate (ps > .150); thus, stress groups were combined for the moderation analyses. I expected children's internalizing symptoms to moderate the strength of mother-daughter HCC associations such that dyads with greater severity of symptoms would have stronger HCC correlations. Results showed that only maternal HCC individually significantly predicted children's HCC in the full model; child symptoms did not significantly predict child HCC. However, the main effect of maternal HCC predicting child HCC was qualified by a significant interaction between child symptoms and maternal HCC (See Table 5). Consistent with my hypothesis and with previous work using salivary indices of cortisol reactivity (Williams et al., 2013), HCC associations became stronger as children's internalizing symptoms became more severe (See Figure 3). Showing a similar pattern to that found for moderation by poor parenting, the effect of daughters' internalizing symptoms appeared strongest at moderate and high levels of maternal HCC. When maternal HCC was low, girls with low, moderate, and high symptom severity showed similarly low HCC, whereas at high maternal HCC, girls' HCC appeared to diverge based on the severity of daughters' symptoms.

Table 5

*Daughters' Hair Cortisol Concentrations (HCC) predicted by maternal HCC, daughters'
internalizing symptoms, and their interaction.*

Model Predictors	R	$(df)F$	p	ΔR^2	p	B	t	p
	.44	(3,54) 5.97	.007**	.13	.003**			
Maternal HCC						0.51	25.55	<.001***
Child Sxs						0.02	0.46	.651
Interaction						0.31	2.15	.036*

Note. Sxs = symptoms. * $p < .05$; ** $p < .01$; *** $p < .001$.
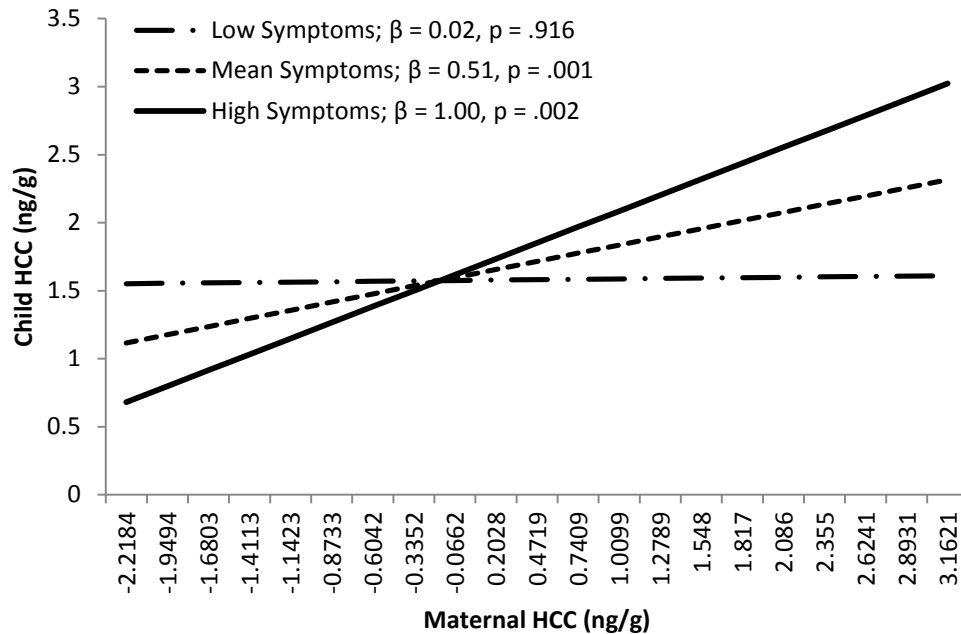
Figure 3. Moderation of the association of mother-daughter hair cortisol concentrations

(HCC) by daughters' internalizing symptoms. Low and high symptoms groups depicted

here represent those who were 1 *SD* below and above the mean poor parenting group,

respectively, with respect to the depressed/withdrawn symptom subscale of the CBCL.

Mediators of Stability of Children's Cortisol

Based on previous work suggesting that subjective experiences of chronic stress (Stalder et al., 2012) and negative caregiving (Hankin, 2012) contribute to the stability of cortisol output over time, I planned to test whether similarity between children's age 3 salivary cortisol and their age 7 hair cortisol levels was mediated by their exposure to a) chronic family stress, or b) poor parenting. To evaluate whether relationships between study variables supported tests of mediation, bivariate correlations for the high- and low-stress groups combined are presented in Table 6.

Table 6

Bivariate Correlations of Daughters' Hair Cortisol Concentrations (HCC), Salivary Cortisol, Chronic Family Stress, and Poor Parenting, Collapsed across Stress-Group.

		1	2	3	4
1. Children's HCC (Age 7)	*r*	1			
	p				
	N	60			
2. Children's AUC$_G$ (Age 3)	*r*	.30*	1		
	p	.021			
	N	60	60		
3. Chronic Family Stress (UCLA)	*r*	-.02	.26†	1	
	p	.908	.050		
	N	59	59		
4. Poor Parenting Composite	*r*	-.01	.34**	.39**	1
	p	.950	.009	.002	
	N	60	60	59	60

Notes. AUC$_G$ = area under the curve with respect to ground. AUC$_G$ measures were taken during a social evaluative stressor task at age 3. Chronic Family Stress ratings were obtained from the UCLA Life Stress Interview.
* $p < .050$; **$p < .010$; † = trend level significance.

Chronic Stress. In the first proposed model testing the mediating role of chronic stress, children's HCC at age 7 was the criterion variable, while their salivary cortisol levels (AUC_g) at age 3 served as the focal predictor. Following protocols outlined by Baron and Kenny (1986), I first examined the associations between the three variables. As expected, the focal predictor, AUC_G, and the criterion, HCC, were moderately correlated with one another (see Table 6). Unexpectedly, however, the association between the proposed mediator, chronic stress, and the criterion was nonsignificant (Table 6); thus, I did not continue with mediation analyses for this model.

Caregiving. The second proposed model tested whether exposure to poor parenting mediated the stability in children's cortisol from age 3 (AUC_g) to age 7 (HCC). As mentioned above, the association between the focal predictor and criterion was significant and in the expected direction (Table 6). However, similar to what was observed in the first model, the proposed mediator (poor parenting) was unrelated to the criterion (Table 6); thus, I did not continue further with these mediation analyses.

Discussion

Several methods exist for assessing cortisol markers of HPA axis function. While studies using blood plasma, urinary, and salivary cortisol measures have provided a wealth of valuable information, such indices are ill-equipped to answer questions pertaining to cortisol in the context of chronic stress, an important consideration for developmental researchers interested in emerging depression risk. This limitation, as well as challenges related to sample collection and storage, has spurred recent interest in an emerging index of HPA output: HCC. Few studies have examined the validity of HCC as

a measure of cortisol responses to chronic stress, particularly in children, and its potential utility in developmental research is uncertain. The current study therefore sought to validate HCC in a sample of mother-daughter dyads from high and low chronic stress families. To my knowledge, this is the first study to explore HCC associations in mother-daughter dyads, and the first to explore the influence of caregiving on intra-family HCC associations using lab-based measures of parenting quality.

Overall, my results provide tentative support for the validity of HCC as an index of psychophysiological stress reactivity. I found that high-stress mothers had lower HCC than their low-stress counterparts, consistent with the literature reporting a "blunted" pattern of HPA response following severe repeated or chronic activation of the HPA axis, often as a result of prolonged exposure to chronic stress (e.g., Fries, Hesse, Hellhammer, & Hellhammer, 2005; Gunnar & Vazquez, 2001; Heim, Ehlert, & Hellhammer, 2000; Hori et al., 2014; Suzuki et al., 2013; Yehuda, 2002). Hypocortisolemia has been noted in a subset (about 20-25%) of individuals suffering from stress-related conditions, such as fibromyalgia (Griep et al., 1998; Gur et al., 2004), chronic pain (Heim, Ehlert, Hanker, & Hellhammer, 1998), chronic fatigue (Roberts et al., 2004), PTSD (Rohleder et al., 2004), melancholic and atypical depression (Gold & Chrousos, 2002), and burnout (Pruessner, Hellhammer, & Kirschbaum, 1999). With respect to HCC specifically, while some studies of PTSD have found elevated HCC in such patients (Steudte et al., 2011a), others have found relatively lower HCC (Steudte et al., 2013). Moreover, decreased HCC have also been found in individuals with GAD (Steudte et al., 2011b) and in individuals reporting increased stress related to an economic crisis (Faresjö et al., 2013). Lastly, negative correlations between perceived stress and HCC have been observed in samples of adults

with and without depression (Gerber et al., 2013). Interestingly, this blunted pattern was not observed in the high-stress daughters of the current study, despite the fact that the high-stress group of mothers reported significantly higher levels of internalizing symptoms in their daughters, which suggests that chronic stress was negatively impacting these girls. However, it is likely that the high-stress girls experienced significantly less chronic stress over their lifetime, compared to their mothers, by virtue of their young age. Downregulation of mineralcorticoid and glucocorticoid receptors in the HPA axis occurs only after sufficient protracted exposure to stress (Checkley, 1996). Thus, the chronic stress experienced by the high-stress girls may have been too brief to induce HPA axis overloading that could ultimately lead to blunting, indicating that such associations may develop later in childhood.

Although I expected maternal HCC to be positively correlated with symptoms of depression and anxiety, I did not find evidence to support this. However, the current study used a low risk community sample in which there was limited variability in symptom severity, and my power to detect such effects was therefore limited. Because HCC is presumed to be a measure of cortisol responses to chronic stress, I anticipated that trait-like predispositions towards stress reactivity might be more strongly associated with maternal HCC. I therefore assessed mothers' BIS, the tendency to react with fear and nervousness in the face of punishment cues, which has been linked to anxious symptoms in adults (Carver & White, 1994; Johnson, Turner, & Iwata, 2003). As expected, maternal HCC were significantly associated with BIS, though this was only true for the high-stress mothers.

Similar to my analyses of maternal HCC, analyses of associations with children's HCC yielded mixed findings. As hypothesized, daughters' HCC were positively related to their salivary cortisol output (AUC_G) following a social stressor task at age 3, supporting the validity of HCC as an index of cortisol responses to chronic stress. However, children's HCC were unrelated to parent-reported child anxious/depressive symptoms, also measured when children were 7 years old. These null findings are somewhat surprising given that previous research has linked salivary cortisol reactivity to symptoms of psychopathology (Adam et al., 2010; Bhagwagar, Hafizi, and Cowen, 2005; Nemeroff & Vale, 2005; Vreeburg et al., 2009; Vreeburg et al., 2010). It is possible that such relationships only emerge later on in life as regulatory systems mature, although Palmer and colleagues (2013) found a significant correlation between HCC and maternal-reported socioemotional problems in their sample of 1-year-old infants. Another potentially contributing factor was the current sample's rate of internalizing symptoms; such symptoms were uncommon in this community sample, limiting my power to detect these effects. Finally, certain maternal characteristics associated with stress, such as the presence of depressive symptoms (e.g., Berg-Nielsen, Vika, & Dahl, 2003; Fergusson, Lynskey, & Horwood, 1993; Najman et al., 2001) and high trait neuroticism (e.g., Durbin & Wilson, 2012), are predictive of biased reporting of child behaviour. As such, it is also possible that high chronic stress is associated with biased maternal reports of child symptoms such that these young girls are exhibiting neither physiological nor behavioral signs of chronic stress early in development. Such biased reporting may also be partly responsible for the significantly greater maternal-reported anxious and inattentive

symptoms in high-stress daughters in the absence of significant group differences in child HCC.

