KNOWING YOUR BABY MATTERS:
THE IMPACT OF TEMPERAMENT
GUIDANCE MATERIALS
FOR PARENTS

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of SYDNEY LAUREN IVERSON find it satisfactory and recommend that it be accepted.

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Abstract

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Past temperament guidance programs have been successfully utilized to improve caregiver understanding of temperament, foster responsivity in parent-child interactions, and teach strategies for appropriately responding to various temperament traits. No studies to date have examined the impact of simply providing brief psychoeducational temperament information to parents, nor have previous interventions utilized the psychobiological model of temperament as a frame for intervention, both evaluated in the present study. Parents of infants ages three to 12 months (n = 35) participated in a within-subjects repeated measures intervention examining the impact of the distribution of a comprehensive temperament brochure on temperament knowledge, attitudes toward the program, and goodness of fit (measured by examining multiple self-reported parenting stress domains and observed parent child interaction factors, including sensitivity, reciprocity, directedness, tempo, intensity, and emotional tone in both play and teaching tasks). Temperament brochures were provided within two weeks of the initial home visit, and parents were given approximately two weeks to review the brochure before being sent the final questionnaires and scheduling the final home visit. Parents demonstrated an increase in
temperament knowledge and were generally accepting of the brief temperament program. Contrary to hypotheses, no changes in parenting stress were reported following the intervention; however, behavioral changes in parent-child interactions were observed. In the teaching task, increases in sensitivity were observed, and interactions shifted from more parent-directed to more balanced following the intervention. Differential utility effects were also observed in the context of the teaching task. Infant gender functioned as a moderator of intervention effects in two parent-child interaction domains. A significant increase in reciprocity was observed strictly for interactions between mothers and boys, with these interactions demonstrating significantly lower levels of reciprocity than interactions with girls prior to the intervention. Next, gender interacted with directedness, in that interactions became more balanced in interactions with female infants, but remained more parent directed with male infants. Finally, maternal education functioned as a moderator of tempo, insofar as mothers in the higher education group shifted from slower to moderate tempo following the intervention. Promising results suggest the need for continued implementation and evaluation of temperament-based interventions.
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Dedication

For my mom and dad, who provide constant encouragement and support.

Thank you for your unfailing belief in me, as it has taught me to always believe in myself.
CHAPTER ONE

INTRODUCTION

Temperament, often seen as the early stages of personality, has been defined in many ways throughout the history of temperament research. From early in infancy, babies show significant variability in their reactions and responses to the environment linked to underlying differences, and these differences persist throughout life (Zentner & Shiner, 2012). There is still extensive debate around the best definition and model of temperament. Zentner and Bates (2008), however, created a general inclusion criterion around the classification of temperament, as it fits within each of the various temperament models that have been proposed. Zentner and Bates described that temperament includes individual differences in typical behaviors in the domains of affect, activity, attention, and sensory sensitivity. These domains are expressed in characteristics of the individual, and include particular response patterns (i.e., intensity, latency, duration, threshold, and recovery time) in situations. Additionally, temperament is noted as having a biological basis, with an appearance in the first few years of life. Finally, temperament is described as relatively enduring, and predictive of various outcomes, such as risk for psychopathology (e.g., Ormel et al., 2005), problems with socialization (e.g., Wetter & Hankin, 2009), and low academic achievement (e.g., Graziano, Reavis, Keane, & Calkins, 2007).

Presently, the psychobiological model of temperament (Rothbart, 1981) is the most widely accepted temperament framework, defining temperament as constitutionally based individual differences in reactivity and self-regulation (Rothbart & Derryberry, 1981). Reactivity, broken up into positive and negative reactivity within the three-factor structure of the psychobiological model, describes one’s disposition toward positive and negative emotionality. Orienting and regulatory capacity, the final factor, refers to the processes that assist us with
regulating reactivity. Early reactivity and regulation provide the basis for coping with challenges in the environment (Rothbart, 2012).

Numerous studies and reviews have demonstrated that temperament directly predicts children’s adjustment problems over and above other risk factors (Nigg, 2006; Rothbart & Bates, 2006), and is a critical component of early social-emotional development. Social-emotional development describes the child’s experience, expression, and management of emotions, and the ability to have healthy, fulfilling relationships with others. (Cohen, Onunaku, Clothier, & Poppe, 2005). Primary caregivers are exceptionally important for early social-emotional development, and impact long term relationships with peers, teachers, and partners.