As hypothesized, mother-daughter HCC associations were moderated by mothers' poor parenting. Specifically, HCC relatedness increased as the quality of parenting became poorer. These findings are in line with prior research in mother-infant dyads suggesting that more negative parenting styles (i.e. more restrictive or punitive parenting) are associated with stronger relatedness of salivary cortisol output (Hibel et al., 2009). As well, previous research with mother-child dyads (Williams et al., 2013) found that lower affective responsiveness was associated with greater dyadic similarity in salivary cortisol slope, which is also consistent with the current results. However, this finding is not consistently reported in the literature; indeed, others have found the opposite pattern of increased relatedness of cortisol profiles with greater sensitivity (e.g., van Bakel & Riksen-Walraven, 2008). Thus, further research aimed at replication is needed to explain these discrepant findings.

Similar to the poor parenting results, I found that girls' internalizing symptoms moderated the strength of mother-daughter HCC associations. As expected, HCC concordance within dyads increased with increasing symptom severity. This finding is consistent with previous work by Papp and colleagues (2009), who reported that greater mother-adolescent salivary cortisol synchrony was associated with increases in both maternal and adolescent negative affect, whereas experiences of positive affect had no effect on cortisol synchrony. However, contradictory findings have been reported as well. In particular, Williams et al. (2013) found that, contrary to expectations, maternal anxiety was unrelated to intra-dyadic salivary cortisol associations in a sample of 7-12 year old

children and their mothers. The researchers admitted, however, that their reliance on self-reported saliva collection times might have confounded their results (Williams et al., 2013), as evidence suggests that the effects of negative affect on cortisol synchrony may be specific to certain times of day (e.g., only at nighttime; Feder et al., 2008). More work is needed to clarify the influence of partners' emotionality on dyadic physiological synchrony.

Unexpectedly, I did not find support for my hypotheses that chronic family stress and poor parenting would mediate the stability of children's cortisol levels over time. This is inconsistent with previous work showing positive associations between perceived stress and stability of cortisol levels over time (Stalder et al., 2012). My null findings with respect to these mediation analyses may arise in part from my use of different types of cortisol measures at baseline and the age 7 follow-up assessments. AUC_G is thought to be conceptually similar to HCC in that it takes into account trait-like basal cortisol levels (Nicholson, 2007); nonetheless, it is partially driven by cortisol output in response to an acute stressor (Nicolson, 2007; as opposed to chronic stress, as is the case with HCC). These methodological differences likely reduced the shared variance between the age 3 and age 7 cortisol measures, thus limiting my ability to detect mediators of cortisol stability. Further, surprisingly little research has evaluated factors that mediate the stability of stress reactivity patterns over longer periods, such as the current follow-up of 5 years; thus, it would be premature to characterize the finding of chronic stress as a mediator of cortisol stability as well-established. Future studies should therefore continue to explore chronic stress and its facets as potential mediators of cortisol stability.

The current study had several strengths. First, to my knowledge, this study was the first to examine HCC in mother-daughter dyads, and among the first to compare HCC with other indices of HPA activity in children. Further, the high compliance rate with hair sampling procedures and the inclusion of interview measures of chronic stress were also strengths.

However, the current study also had some limitations. First, the sample size was relatively small; thus, even moderate effects failed to reach full significance. In particular, post hoc power analyses suggested that I was underpowered to find group differences in girls' HCC. Given the modest effect size I observed, a substantially larger sample size would have been needed to adequately power that analysis. Second, the nature of the community sample and young age of child participants likely limited my ability to link HCC to symptoms of disorder. Third, for this relatively small pilot study, I chose to sample only females to maximize the amount of hair I could collect from participants. Thus, results of the current study may not generalize to males, and future research using a larger sample of male and female participants is clearly needed. Fourth, I only assessed HCC at one time point over a 3-month window. However, it is possible that maternal HCC would have been more strongly related to the indices of depression and anxiety I used, which covered a 2-week period, had I separated hair segments into shorter segments (for example 1cm sections). Fifth, I selected dyads to maximize group differences in severity of maternal chronic stress; thus, the resulting sample did not represent the full range of stress levels. Where appropriate (i.e., where patterns of findings were similar for both groups), I combined stress groups in analyses to maximize power in this modestly sized sample. However, this also limited my ability to evaluate

group differences in these effects (e.g., although both groups showed stronger HCC associations with greater poor parenting, it is possible that this effect was stronger in the high-stress group compared to the low-stress one). Additionally, I was limited by my use of different types of cortisol measures at the baseline and the age 7 follow-up assessments. Although salivary cortisol and HCC are moderately correlated with one another (D'Anna-Hernandez, Ross, Natvig, & Laudenslager, 2011), they nonetheless measure different aspects of HPA axis function; thus, direct comparisons between the two must be interpreted with caution, particularly where stability of HPA axis activity is a primary question. Finally, although HCC was relatively easy to collect compared to other cortisol sampling methods, it did require sending trained experimenters to the home. Future research should examine the feasibility of having subjects collect their own hair samples at home to further reduce costs.

In conclusion, the current study found preliminary support for the validity of HCC as an index of cortisol responses to chronic stress. More specifically, children's HCC were related to their salivary cortisol levels at an earlier time point. Further, high-stress mothers showed significantly lower HCC levels relative to the low-stress mothers, consistent with a growing line of research on blunting of HPA activity following exposure to chronic stress. Lastly, as expected, mothers' and daughters' HCC were positively correlated, especially in dyads experiencing high stress, and this association was moderated by the presence of poor quality parenting and child internalizing symptoms.

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Appendix A: Health and Lifestyle Factors Affecting Hair Cortisol
Questionnaire

Factors known to influence hair cortisol concentration:

Please answer the following questions <u>about yourself</u>:

- Currently pregnant? (Y/N) If yes, which trimester? _____

- Hair washing frequency (number of washes/week): _____

- Is hair dyed? (Y/N) Is hair bleached? (Y/N)

- Height _____ ft _____ in

- Weight _____ lbs

- Smoking Status (Y/N)

- If a smoker or past smoker, pack years (packs/day*years smoked): _____

- Alcohol Consumption (standard drinks/day): _____

- Current Medical Conditions; Please list _____

- Current Medications; Please list _____

Please answer the following questions <u>about your child</u>:

- Hair washing frequency (number of washes/week): _____

- Is hair dyed? (Y/N) Is hair bleached? (Y/N)

- Height _____ ft _____ in

- Weight _____ lbs

- Current Medical Conditions; Please list _____

- Current Medications; Please list _____

Appendix B: Parenting Tasks Coding Manual and Record Form

Note: This coding system is derived from the Teaching Tasks coding manual and Qualitative Ratings for Parent-Child Interactions.

CODING

A. RATING SCALES

There are fifteen rating scales used for coding the parenting tasks. Seven of these scales focus on parent behavior, eight focus on child behavior, and two scales are more dyadic. The scales are:

Parent Sensitivity/Responsivity

Parent Detachment

Parent Supportive Presence

Parent Intrusiveness

Parent Hostility

Parent Quality of Instruction

Parent Confidence

Parent Positive Affectivity

Parent Negative Affectivity

Child Persistence

Child Interest/Engagement

Child Positive Affect

Child Negativity to Parent

Child Negative Affect

Child Compliance

Child Affection (positive orientation) to Parent

Child Avoidance of Parent

Quality of Relationship

Boundary Dissolution

Each scale is presented here, containing an initial description of the goals of the scale and a description of each rating point.

Parent Sensitivity/Resposivity: This scale focuses on how the parent observes and responds to their child's social gestures, expressions, and signals as well as how they respond to child negative affect. The key defining characteristic of a sensitive interaction is that it is child-centered. The sensitive parent is tuned to and manifests awareness of the child's needs, moods, interests, and capabilities, and allows this awareness to guide his/her interaction. A sensitive parent provides stimulation that is appropriate to the situation. He/she provides the child with contingent vocal stimulation and acknowledges the child's interest, efforts, affect, and accomplishments. A sensitive parent can spend time just watching the child but the difference between them and a detached parent is that the sensitive parent seems to be actively taking an interest in the child's activities, as evidenced by comments and embellishments when the child loses interest. A sensitive interaction is well timed and paced to the child's responses, a function of its child-centered nature. Such an interaction appears to be "in sync". The parent paces toys and games to keep the child interested and engaged, but also allows the child to disengage and independently explore the toys. Some markers of sensitivity include: (a) acknowledging the child's affect; (b) contingent vocalizations by the parent; (c) appropriate attention focusing; (d) evidence of good timing paced to the child's interest and arousal level; (e) picking up on the child's interest in toys or games; (f) shared positive affect; (g) encouragement of child's efforts; (h) providing an appropriate level of stimulation when needed; and (i) sitting on floor or low seat, at child's level to interact.

1. **No Sensitivity.** There are almost no signs of parent sensitivity. Thus, the parent is either predominantly intrusive or detached. The parent rarely responds appropriately to the child's cues, and does not manifest awareness of the child's needs. Interactions are characteristically ill-timed or inappropriate. A parent who typically appears oblivious or punitive to the child's needs and affect would receive this score.
2. **Very Low**. This score would be given to parents who display weak or infrequent signs of sensitivity/responsiveness. While the parent is sometimes sensitive, the balance is clearly in the direction of insensitivity. The parent may give some delayed or perfunctory responses to cues from the child but the parent clearly appears more unresponsive than responsive.
3. **Low.** This rating should be given to parents who display some clear instances of sensitive responding. The parent can be characterized as sensitive to the child; however, the parent's behaviors may be mechanical in quality and ill-paced. The interaction can be characterized by a mixture of well-timed and faster paced episodes, or by a parent who is trying to be sensitive, but the interaction has signs of insensitivity. This rating may also be given to parents who are trying to interact appropriately with their child but he/she may appear not to know what to do. The parent is inconsistently sensitive and hard to categorize.

    4Moderate. This rating should be given to parents who are predominantly sensitive/responsive. The parent demonstrated sensitivity in most interactions but may neglect to give a fuller response or a well-timed, appropriate response. Some of the parent's responses are mixed, i.e. some are half-hearted or perfunctory, but the majority are full responses.

5High. The rating should be given to parents who are exceptionally sensitive and responsive. Instances of sensitivity are rare and never striking. Interactions are characteristically well-timed and appropriate. Overall, most responses are prompt, appropriate, and effective.

Detachment/Disengagement: The detached parent appears emotionally uninvolved or disengaged and unaware of the child's needs. This parent does not react contingently to the child's vocalizations or actions, and does not provide the "scaffolding" needed for the child to explore objects in novel ways. Detached parents either miss or ignore the child's cues for help with toys and games, and their timing is out of synchrony with the child's affect and responses (although not the overwhelming barrage of stimulation that intrusive parents present). Simply allowing the child to play by him/herself is not necessarily a sure sign of detachment; this can be appropriate at times, such as when the child is playing happily or contentedly and the parent checks in with the child visually. The detached parent will remain disengaged even when the child makes a bid for interaction with the parent. The detached parent is passive and lacks the emotional involvement and alertness that characterizes a sensitive parent. He/she appears uninterested in the child. There may be a "babysitter-like" quality to the interaction in that the parent appears to be somewhat attentive to the child, but behaves in an impersonal or perfunctory manner that fails to convey an emotional connection between the parent and the child. Other parents may demonstrate a performance-orientation in that the interaction is tailored towards performing for the camera rather than reacting to and facilitating child-centered behavior.

1. **Not Detached**. This rating should be given to parents who display almost no signs of detachment or under involvement. When interacting with the child, the parent is clearly emotionally involved. These parents can be sensitive or intrusive.

2. **Minimal Detachment**. This rating should be given to parents who display minimal signs of detachment. While they are clearly emotionally involved with the child during most of the interaction, there may be brief periods of detachment.

3. **Somewhat Detached**. This rating should be given to parents who remain involved and interested in the child while at the same time demonstrating the tendency to act in an uninterested, detached or perfunctory manner. Parents alternate between periods of engagement and disengagement. The periods of disengagement may be marked by unemotional or impersonal behavior. There may be a low-level of impersonal/unemotional behavior running throughout the interaction.

4. **Moderately Detached**. This rating should be given to parents who are predominantly detached. While there may be periods of engagement, the interaction is characterized chiefly by disengagement. The parent may be passive and fail to initiate interactions with the child. When interactions do occur, they may be marked by an impersonal, perfunctory style. Parent may show a lack of emotional engagement throughout the interaction

5. **Highly Detached**. This rating should be given to parents who are extremely detached. The child plays without parent attention almost all of the time, even when the parent is within a suitable distance for interacting. In the minimal instances of involvement, the parent's behaviors are simple, mechanical, stereotyped, bland, repetitive, and perfunctory. The parent is clearly not emotionally involved with the child, and appears to be "just going through the motions".

Parent Supportive Presence: A parent scoring high on this scale expresses positive regard and emotional support to the child. This may occur by acknowledging the child's accomplishments on task the child is doing (e.g. building a house of blocks), encouraging the child with positive emotional regard (e.g. "You're really good at this"/"You got another one right")and various other ways of letting the child know that he/she has their support and confidence to do well in the setting (e.g. positive reassuring voice tone). If the child is having difficulty with a task, the parent is reassuring and calm, providing an affectively positive "secure base" for the child, perhaps leaning closer to the child to give a physical sense of support. A parent scoring low on this scale fails to provide supportive cues. They might be passive, uninvolved, aloof, or otherwise unavailable to the child. Such a parent also might give observers the impression that they are more concerned about their own adequacy in the setting than their child's emotional needs. A potential difficulty in scoring this scale is to discount messages by the parents that seemingly are supportive in verbal content but are contradicted by other aspects of the communication (e.g., the parent seems to be performing a supportive role for the camera and not really engaged in what the child is doing or feeling). Signs of such questionable support are improper timing of support, mismatch of verbal and bodily cues, and failure to have the child's attention in delivering the message. These types of supportive messages would not be weighted highly because such features suggest that supportive presence is not a well practiced aspect of their interaction outside the laboratory setting.

1. Parent completely fails to be supportive to the child, either being aloof and unavailable or being hostile

   toward the child when the child shows need of some support.

2. Parent provides very little emotional support to the child. Whatever supportive presence is displayed is

   minimal and not timed well, either being given when the child does not really need it, or only after the child

   has become upset.

3. Parent gives some support but it is sporadic and poorly timed to the child's needs. The consistency of this

   support is uneven so as to make the mother unreliable as a supportive presence.

4. This parent does a respectable job of being available when their child needs support. The parent may lean closer as the child shows small signs of frustration and praise the child's efforts to show that they are available and supportive, but inconsistency in this style makes support unreliable or unavailable at crucial times in the session.

5. The parent provides good support, reassurance and confidence in the child's ability, but falters in this at times

   when the child especially could use more support. Or, parent is universally supportive but gives no evidence of modulation to the child's needs.

6. Parent establishes him/herself as supportive and encouraging toward the child and continues to provide support when the child needs it. As the child experiences more difficulty, parent support increases in commensurate fashion. The parent has some lapses, however, in which the child's performance wavers for lack of support. Yet, they redouble support and attempt to return the child to a level of confidence that is more optimal.

7. Parent skillfully provides support throughout the session. Parent sets up the situation from the beginning as one in which they are confident of the child's efforts. Parent may reject inadequate solutions to problems in a way that does not reduce their support and confidence in the child's ability to get the correct solution. If the child is having difficulty, the parent finds ways to encourage whatever solution the child can make. Parent not only is emotionally supportive but continuously reinforces the child's success

Parent Intrusiveness: A parent scoring high on this scale lacks respect for the child as an individual and fails to understand and recognize the child's effort to gain autonomy and self awareness. This parent interferes with the child's needs, desires and interests or actual behaviors. The parent's behavior is guided more by their own agenda rather than the child's needs. Reasonable or appropriate limit setting or directing the child's behavior to the task may be intrusive, depending on the content of the parent's involvement. Setting limits is crucial to the socialization process at this age, and giving the child directives is part of many tasks. **But behaviors are intrusive if they indicate a lack of respect for the child**. Intrusiveness can occur in a harsh physical manner (parent grabbing the child's arms or hands and placing them somewhere else), or with affection (**inappropriate** contact which interferes with the child's efforts, such as kissing, hugging, etc.), or if the parent does not allow the child autonomy in problem-solving tasks (imposes directions and does not allow opportunities for self-directed efforts). It is important that intrusiveness be evaluated from the perspective of the child. Look at cues from the child preceding or after the parent's behavior to see how the child has perceived the parent's action; and what may seem as intrusive to the coders, may not be to the child (e.g., if fast-paced stimulation from the parent is enjoyed by the child, as shown by smiles or laughter, parental behavior that would otherwise be judged as intrusive will not be

counted as such. However, because this judgment is highly subjective, this aspect should not carry a lot of weight when coding, but attention to context is important.)

1. **No Intrusiveness**: No sign of intrusiveness. The parent may be involved yet continues to respect the

   child's needs, or may alternatively be totally uninvolved with the child and appear withdrawn. In either case,

   the parent does not impose directives on the child unless it is clear that the child needs direction. If directives

   are given, it is in a manner showing respect for the child.

2. **Very Low**: The parent may show subtle signs of being intrusive, i.e. stepping in to help before the child

   demonstrates need, but the child does not perceive these as intrusive and does not appear to become upset by

   them.

3. **Moderately Low**: There is some indication of intrusiveness but it is not pervasive. These instances are of low

   intensity and again may not cause the child to become upset. For example, the parent may redirect the child

   to a new toy/task in a poorly timed fashion. Alternatively, low level intrusiveness may be "chronic"; however, the child has the opportunity to do some exploration.

4. **Moderate**: Clear signs of intrusiveness and/or a feeling of intrusiveness that is easily or clearly picked up by

   the coders, but parent still allows the child periods of exploration or autonomy. The instances of intrusiveness

   are generally of low intensity (i.e. the parent provides new instruction before the child has had a chance to

   complete the last task), yet there may be one high level act at an inappropriate time or there may be an

   episode of rough physical handling.

5. **Moderately High**: Clear signs that parent does not respect the child's needs and interests. There may be a

   couple high intensity, or several low level intrusive interactions. E.g., parent may often grab objects from the

   child, issue directives with no regard for child's response, or do much of the task for the child. However, parent may allow the child **some periods of exploration or autonomy**.

6. **High**: Clear incidents of intrusiveness throughout the session, and the parent's agenda clearly has precedence

   over the child's needs and interests. There may be either several high intensity intrusive interactions or

   persistent low level intrusive interactions. E.g., the parent may grab the child and physically direct behavior

   more than once, or the parent may be uninvolved for long periods, **but whenever they do interact, these**

   interactions are consistently intrusive. **Parent also allows for less autonomy than exhibited in #5.**

7. **Very High**: A highly intrusive parent's agenda clearly has precedence over the child's wishes. Parent frequently intervenes inappropriately without cues from the child, and seems to react to his/her own schedule rather than basing actions upon the child's needs. Frequent high level indicators (i.e. takes stimulus out of child's hands, no regard for what child wants to do, more than in #6) are pervasive throughout the session (i.e. parent appears to be doing task him/herself). May show assertive techniques to get the child to comply with their wishes; these can be either verbal or physical incidents of intrusiveness.

P**arent Hostility**: This scale reflects the parent's expression of anger, frustration, annoyance, discounting or rejecting of the child. A parent scoring high on this scale would clearly and openly reject the child, blame him or her for mistakes, and otherwise make explicit the message that they do not support the child emotionally. A parent scoring low on this scale may be either supportive or cold and show some expressions of anger, frustration, or annoyance, but they do not blame or reject the child. A rejecting parent may also show some Supportive Presence (and the inconsistency of their behavior would be revealed by these two scores). Given the low frequency and the clinical relevance of rejecting one's child during a videotaped session, any events which are clearly hostile should be weighted strongly in this score.

1.**Very low**: Parent shows no signs of anger, annoyance, frustration, or rejection. They may or may not be

   supportive, but they do not try to put down the child or avoid the child in rejecting ways. Passive or

   emotionally uninvolved parents would be included here if the parent did not reject the child or communicate

   hostility toward the child.

2. **Low**: This parent did one or two things that seemed to communicate a little hostility

(i.e. anger, frustration,

annoyance) toward the child. These messages were not overt but rather muted expressions toward the child

(e.g., pulling away something with a jerk, putting hand on their hip to show exasperation, giving a negative

look at the child briefly, having an exasperated tone of voice, parroting or mimicking the child in a negative

fashion).

3. **Moderately low**: Signs of hostility again are very fleeting, but they occurred on several occasions during the

session, and at least one sign could be identified as clear and overt or an accumulating sense of unexpressed

anger and avoidance toward the child was seen in the parent's behavior.

4. **Moderate**: Several instances of hostile or rejecting behaviors. Two or more of these events are reliably clear

to observers, but expressions are brief and do not set the tone of parent's interactions immediately following

the episodes.

5. **Moderately high**: parent is overtly rejecting or hostile several times. Behaviors include overt and clearly

communicated rejections of child and expressions of hostility or anger which appear intermittently through

substantial periods of the session. This parent's behavior is more rejecting than not, either by the frequency

of hostile behavior or by the potency by which rejection is communicated several times in the session.

6. **High**: This parent has frequent expressions of rejection and hostility directed toward the child. There is little

or no effort to show warmth during substantial portions of the session, especially after parent becomes

irritated with the child (i.e., parent may initially be warm and then rejects the child strongly). Parent is

frankly and directly rejecting and hostile (e.g., telling child they will leave him/her behind if he/she does not

do the task/play with the toy, using negative performance feedback but little positive feedback, blaming the child for incompetence on the tasks, and overtly refusing to

recognize the child's success, e.g., "You couldn't have done it without me showing you!"). Any warmth seems superficial relative to the parent's distancing from the child, and rejection is used as a control technique against the child.

7.**Very high**: This parent shows characteristics of the previous scale point, but expressions of anger toward the

child also are accompanied by strong, barely controlled emotions, suggesting the possibility of physical abuse

and neglect of the child in some situations.

Parent Quality of Instruction: The important features of this rating are how well the parent structures the situation so that the child knows what the task objectives are and receives hints or corrections while solving the problems that are: (a) timely to his/her current focus, (b) paced at a rate that allows comprehension and use of each hint, (c) graded in logical steps that the child can understand, and (d) stated clearly without unnecessary digressions to unrelated phenomena or aspects of the task that might only confuse the child. The parent's approach suggests that they have some sort of plan for how their instructions will help the child. Yet, the parent is also flexible in their approach and uses alternative strategies or rephrases suggestions when a particular cue is not working, and they coordinate their suggestions to the effort that the child is making to solve the task. **See attached list for a more complete description of the components of quality instruction.**

1. The parent's instructions are uniformly of poor quality. They either are totally uninvolved or fail to structure

the tasks so that the child understands what is required, and the parent gives clues that are of no help to the child's problem-solving efforts and appear to embody no effective plan of teaching.

2. Parent occasionally gives effective instruction. Parent may be able to structure the tasks so that the child

understands what to do and gives a few helpful hints to the child, but these are minimal compared to the

ineffectiveness of most of their attempts or lack of attempts.

3. Parent effectively structures some portions of the tasks and provides good hints, but their assistance is

 inadequate for much of the session.

4. Parent provides adequate structure and instruction for the child to work on the tasks during much of the

session, but overall their instruction is lacking in major ways at several points during

the session.

   Alternatively, the parent may approach tasks in a way that is very structured but requires the child to

   attend primarily to their directives and allows little opportunity for the child to engage the tasks directly (i.e.,

   the parent therefore does not have to coordinate their teaching to the child's efforts); **the result is that the**

   child does not gain a sense of competence in performing the tasks.

5. Parent generally provides instruction that is sufficient and appropriate, but there are some periods in which it

   is inadequate in amount or quality. Alternatively, the parent may approach tasks in a way that is very

   structured but requires the child to attend primarily to their directives and allows little opportunity for the child to engage the task directly (i.e., the parent therefore does not have to coordinate their teaching to the child's efforts); **yet, despite their directiveness, child still gains a sense of competence**.

6. Parent's instruction demonstrates **most** of the desirable features for this rating and in general the parent

   appears to provide good help throughout the session.

7. Parent demonstrates **almost all** the characteristics of effective instruction consistently throughout the

   session. The tasks are sufficiently structured so that the child understands the objectives and can attempt to

   solve the problems directly. Parent's assistance coordinated to the child's activity and needs for assistance.

¨

Components of Quality of Instruction

-obtains child's attention

-explains the goal of the task in a developmentally appropriate manner

-provides instructions which are contingent upon the child's previous action (e.g., child picks up a block; parent

  then tells child to find one that looks the same)

-structures the task into logical steps

-has a range of strategies which they can apply in response to the child's actions

-changes strategies when the current one is not working and does so in a timely manner

-provides appropriate feedback (e.g., okay, that's it, try again)

-uses developmentally appropriate language that their child can understand

-times their instructions based on child's actions; does not present instructions too quickly (while child is still
  working on previous step) or too slowly (long after the child first shows indications of needing help)

-persists despite difficulties; does not give up

Parent Confidence: Degree to which the parent seems to believe that they can work successfully with the child in the situation and that the child will behave appropriately (whether this is more or less task oriented depends on parent's definition of the situation as a social or achievement oriented activity).

1. **Mostly unconfident**: The parent is uncertain in interactions with their child, being either unduly tentative,
    restricting, or appeasing (or a combination of these behaviors). Signs of a lack of confidence include doing
    the tasks for the child, appeasing the child by letting him do what he wants, overkill with strong
    reinforcement, showing clear signs of relief when the tasks go successfully, periodic checking with the
    experimenter to see if they are "doing it right", apologizing for behavior, and/or anxious laughter and
    giggling in response to their own or their child's efforts. There may be a sense that they are trying to deal with problem situations by using such tactics that distract from the issue rather than dealing with it directly. Alternatively, a parent may not show tentativeness, but be overly power assertive/ intrusive /grabby in their attempts to control her child's behavior.

2. **Somewhat unconfident**: Parent seems fairly confident that they can interact with the child in ways that will be satisfactory; however they do show some evidence of hesitancy or appeasement or anxiety in making

requests of the child. A few signs of a lack of confidence (as described above in 1) may be present but are not

pervasive and do not persist throughout the session.

3. **Mostly confident**: Parent is quite confident that their interactions with the child will proceed in an acceptable

manner and that they need not take special precautions to ensure this. Parent seems relaxed about interacting with their child and seems to believe that they could deal adequately with any problems that might arise. Parent trusts in their instincts and skills as a parent (whether or not we as coders believe that they should!).

Parent Positive Affectivity: This scale is a measure of the frequency and intensity of the parent's expression of positive affect (PA). Positive affect includes facial, vocal, and bodily components. A high score on this scale may be obtained even if the parent expresses negative affect in the session.

1. **Low Parent PA**: Parent shows very little or no positive affect throughout entire session. Examples of low

parent PA include lack of smiling, low energy, and subdued/ blunted/ flat affect.

2. **Moderate Parent PA**: Parent exhibits a few instances of positive affect (i.e. slight smiles). The majority

of the PA displayed is of low intensity; however, there may be clear, but few, instances of moderate/high

intensity PA (i.e. laughing, hugging the child). These elements are only minor elements of the session and

are not expressed frequently or consistently.

3. **High Parent PA**: Parent clearly expresses PA at a level that is more intense and frequent than in #2. Parent

appears energetic and engaged. Parent may display frequent low level instances of PA (i.e. contentment,

smiling), but also displays several high level instances of PA.

Parent Negative Affectivity: This scale is a measure of the frequency and intensity of the parent's expression of negative affect (NA). Negative affect includes facial, vocal, and bodily components. A high score on this scale may be obtained even if the parent expresses positive affect in the session.

1. **Low Parent NA**: Parent shows very little or no negative affect throughout entire session. Examples of low

   parent NA include lack of irritability, frustration, or any other form of NA (i.e. anger, sadness, fear).

2. **Moderate Parent NA**: Parent exhibits a few instances of negative affect. The majority of the NA displayed

   is of low intensity (i.e. slightly negative tone of voice). These elements are only minor elements of the

   session and are not expressed frequently or consistently.

3. **High Parent NA**: Parent either expresses (1) consistent low levels of NA throughout session, or (2) at least

   two clear instances of NA that are of greater intensity than in #2 (i.e. shouts at child, grabs child)

Child Persistence: This is a measure of the extent to which the child actually was problem-oriented in the session **(i.e. to the specific task instructed to do). Do not code persistence related to other tasks the child may engage in that are not specific to the session goal (i.e. if the child is working with the blocks but not doing the specified activity with them).** At the low extreme, the child shows no effort on the task, refuses to become involved in the task and either flees or spends his/her time in off-task activities, or is involved only to the extent that parent enforces his/her attention to their directions and responds to their questions about the task. At the high end, the child is actively engaged in the problems and attempts solutions either directly on his/her own or through parent's mediating suggestions (regardless of how good the child's or parent's skills on the problems really are). The child may be either sober or playful, compliant or not compliant to the parent's directions, as long as s/he shows motivation toward solving the task. Although the child's degree of task motivation may depend greatly on the parent's efforts to keep the child on task, the observer should consider this rating to reflect the child's problem-solving efforts regardless of the degree to which parent was instrumental in creating the persistence.

1. **<u>Very low</u>**: Child actively tries to avoid the task. S/he seems to want no part in this problem-solving exercise

   and spends as little time as s/he can get away with doing the tasks at all.

2. **<u>Low</u>**: Child is engaged somewhat in the tasks but always superficially and never with effort or concentration

   on a problem issue. For instance, the child might respond to task-related questions but doesn't invest any

   effort in this or any of his/her own energies to it.

3. **<u>Moderately low</u>**: Child works at tasks with some diligence but efforts are mixed, and s/he has no long

   periods of concentrated problem solving.

4. **<u>Moderate</u>**: Child sustains some long periods of task oriented efforts, but clearly avoids task after reaching

   some difficulty level. Or child's persistence waxes and wanes.

5. **<u>Moderately high</u>**: Child devotes relatively large periods of attention to the tasks and concentrates on the

   problems with regularity. S/he gives sustained attention for some period to at least three of the four problems

   in attempts to get correct solutions. His/her persistence eventually wanes, however, on portions of the

   problems and s/he begins to treat them in a task-avoidant fashion with superficial answers that show lack of

   concentration or disinterest.

6. **<u>High</u>**: Child persists across most of the session in trying to solve the problems. S/he loses interest or

   concentration only sporadically within an overall pattern of effort on the tasks.

7. **<u>Very high</u>**: Child is persistent virtually throughout the session. S/he displays very little if any diversionary

   tactics requiring special effort by the parent to engage him/her at the tasks. S/he works at each task with an

   apparent goal of getting correct solutions for each part of the task until the problem is solved or exhaustively

approximated.

Note: A child who is at the tasks much of the time because of constant efforts by the parent to return the child to the tasks should **not** get a 6 or 7 score, even though the child worked at the tasks. Also, to get a 6 or 7, the child needs to be <u>actively engaged </u>(not just merely compliant).

<u>**Child Interest/Engagement:**</u> Child acts with vigor, confidence, and eagerness in the activities **(not necessarily the specific task instructed to do).** Child takes an active interest in his/her activities, invests effort in them (although is not necessarily very persistent in instructed task), and appreciates successes. Child should appear to be directing his/her energy into activities (but not necessarily the task at hand as in Child Persistence). There are a variety of ways that interest can be displayed. For example, the child may actively seek out and interact with toys/tasks or the child may intently watch the parent's actions/demonstrations with a toy/task offering comments and enthusiasm.

1. Child shows no interest in activities. Child seems hesitant to engage problems or does so "mechanically" and

   with no evidence of being interested. Child may show an extreme lack of confidence in her/his behavior.

2. Child is **generally** not engaged in task or non-task activities. Child does take some active interest in her/his

   activities and becomes engaged. However, the engagement lasts only for **brief** periods. The session is

   dominated mostly by lack of interest.

3. Child shows some clear moments of interest and active engagement in her/his activities (more frequent than

    in #2) but primarily s/he does not engage the situation in this way.

4. Child shows a mixture of interest and restraint or superficiality of effort. This may occur because the

   child is very slow in "warming up" to the task. But, the child continues to show major periods of

   non-engagement. For instance, the child performs activities, but it seems mechanical and lacking much vigor

   and engagement.

5. The child is basically interested in the activities and is engaged for much of the session

about these or other

activities. But, the child's engagement in activities slightly waxes and wanes throughout the session. The

child exhibits more vigor and energy directed toward his/her activities than in #4.

6. Child demonstrates engagement for most of the session with only brief and minor periods in which this is not

 so. The child is quite eager and confident in approaching the tasks and enjoys her/his accomplishments.

7. Child shows high interest/engagement in activities throughout the session. Child approaches his/her goals

eagerly and with some persistence when she/he encounters difficulties. The child has a notable sense of

energy in all activities. Child clearly "jumps" on tasks with eagerness and wants to get involve

Child Positive Affect: This scale is a measure of the frequency and intensity of the child's expression of positive affect (PA). Positive affect includes facial, vocal, and bodily components. Examples of PA include smiling, laughter, giggling, jumping up and down excitedly, skipping, clapping, excited hand flapping/waving, expressions like "this is fun!", "wow!", "I like that," etc. This scale is inclusive of all form of positive affect. This scale captures positive affect regardless of interest or engagement in activity or persons. A high score on this scale may be obtained even if the child expresses negative affect in the session. **Score positive affect regardless of instances of negative affect.**

1. **Very low**: Child shows very little or no positive affect throughout entire session.

2. **Low**: Child exhibits only a few instances of positive affect (i.e. slight smiles); however, the intensity of the

positive affect is low.

3. **Moderately low**: Child shows more positive affect than indicated in #2, but it is brief and only of moderate

intensity (i.e. some brief instances of smiling or slight giggle).

4. **Moderate**: Child shows some clear positive affect, but these are only minor elements of the session and are

not expressed frequently or consistently throughout the session.

5. **<u>Moderately high</u>**: On a number of occasions, the child expresses positive affect. The child displays several

   (2 or 3) clear high level instances of positive affect (i.e. loud laughter, full big smiles, clapping).

   Alternatively, the child frequently displays low levels of positive affect (i.e. contentment) but does not do so

   consistently throughout the session.

6. **<u>High</u>**: The child expresses positive affect. This can be demonstrated by a number of high level instances of

   PA or consistent displays of lower level PA or a mixture of both. These instances should be more frequent

   and/or more intense than in #5 and occur at various points throughout the session. There should be no

   ambivalence in the child's expression of positive feelings. However, PA may not completely dominate the

   session as in #7.

7. **<u>Very high</u>**: The child demonstrates high levels of positive affect. The child's positive affect permeates the

   session as a whole and is displayed to some degree during the whole session.

<u>Child Negativity to Parent</u> Degree to which the child shows anger, dislike, or hostility toward the parent. At the high end, the child is repeatedly and overtly angry at their parent, e.g., forcefully rejecting their ideas, showing angry and resistant expression, pouting, or being unreasonably demanding or critical of the parent. At the low end, there are neither overt nor covert signs of such anger.

1. Child shows no signs of negativism.

2. Child shows no clear indications of negativism, but the tone of some interactions appears somewhat negative.

3. Child is negativistic only briefly in any overt fashion, but these suggest some noticeable anger and resistance

    in the child's interactions with parent.

4. Child shows clear negativism toward the parent on several occasions or one significant occasion, but these

are rather isolated episodes separated by periods in which the child may behave quite positively, or neutrally,

   toward the parent.

5. Child is frequently negativistic or a few instances of strong or intense negativism, but these are not

   predominant in the interaction.

6. Child's anger is a predominant aspect of their interactions, but it is shown in more sporadic and generally

   subtler ways than in #7.

7. Child is repeatedly and overtly angry or resistant toward the parent. The degree of anger here seems so

   strong that the child cannot disguise it in subtler ways for long, but it repeatedly appears in her/his

   interactions with the parent.

Child Negative Affect: This scale is a measure of the frequency and intensity of the child's expression of negative affect (NA) (i.e. anger, sadness, fear, undifferentiated NA). Negative affect includes facial expressions of anger, sadness, and fear, vocalizations of NA, and bodily expressions of NA. Some examples of NA include crying, pouting, jumping up and down in a frustrated manner, pushing in an aggressive way, banging one's fist, loss of vigor, tentative-type play, saying things in a negative tone (i.e. "I don't want to!," "No!"), etc. This scale is inclusive of Child Negativity to Parent. It captures all forms of negative affect expressed during the session. A high score on this scale may be obtained even if the child expresses positive affect in the session. **Score negative affect regardless of instances of positive affect.**

1. **Very low**: Child shows very little or no negative affect throughout entire session.

2. **Low**: Child exhibits only a few instances of negative affect (i.e. slight pouting); however, the intensity of the

   negative affect is low.

3. **Moderately low**: Child shows more negative affect than indicated in #2, but it is brief and only of moderate

   intensity (i.e. some brief instances of pouting or slight angry gestures).

4. **Moderate**: Child shows some clear negative affect, but these are only minor elements of the session and are

not expressed frequently or consistently throughout the session.

5. **<u>Moderately high</u>**: On a number of occasions, the child expresses negative affect. The child displays several

   (2 or 3) clear high level instances of negative affect (i.e. angry outburst, crying, throwing toys).

   Alternatively, the child frequently displays low levels of negative affect (i.e. whining) but does not do so

   consistently throughout the session.

6. **<u>High</u>**: The child expresses negative affect. This can be demonstrated by a number of high level instances of

   NA or consistent displays of lower level NA or a mixture of both. These instances should be more frequent

   and/or more intense than in #5 and occur at various points throughout the session. There should be no

   ambivalence in the child's expression of negative feelings. However, NA may not completely dominate the

   session as in #7.

7. **<u>Very high</u>**: The child demonstrates high levels of negative affect. The child's negative affect permeates the

   session as a whole and is displayed to some degree during the whole session.

Child Compliance: This scale measures the degree to which the child shows willingness to listen to parent's suggestions in the setting and to comply to parent's requests in a reasonable manner. At the high end, a child matches his/her behavior to parental directions in a detailed fashion, e.g., if parent asks the child to try to use a certain block, the child uses that block. The child also is attentive to parent and may focus his/her activity around parent's directions to the extent that they provides direction. At the low end of the scale, the child actively refuses to comply with parental directions throughout most of the session. The child may do so by overt denial of parent's demands and pulling away from the parent or leaving the parent's vicinity, rejecting their physical efforts to help solve the task, and acting contrary to the parent's suggestions. At intermediate scale points, the child shows a mixture of compliant and rejecting responses to parent's plans, acts as though incognizant of parent's suggestions either because the child is involved in his/her own schedule of activity or because the parent gives few directions with which to comply. It is important to consider whether or not the child understands the directions s/he has been given; **unclear directions which are not responded to by the child does**

not indicate non-compliance.

1. Child rejects virtually all directions of parent during the session. Early in the session and continuing

throughout, the child refuses to obey parent. Commands and suggestions may be followed at initial steps but

are regularly sequenced with refusals to comply. In effect, the child does nothing demanded of him/her and

nothing related to the task (ex: doesn't even play with the blocks at all).

2. Child shows strong tendency toward noncompliance but it is mixed with a few efforts to follow suggestions

and directions given by parent. Noncompliance is more sporadic and may be patterned to frustrating and

difficult moments of the session compared to the above level. Or, the child is engaged in task-related

activities but does not comply to specific instructions for the task at hand (i.e. plays with the blocks but

doesn't make the shapes he/she is asked to do).

3. There are major, but isolated, episodes of noncompliance during the session, or tendencies toward

noncompliance throughout, that make the interaction difficult and strained. Yet, the child does comply

eventually in most instances.

4. The child seems not to be strongly invested in noncompliance and basically complies eventually to most

directives. There seems to be some purposeful noncompliance, however, that produces momentary

difficulties between parent and child. (**Note**: Any child who is obedient and conforming to the parent's

demands out of fear can only get a maximum score of 4.)

5. The child basically seems compliant toward parent's demands and willing to work in collaboration with them

but may also show some noncompliance. Child does not seem invested in rejecting parent's directions, and

episodes of noncompliance are brief and followed by behavior indicating acceptance of parent's leadership.

6. Child complies with virtually all major directions of parent, e.g., staying on task or returning to task efforts

at the parent's direction, accepting the parent's ideas on how to do the tasks. Child may not comply with lesser details with regularity, however, e.g., parent's suggestions about placing a particular block or turning the other wheel of the etch-a-sketch sometimes would go unheeded. Child may be briefly noncompliant when frustrated or bored, but recovers quickly.

7. Child actively orients toward parent's directions in the session and complies to all major task instructions

plus most details about specific behaviors on the tasks, e.g., using the particular block parent suggests, giving

answers to parent's questions about the form and color or pieces on the form board task. Thus, the child molds his/her behavior into a collaborative effort with parent on the tasks, heeding parent's suggestions with a compliance that suggests a basic trust in parent's advice and direction and acceptance of parent's authority as a guide in this situation. The child may disagree with some ideas and argue for other approaches to problem details, but these behaviors reflect autonomy within a compliant orientation rather than intentional noncompliance.

Child Affection Toward Parent/Positive Orientation Toward Parent: This scale reflects whether there was a substantial period of positive regard and sharing of happy feelings of the child toward the parent and the degree to which the child displayed an overall positive orientation toward the parent. Although the child also might become angry or avoid the parent elsewhere in the session, a relatively high rating still would be given if some portions of the session met the criteria of this scale. (Thus, between this scale and the avoidance scale, one can distinguish among children who were simply uninvolved with parent. avoidant of parent, or positively involved but also avoidant at some point.) The criteria of this scale are evidences that the child approached and attempted to share positive affect with the parent, **i.e., looking at parent, making eye contact and smiling, engaging in conversation, and other "approach" behavior**.

1. **Very low**: Child clearly does not attempt to share experiences with parent. Signs such as failure to make eye

contact with parent when expressing happiness, directing expressions of success to the experimenter but not

to the parent, and similar clues can be used as evidence that the child attempts little sharing of feelings with

parent.

2. **Low**: Child has very minor incidents which seemed expressive of positive regard toward parent and from

which one might infer <u>some</u> positive feelings are expressed toward parent. Yet, child largely shows no positive regard toward parent.

3. **Moderately low**: Child shows some positive regard but it is brief or mixed in quality. Possibly, child seems

ambivalent in such expressions.

4. **Moderate**: Child shares some clear positive regard towards parent, but these are only minor elements of the

interaction and are not expressed frequently or consistently throughout the session. Child may seem slightly

subdued in interaction with parent during parts of the session.

5. **Moderately high**: On a number of occasions the child expresses positive regard and shows positive

orientation toward and/or shares happy expressions with the parent. The child displays several (2 or 3) clear

"high level" instances of positive regard towards the parent (e. g., smiling at or laughing with them).

Alternatively the child frequently displays "low level" instances of positive regard towards the parent (e.g.,

making eye contact with parent, visibly brightening when interacting, engaging parent in conversation, etc.), but does not do so consistently throughout the session.

6. **High**: The child is warm and expressive towards parent for a substantial part of the session. This could be

demonstrated by a number of high level instances of positive regard or consistent displays of lower level

positive regard or a mixture of both. These instances should be more frequent and/or more intense than in 5

and occur at various points throughout the session. There should be no ambivalence in the child's expressions

of positive feelings, but warmth and positive regard may not completely dominate the session as in 7.

7. **Very high**: The child demonstrates a very positive, engaging, and sharing relationship towards the parent.

The child's positivity towards the parent permeates the session as a whole and is displayed to some degree

during the whole session.

Child Avoidance of Parent: This scale reflects the child's tendencies or clear attempts in the session to avoid interacting with the parent. A child high on avoidance would try **at some point** in the session to withdraw from the parent either by leaving the situation or resisting the parent's attempts to engage him or her. A child low on this scale would show no efforts to avoid the parent per se. The child may be angry or noncompliant but yet maintain interaction with the parent.

1. **Very low**: Child shows no withdrawal from parent. Child maintains roughly an equal level of interaction to

   parent's interactions throughout the session. If child is noncompliant, some of parent's messages might be

   ignored, but if it does not seem to be the child's intention to avoid interaction with the parent in this

   situation, such brief ignoring would not count as avoidance.

2. **Low**: Child shows no clear withdrawal from interaction with parent. Perhaps there is some noncompliance

   that seems a little suggestive of avoidance of parent and would be counted here.

3. **Moderately low**: Child has a little tendency to avoid the parent, perhaps through ignoring parent for brief

   periods. There are no major incidents of avoidance, but rather some hints of ambivalence, or lack of interest

   about interacting with the parent.

4. **Moderate**: Child shows some small effort to avoid interaction with parent at some point in the session.

   There may be a sustained period of ignoring parent's messages or a brief and vague effort to leave the

   situation. These efforts are easily overcome by parent's efforts to maintain the child's involvement with them.

5. **Moderately high**: Child makes a clear effort to avoid interacting with parent. Child's resistance to continued

   interaction is sustained for some time, but eventually overcome by parent's efforts to maintain the child's

   involvement with them.

6. **High**: Child has a strongly maintained effort to avoid interaction with parent, probably by repeated attempts

to leave the room and avoid contact with them. Once evoked, this avoidance is likely to be repeated unless

parent is very cautious in their treatment of child.

7**. Very high**: Child strongly avoids parent for a sustained period and seems highly invested in resisting any

emotional bond with them for long periods of the session. Once evoked, the child's avoidance is dominant in

the session and remains a possibility to happen again for the rest of the session. Such episodes merit this

rating even though child may have been very engaging of parent earlier in the session.

(**Note**: Noncompliance on tasks should not be scored as avoidant unless it reflects an avoidance or rejection of parent.)

Quality of Relationship: This scale is dyadic and global and focuses on the affective and reciprocity aspects of the parent-child relationship. For a high score, there needs to be a strong sense of relatedness and mutual engagement between parent and child, with both explicitly acknowledging and responding to the other. This can be seen by affective and/or verbal sharing (i.e. sharing gazes, smiling, vocalizing, conversing) and contingent responding to each other. Each seems to adapt well to the other, and the pair seems harmonious/"in tune". It is obvious that they enjoy each other. There may be a sense of playfulness in their interactions. They seem relaxed, and interactions are smooth and "natural". If the child is upset, the parent immediately moves to support the child and help him/her calm down and resume prior activity (secure base behavior). Conflicts are quickly, easily, and amicably resolved with little or no escalation. Parent and child return to engagement/ relatedness after the problem or conflict. For a low score, a core sense of emotional relatedness must be absent. Parent and child do not interact responsively, evidenced by rejection, ignoring, or dismissal by either the parent or child. Little/no affective sharing occurs, or attempts made by either one for affective sharing are ignored or rebuffed. There may be a sense of negativity between the two characterized by frustration, tension, anxiety, fearfulness, or hostility. They do not seem "in-tune" with each other and do not seem to enjoy being together. In cases where the child is easily upset, the parent is ineffective in supporting the child and in helping to calm down (child can't quickly resume prior activity). Conflicts are not resolved quickly, easily, or amicably, and are characterized by escalation. There is little sense of relatedness between the parent and child after the conflict.

1. **None/Very low**: There is no sense of relatedness, with no emotional engagement and a lack of warmth or

enjoyment. Affective sharing is completely absent. **Or**: The relationship is characterized by unsuccessful bids

for reciprocity, where either the parent or the child rejects, dismisses, or ignores the other. Feelings of

negativity (i.e. frustration, hostility, anxiety, fearfulness, tension) characterize their interactions, and they are

clearly not "in sync."

2. **Low**: This pair exhibits few basics for a positive affective relationship. There is a little bit of relatedness/

reciprocity, with one or two examples of affective sharing or responsiveness. A general negativity/avoidance

may characterize their interactions, and it is evident that they are not comfortable with each other. Child

distress or conflicts are not smoothly handled. **Or**: Interactions are largely negative (i.e. frustrated, hostile,

anxious, tense) and do not flow smoothly but seem awkward, rigid, or jerky.

3. **Moderately low**: Reciprocal interactions are sporadic. Emotional engagement is weak and erratic. Affective

sharing and responding are inconsistent/infrequent. Less negativity and some positive interactions are present.

4. **Moderate**: There is some mutual engagement and reciprocity. Parent and child are both interested in each

other for periods in the session, and there are a fair number of instances of affective/verbal sharing and

responsiveness. Interactions are somewhat relaxed, positive, and harmonious, but there may be some instances

of negativity (i.e., fearfulness, frustration, hostility, anxiety, tension).

5. **Moderately high**: Interactions are positive for most of the session, with a fair amount of affective/verbal

sharing and contingent responding. Interactions seem to be fairly natural and relaxed. There's a sense of

mutual enjoyment characterized by positive affect. One or two instances of negativity may occur, but tension

is generally at a minimum. Overall the relationship is characterized by a stronger sense of relatedness,

responsiveness, and sharing than in # 4.

6. **High**: Interactions are positive for the entire session. Affective/verbal sharing and contingent responsiveness

  occur fairly frequently and characterize most interactions. Child distress/conflicts are smoothly handled. There

  may be instances of playfulness or humor. Overall, the pair seems to be synchronous and harmonious.

7. **Very high**: Parent and child genuinely enjoy each other's company and/or have fun together. Interactions are

  natural, relaxed, and smooth. An "easygoing" quality is present. Affective/verbal sharing and contingent

  responding occur throughout and characterize virtually all interactions in the session. Overall, this seems like

  this is a regular pattern of interaction for this pair.

Physical and/or Psychological Dissolution of Boundaries in the Parent-Child Relationship: This scale concerns the degree to which the parent and child maintain appropriate role relationships. There must be clear boundaries between who is the parent and who is the child, with the parent being in control and having more power than the child. Both should demonstrate a clear sense of comfort/confidence in their respective roles as parent and child. Parents who are low on boundary dissolution must demonstrate a clear ability to provide firm directives and set expectations for the child. There must be evidence that parent is clearly trying to be the parent. The parent's skill in instructing or their investment and effectiveness in doing the task should not be considered in rating this scale. What is important is that parent stays in a parental role and maintains control of the situation. Also, physical behaviors should always be responsive to the child's needs for support and encouragement. A parent who is high on boundary dissolution may be so because they are high on either psychological or physical boundary dissolution (they do not have to be high on both). The **psychological boundaries** between a parent and child may dissolve when parent begins treating the child as his/her contemporary and not taking charge and setting the necessary limits. Instead of giving the child the firmness and the reassurance he/she needs, the parent may treat the child as a playmate, participating in distracting activities with the child. For example, parent may stimulate the child or be charmed by his/her antics rather than re-directing him/her to the task at hand. Or, the parent may treat the child as a partner (parentification), perhaps speaking in hushed, intimate tones, engaging in provocative teasing, or deferring to child (i.e. letting him/her dictate the situation) when he/she needs her to take charge. When psychological boundaries are dissolved, the parent, in attempting to meet his/her own needs, is not helping the child structure the situation or regulate his/her behavior. The parent is failing to maintain the parental role and is defining the relationship with the child as playmates or intimate partners. The **physical boundaries** between parent and child may dissolve

when the parent controls or manipulates the child using physical intimacy and sensuality. Untimely affectionate behavior should be distinguished from affectionate behavior used to comfort, reassure, or share positive feelings. While affection responds to the needs of the child, untimely affectionate behavior serves the needs of the parent and is insensitive and unresponsive to the needs of the child. Untimely affectionate behavior often interrupts the flow of the child's behavior and draws the child into overstimulating patterns of interaction which distract him/her from the task at hand. **Do not code parent affection as untimely if it doesn't distract or disrupt the child in a negative way and is viewed as encouraging or supportive displays of affection (ex: child starts to show some negative affect and parent hugs and tickles the child to help the child move forward on the tasks in a positive manner)**

1.**<u>Completely clear parent-child boundaries</u>**: It is always clear who is the parent and who is the child. Parent

is clearly comfortable in their role and is in charge of the situation. Parent provides directives, sets limits if needed, and communicates expectations to child. Any physical contact is completely responsive to child's needs.

2. **<u>Clear parent-child boundaries</u>**: It is generally clear who is the parent and who is the child. However, there

may be one short lapse during which there may be some blurring of roles (i.e. parent, on one occasion, does

not provide directives or limits which the child needs, or once may briefly engage in untimely affectionate behavior (see definition above).

3. **<u>Parent-child boundaries maintained</u>**: For most of the time, parent is parent and child is child. However,

there may be a few times when the parent becomes involved in brief distracting playful interactions, or does

not provide needed limits or directives, or touches the child inappropriately, or is unduly hesitant and appeasing (boundaries are slightly fuzzy). Yet when it is called for, parent structures the situation in a matter-of-fact manner, firmly setting limits and exercising control.

4. **<u>Boundaries begin to dissolve</u>**: There is some ambiguity about who is the parent and who is the child but

only sporadically throughout the session. There may be some general hesitancy on the part of parent, and the parent may sometimes defer to the child instead of exerting control when needed. Although the parent may attempt to set limits, the parent is often not clear or firm, and/or the parent may initially come on strong but then quickly back down at the first sign of resistance. Or the parent may at times encourage a playmate/partner relationship; parent may initiate stimulating non-task activities for their own enjoyment or be amused by their child, or parent and child may be engaged in

a non-playful power struggle, bickering like peers *or* sibs (e.g. "you do it"; "no you do it"; "no you"). Boundary dissolution at this level may be characterized by one high level but isolated instances of physical intimacy not responsive to the child's needs (e.g. child is picking up toys, parent grabs him/her towards them for a kiss), or by several low level instances (e.g. brief pat, touch, or tap, although they must qualify as untimely affectionate behavior).

5. **Boundaries are partially dissolved**: The roles of parent and child may be partially dissolved, as though they

are sometimes playmates or partners rather than parent and child. When the situation calls for direction and

limit-setting, parent responds by being playful and overstimulating, may be charmed by and encouraging of the child's non-task antics, or may be unduly tentative and appeasing. There may be occasional instances of parent deferring to child in a meek compliant way. For example, the child orders the parent around (e.g. "don't do that"), and parent complies. Boundary dissolution at this level may also be characterized by a couple high-level untimely affectionate behaviors or low level untimely affectionate behaviors that occur sporadically throughout the session (see #4). Included at this level would also be parents who engage in less of these behaviors but continue despite the child's clear signals to stop.

6. **Boundaries nearly dissolved**: It is generally difficult to tell who is the parent and who is the child, though

there may be a few instances of appropriate role behavior. Overall, this relationship is characterized by a lack

of clear boundaries between parent and child. The behaviors discussed in #5 are now more frequent and more

prominent. For a significant portion of the session parent fails to maintain their role by taking charge and setting limits. On a number of occasions parent may initiate distracting antics as a playmate would, which compromise efforts to complete the task. Parent may appear painfully tentative and appeasing, often being unable to even attempt to direct the child (parent may even seem afraid of child). Boundary dissolution at this level may also be characterized by a few high-level untimely affectionate behaviors or persistent low-level untimely affectionate behaviors; physical contact is clearly initiated in response to the parent's needs and is

unresponsive to the needs or signals of the child.

7. **Boundary dissolution predominates**: It is unclear who is the parent and who is the child throughout the

session. This boundary dissolution may take several forms. Parent may almost always fail to take charge and

set limits when called for, if parent does attempt to do so at all, they always talks to the child in a tentative,

appeasing, perhaps fearful manner. Or a playmate relationship may predominate, with the parent initiating

and participating in distracting and stimulating activities when leadership is called for. Or the child may take

on the role of parent, controlling the situation and dictating to the parent what they should do, with the parent

meekly deferring to or obeying the child. Or there may be a high amount of untimely affectionate behavior

present, more than in #6 and with the parent's needs always taking precedence.

Scoring Sheet for Parent-Child Interaction Tasks Coding
Start time: **Stop time:**
Coder Initials: **Date:**

Behavior	Notes/Comments	Score
Parent Sensitivity/Responsiveness		
Parent Detachment		
Parent Supportive Presence		
Parent Intrusiveness		
Parent Hostility		
Parent Quality of Instruction (code for puzzles with parent task only)		
Parent Confidence		
Parent Positive Affectivity		
Parent Negative Affectivity		

Appendix C: Parenting Styles and Dimensions Questionnaire

REMEMBER: Make two ratings for each item; (1) rate how often your spouse exhibits this behavior with your child and (2) how often you exhibit this behavior with your child.

SPOUSE EXHIBITS BEHAVIOR:
1 = Never
2 = Once In A while
3 = About Half of the Time
4 = Very Often
5 = Always

I EXHIBIT THIS BEHAVIOR:
1 = Never
2 = Once In A while
3 = About Half of the Time
4 = Very Often
5 = Always

[She]   [I]

_____ _____   1.   [She is] [I am] responsive to our child's feelings and needs.

_____ _____   2.   [She uses] [I use] physical punishment as a way of disciplining our child.

_____ _____   3.   [She takes] [I take] our child's desires into account before asking the child to do something.

_____ _____   4.   When our child asks why he/she has to conform, [she states] [I state]: because I said so, or I am your parent and I want you to.

_____ _____   5.   [She explains] [I explain] to our child how we feel about the child's good and bad behavior.

_____ _____   6.   [She spanks] [I spank] when our child is disobedient.

_____ _____   7.   [She encourages] [I encourage] our child to talk about his/her troubles.

_____ _____   8.   [She finds] [I find] it difficult to discipline our child.

_____ _____   9.   [She encourages] [I encourage] our child to freely express himself/herself even when disagreeing with parents.

_____ _____   10.   [She punishes] [I punish] by taking privileges away from our child with little if any explanations.

_____ _____   11.   [She emphasizes] [I emphasize] the reasons for rules.

_____ _____   12.   [She gives] [I give] comfort and understanding when our child is upset.

_____ _____   13.   [She yells or shouts] [I yell or shout] when our child misbehaves.

_____ _____   14.   [She gives praise] [I give praise] when our child is good.

_____ _____   15.   [She gives] [I give] into our child when the child causes a commotion about something.

_____ _____   16.   [She explodes] [I explode] in anger towards our child.

_____ _____   17.   [She threatens] [I threaten] our child with punishment more often than actually giving it.

_____ _____   18.   [She takes] [I take] into account our child's preferences in making plans for the family.

_____ _____   19.   [She grabs] [I grab] our child when being disobedient.

_____ _____   20.   [She states] [I state] punishments to our child and does not actually do them.

_____ _____   21.   [She shows] [I show] respect for our child's opinions by encouraging our child to express them.

_____ _____   22.   [She allows] [I allow] our child to give input into family rules.

_____ _____   23.   [She scolds and criticizes] [I scold and criticize] to make our child improve.

_____ _____   24.   [She spoils] [I spoil] our child.

_____ _____   25.   [She gives] [I give] our child reasons why rules should be obeyed.

_____ _____   26.   [She uses] [I use] threats as punishment with little or no justification.

_____ _____   27.   [She has] [I have] warm and intimate times together with our child.

_____ _____   28.   [She punishes] [I punish] by putting our child off somewhere alone with little if any explanations.

_____ _____   29.   [She helps] [I help] our child to understand the impact of behavior by encouraging our child to talk about the consequences of his/her own actions.

_____ _____   30.   [She scolds or criticizes] [I scold or criticize] when our child's behavior doesn't meet our expectations.

_____ _____   31.   [She explains] [I explain] the consequences of the child's behavior.

_____ _____   32.   [She slaps] [I slap] our child when the child misbehaves.

Appendix D: Behavioral Inhibition System/Behavioral Activation System Scales

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to all the items; do not leave any blank. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

  1 = very true for me
  2 = somewhat true for me
  3 = somewhat false for me
  4 = very false for me

1. A person's family is the most important thing in life.

             1   2   3   4

2. Even if something bad is about to happen to me, I rarely experience fear or

nervousness.   1   2   3   4

3. I go out of my way to get things I want.

             1   2   3   4

4. When I'm doing well at something I love to keep at it.

             1   2   3   4

5. I'm always willing to try something new if I think it will be fun.

             1   2   3   4

6. How I dress is important to me.

             1   2   3   4

7. When I get something I want, I feel excited and energized.

             1   2   3   4

8. Criticism or scolding hurts me quite a bit.

             1   2   3   4

9. When I want something I usually go all-out to get it.

             1   2   3   4

10. I will often do things for no other reason than that they might be fun.

             1   2   3   4

11. It's hard for me to find the time to do things such as get a haircut.

        1   2   3   4

12. If I see a chance to get something I want I move on it right away.

        1   2   3   4

13. I feel pretty worried or upset when I think or know somebody is angry at me.

        1   2   3   4

14. When I see an opportunity for something I like I get excited right away.

        1   2   3   4

15. I often act on the spur of the moment.

        1   2   3   4

16. If I think something unpleasant is going to happen I usually get pretty "worked up."

        1   2   3   4

Please answer the questions on the <u>back</u> of this page

1 = very true for me
2 = somewhat true for me
3 = somewhat false for me
4 = very false for me

17. I often wonder why people act the way they do.

        1   2   3   4

18. When good things happen to me, it affects me strongly.

        1   2   3   4

19. I feel worried when I think I have done poorly at something important.

        1   2   3   4

20. I crave excitement and new sensations.

        1   2   3   4

21. When I go after something I use a "no holds barred" approach.

        1   2   3   4

22. I have very few fears compared to my friends.

        1   2   3   4

23. It would excite me to win a contest.

          1   2   3   4

24. I worry about making mistakes.

          1   2   3   4

Appendix E: Inventory to Diagnose Depression

On this questionnaire are groups of 5 statements. Read each group of statements carefully. Then pick out the one statement in each group that best describes the way you have been feeling the <u>PAST WEEK</u>. Circle the number next to the statement you picked.

1)   0   I do not feel sad or depressed.

         1   I occasionally feel sad or down.

         2   I feel sad most of the time, but I can snap out of it.

         3   I feel sad all the time, and I can't snap out of it.

         4   I am so sad or unhappy that I can't stand it.

2)   0   My energy level is normal.

         1   My energy level is occasionally a little lower than normal.

         2   I get tired more easily or have less energy than usual.

         3   I get tired from doing almost anything.

         4   I feel tired or exhausted almost all of the time.

3)   0   I have not been feeling more restless and fidgety than usual.

         1   I feel a little more restless or fidgety than usual.

         2   I have been very fidgety, and I have some difficulty sitting still in a chair.

         3   I have been extremely fidgety, and I have been pacing a little bit almost every day.

         4   I have been pacing more than an hour per day, and I can't sit still.

4)   0   I have not been talking or moving more slowly than usual.

         1   1 am talking a little slower than usual.

         2   I am speaking slower than usual, and it takes me longer to respond to questions, but I can still carry on a normal conversation.

         3   Normal conversations are difficult because it is hard to start talking.

         4   I feel extremely slowed down physically, like I am stuck in mud.

5)   0   I have not lost interest in my usual activities.

         1   I am a little less interested in 1 or 2 of my usual activities.

    2   1 am less interested in several of my usual activities.

    3   I have lost most of my interest in almost all of my usual activities.

    4   1 have lost all interest in all of my usual activities.

6)   0   I get as much pleasure out of my usual activities.

    1   I get a little less pleasure from 1 or 2 of my usual activities.

    2   I get less pleasure from several of my usual activities.

    3   I get almost no pleasure from most of the activities which I usually enjoy.

    4   I get no pleasure from any of the activities which I usually enjoy.

Circle the statement that best describes the way you have been the PAST WEEK.

7)   0   1 have not noticed any recent change in my interest in sex.

    1   I am only slightly less interested in sex than usual.

    2   There is a noticeable decrease in my interest in sex.

    3   I am much less interested in sex now.

    4   I have lost all interest in sex.

8)   0   I have not been feeling guilty.

    1   1 occasionally feel a little guilty.

    2   I often feel guilty.

    3   I feel quite guilty most of the time.

    4   I feel extremely guilty most of the time.

9)   0   I do not feel like a failure.

    1   My opinion of myself is occasionally a little low.

    2   I feel I am inferior to most people.

    3   I feel like a failure.

    4   I feel I am a totally worthless person.

10)   0   1 haven't had any thoughts of death or suicide.

    1   I occasionally think life is not worth living.

    2   1 frequently think of dying in passive ways (such as going to sleep and not waking up), or that I'd be better off dead.

      3   I have frequent thoughts of killing myself, but I would not carry them out.

      4   I would kill myself if I had the chance.

11)   0   I can concentrate as well as usual.

      1   My ability to concentrate is slightly worse than usual.

      2   My attention span is not as good as usual and I am having difficulty collecting my thoughts, but this hasn't caused any problems.

      3   My ability to read or hold a conversation is not as good as it usually is.

      4   I cannot read, watch TV, or have a conversation without great difficulty.

12)   0   I make decisions as well as I usually do.

      1   Decision making is slightly more difficult than usual.

      2   It is harder and takes longer to make decisions, but I do make them.

      3   I am unable to make some decisions.

      4   I can't make any decisions at all.

13)   0   My appetite is not less than normal.

      1   My appetite is slightly worse than usual.

      2   My appetite is clearly not as good as usual, but I still eat.

      3   My appetite is much worse now.

      4   I have no appetite at all, and I have to force myself to eat even a little.

Circle the statement that best describes the way you have been the PAST WEEK.

14)   0   I haven't lost any weight.

      1   I've lost less than 5 pounds.

      2   I've lost between 5-10 pounds.

      3   I've lost between 11-25 pounds.

      4   I've lost more than 25 pounds.

15)   0   My appetite is not greater than normal.

      1   My appetite is slightly greater than normal.

      2   My appetite is clearly greater than usual.

      3   My appetite is much greater than usual.

      4   I feel hungry all the time.

16)   0   I haven't gained any weight.
          1   I've gained less than 5 pounds.
          2   I've gained between 5-10 pounds.
          3   I've gained between 11-25 pounds.
          4   I've gained more than 25 pounds.

17)   0   I am not sleeping less than normal.
          1   I occasionally have slight difficulty sleeping.
          2   I clearly don't sleep as well as usual.
          3   I sleep about half my normal amount of time.
          4   I sleep less than 2 hours per night.

*** If you circled # 1, 2, 3, or 4: Which of these sleep problems have you experienced? (Circle all which apply)

          1   I have difficulty falling asleep.
          2   My sleep is fitful and restless in the middle of the night.
          3   I wake up earlier than usual and cannot fall back to sleep.

18)   0   I am not sleeping more than normal.
          1   I occasionally sleep more than usual.
          2   I frequently sleep at least 1 hour more than usual.
          3   I frequently sleep at least 2 hours more than usual.
          4   1 frequently sleep at least 3 hours more than usual.

19)   0   I do not feel anxious, nervous or tense.
          1   I occasionally feel a little anxious.
          2   I often feel anxious.
          3   I feel very anxious most of the time.
          4   I feel terrified and near panic.

Please answer the questions on the <u>back</u> of this sheet.

Circle the statement that best describes the way you have been the PAST WEEK.

20)   0   I do not feel discouraged about the future.
      1   I occasionally feel a little discouraged about the future.
      2   I often feel discouraged about the future.
      3   I feel very discouraged about the future most of the time.
      4   I feel that the future is hopeless and that things will never improve.

21)   0   I do not feel irritated or annoyed.
1   I occasionally get a little more irritated than usual.
2   I get irritated or annoyed by things that usually don't bother me.
3   I feel irritated or annoyed almost all the time.
4   I feel so depressed that I don't get irritated at all by things that used to bother
       me.

22)   0   I am not worried about my physical health.
      1   I am occasionally concerned about bodily aches and pains.
      2   I am worried about my physical health.
      3   I am very worried about my physical health.
      4   I am so worried about my physical health that I cannot think about
             anything else.

23)   Circle the statement that best describes how your mood varies during the
      course of the day:

      0   I clearly feel the most depressed in the morning.
      1   I clearly feel the most depressed in the afternoon.
      2   I clearly feel the most depressed in the evening.
      3   I do not feel consistently more depressed during any particular part of
             the day.

24)   Do you feel any better when something pleasant happens or someone tries to
      cheer you up?

      0   Yes, I feel almost normal for a short time.
      1   I feel a little better, but I still feel somewhat depressed.
      2   No, I don't feel any better.

25) How does the feeling of depression or sadness compare with the depression you would feel after someone close to you died? (If the 2 types of depression differ ONLY in severity circle #0).

    0   There is no difference between the two types of depression.

    1   There is a definite difference between the two.

Western
Research

Research Ethics

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Elizabeth Hayden
File Number:103574
Review Level:Delegated
Approved Local Adult Participants:60
Approved Local Minor Participants:60
Protocol Title:Familial patterns of cortisol reactivity in response to stress.
Department & Institution:Social Science\Psychology,Western University
Sponsor:
Ethics Approval Date:May 09, 2013 Expiry Date:September 30, 2013
Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Other	References	2013/03/26
Western University Protocol		2013/03/26
Response to Board Recommendations	Description of requested edits	2013/05/01
Revised Letter of Information & Consent	Revised Parent Consent for Self	2013/05/01
Revised Letter of Information & Consent	Revised Parent Consent for Child	2013/05/01
Assent	Letter of Assent	2013/05/01
Instruments	Questionnaire Package	2013/05/01

This is to notify you that The University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/ICH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced revision(s) or amendment(s) on the approval date noted above. The membership of this REB also complies with the membership requirements for REB's as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Signature

Ethics Officer to Contact for Further Information

Erika Basile	Grace Kelly	Shantel Walcott

This is an official document. Please retain the original in your files.

Curriculum Vitae
Sarah Joan Ouellette

Education:

2013 – Present	M.Sc. Candidate, Clinical Psychology Program, University of Western Ontario.
2009-2013	Honours Bachelor of Science (Psychology, with Distinction), Queen's University.

Honours and Awards:

2014-2015; 2013-2014	QOL Graduate Research Award, Children's Health Research Institute, $9000.00
2013-2014	Ralph S. Devereux Award, University of Western Ontario, $1000.00
2009-2013	Dean's List Recipient, Faculty of Arts and Science, Queen's University.
2009-2010	Queen's University Excellence Scholarship Recipient, $1000.00.

Clinical Training:

2014-2015	Assessment Practicum; Dr. Lindsey Forbes, Private Practice
2014-2015	Assessment Practicum; Dr. Colin King, TVDSB
2013	Initial Intervention Practicum; Dr. Jared French, SDC

Teaching Experience:

2013-2015	Graduate Teaching Assistant. Psychology 3220 – Child Psychopathology. University of Western Ontario.

Community Lectures:

2015   "Nature AND Nurture: The Interplay between Biology and Environment in Depression". Advocacy Through Action, London Central Public Library.

2014   "Coping with Stress: Distress Tolerance and Mindfulness". Advocacy Through Action, London Central Public Library.

Academic Posters:

Ouellette, S**.,** Russell, E., Kryski, K., Sheikh, H., Singh, S., Koren, G., & Hayden, E. Hair cortisol concentrations in low- and high-stress mother-daughter dyads: A pilot study of associations and moderators. *Poster presented at the28th Annual Society for Research in Psychopathology Conference.* Evanston, IL. [September 21, 2014]

Heenan, A., Best, M. W., Ouellette, S. J., Meiklejohn, E., Troje, N. F., & Bowie C. R. (2014). Assessing threat responses towards the symptoms and diagnosis of schizophrenia by measuring visual perceptual biases**.** *Poster presented at the 4th Biennial Schizophrenia International Research Society Conference.* Florence, Italy. [April 5 – 9]

Gupta, M., Grossman, M., Holshausen, K., Best, M., Killam, K., Law, C., Ouellette, S., and Bowie, C. (2013). Action -based cognitive remediation versus computer drill and practice: The added value of incorporating real world props and tangible bridging. *Poster presented at the conference for Cognitive Remediation in Psychiatry.* New York, NY. [June 7]

Publications:

Ouellette, S.J., Russell, E., Kryski, K.R., Sheikh, H., Singh, S., Koren, G., & Hayden, E.P. (In Press). Hair cortisol concentrations in higher- and lower-stress mother-daughter dyads: A pilot study of associations and moderators. Developmental Psychobiology.

Heenan, A., Best, M.W., Ouellette, S.J., Meiklejohn, E., Troje, N. F., Bowie, C. R. (2014). Assessing threat responses towards individuals with schizophrenia using visual perceptual biases. Schizophrenia Research, 159, 238-242.

Professional Affiliations:

2013 – Present   Society for a Science of Clinical Psychology, Student Member

2013 – Present   Association for Psychological Science, Graduate Student Affiliate

2013 – Present   Society for Research in Psychopathology, Associate Member

2013 – 2014   Canadian Psychological Association, Student Member

2013 – 2014   London Regional Psychological Association, Student Member

Volunteer and Additional Work Experience:

2014 – Present   Occasional reviewer for the Western Undergraduate Psychology Journal, University of Western Ontario.

2014 – Present   Member of the Clinical Student Advisory Committee, Department of Psychology, University of Western Ontario.

2014 – Present   Member of the Test Library Committee, Department of Psychology, University of Western Ontario.

2014 – 2015   Executive member of the Psychology Graduate Student Association, Department of Psychology, University of Western Ontario.

2013 – 2015   Co-leader of Marketing Committee, Advocacy Through Action, Department of Psychology, University of Western Ontario

2013 – 2014   Member of Graduate Affairs Committee, Psychology Graduate Student Association, University of Western Ontario.

2013 – 2014   Volunteer member of Let's Talk Science in London ON, evaluating gifted elementary students' presentations of medical diagnoses, and leading science-based workshops in a class of elementary students at Masonville Public School.

Summer 2011   Paid Medical Clerk at Hamilton-Wentworth Detention Center in Hamilton, ON.

Summer 2010 Volunteer Mealtime Supervisor in the eating disorders program at The Homewood Psychiatric Hospital in Guelph, ON.

Research Interests:

Biological Indices of Stress Reactivity
Hormonal Influences on Cognition and Affect
Mood and Anxiety Disorders
Gene-Environment Interactions