The interplay between parents and children is complex, and undoubtedly influenced by both temperament and environmental factors. It is important to consider temperament as part of a transactional, developmental process with the environment, with the awareness that parenting can alter temperamental trajectories (Bates, Schermerhorn, & Peterson, 2012). Despite temperament often being described as stable, temperament attributes undergo development, especially rapid in early childhood (Carnicero, Pérez-López, Salinas, & Martínez-Fuentes, 2000; Sallquist et al., 2010), shaped in part by environmental effects (e.g., parenting, home environment) (Bridgett, Laake, Gartstein, & Dorn, 2013; Gartstein, Crawford, & Robertson, 2008). A parent’s ability to respond sensitively to their child, while successfully adapting parenting approaches based on their child’s temperament, directly promotes positive adjustment (Kochanska, 1995; Lengua, Wolchik, Sandler, & West, 2000). Enough specific information about temperament and temperament-related outcomes exists to provide accurate information and meaningful recommendations to caregivers about how to positively influence temperament development (e.g., Bridgett et al., 2013; Gartstein, Crawford, & Robertson, 2008), which is
particularly relevant to clinical applications. Thus, aiming temperament guidance at understanding individual differences related to temperament, and improving positive parenting strategies, may assist children in developing more positive emotional experiences and regulatory capacities (Kochanska, 1995; Lengua, Honorado, & Bush, 2007).

**Health Promotion and Prevention through Temperament Related Guidance**

It has been suggested by The Research and Policy Report on Early Childhood that materials and programs supporting positive social-emotional development can be broken up into promotion, prevention, and treatment domains (Cohen et al., 2005). Promotion focuses on enhancing well-being among all children, while prevention services are aimed at children who are at-risk for poor mental health outcomes. Treatment involves specialized services addressing identified problems. The policy report indicates that in the promotion realm, parents can benefit from public service announcements, brochures, and parent education workshops to promote knowledge of typical development and positive interactions with their children. Despite the suggestion that promotion programs have the capacity to reduce utilization of clinical services and improve developmental outcomes, little research on the effects of promotion efforts exists. It has been suggested that all new public health interventions in these domains should implement formative evaluations of satisfaction and accessibility to ensure that the program makes a positive impact, and that alterations of the program should be made in later dissemination as needed (Boyd & Windsor, 2003; Windsor, Baranowski, Clark, & Cutter, 1994).

Although few studies about the distribution of information to parents about social-emotional concerns have been conducted to determine the impact of the materials, it is notable that between 24 and 50 percent of pediatric office visits involve a behavioral, emotional, or educational concern (Cassidy & Jellinek, 1998; Cooper, Valleley, Polaha, Begeny, & Evans,
Temperament differences underlie many of the problems in infancy and early childhood that bring families in for help (Carey & McDevitt, 1989), however little information about temperament or social-emotional development are incorporated into routine care (Carrey, 1995). Temperament impacts daily parent-child interactions (e.g., Boivin et al., 2005; Lengua, 2006), predispositions to sleeping and feeding problems (Morrell & Steele, 2003; Schmid, Schreier, Meyer, & Wolke, 2009), and response to illness and medical care (Helgadóttir & Wilson, 2004; Young, 2005). It has been suggested that due to a lack of parental and clinician knowledge of temperament, there may incorrect diagnoses of clinical problems, higher than necessary referrals to specialists or other professionals (e.g., psychologists), and inappropriate treatments may be implemented. All of this information suggests that providing parents with guidance information about temperament has the potential to impact the utilization of clinical and medical care, improve family functioning, and reduce the risk of negative developmental outcomes.

Previous temperament guidance programs have been aimed at parents with promotion and prevention efforts, with the overall goal of enhancing social-emotional developmental outcomes. Some temperament interventions have taken a health promotion approach, with more widespread applicability, aiming at improving general well-being, whereas other programs have targeted specifically “at-risk” or “temperamentally difficult” children in a prevention context. Temperament-based promotion/prevention programs have grown to include four primary domains, as described by McClowry and Collins (2012), with the hope of creating environments that benefit child adjustment and development. Temperament-based interventions aim to (1) assist parents, teachers, and caregivers in understanding how a child’s temperament influences their behavior; (2) foster responsivity in child-caregiver interactions to improve the relationship; (3) teach strategies to caregivers to reduce behavior problems or increase competency in
children; and (4) assist children in utilizing strategies to improve self-regulation. There are numerous interventions and curriculums to assist children with regulation, the fourth proposed aim of temperament-based interventions (e.g., Diamond, Barnett, Thomas, & Munro, 2008); however, the primary focus of this project involves altering perceptions of parents to meet the needs of their own child’s unique temperament more effectively, rather than attempting to shift temperament trajectories in children through direct child instruction. Though these regulatory focused interventions have been shown to be beneficial, it is one of the only interventions available in infancy. Further efforts toward preventative interventions are warranted, as they are likely to be beneficial during the early childhood years, and significantly more cost effective in their delivery. Further, although numerous in-person interventions for parents exist that utilize temperament as a mechanism for change (e.g., McClowry, Snow, Tamis-LeMonda, & Rodriguez, 2010; Sheeber & Johnson, 1994), the current project specifically evaluates the effectiveness of written temperament materials for parents. In-person temperament promotion and prevention programs for caregivers have shown promise in increasing temperament knowledge (Franyo & Hyson, 1999; Sheeber & Johnson, 1994), improving child behavior problems (e.g., McClowry, Snow, & Tamis-LeMonda, 2005), and increasing comfort in the parenting role (Sheeber & Johnson, 1994); however, these interventions are intensive, costly, and challenging to disseminate, partially due to a lack of qualified temperament counselors. Thus, temperament guidance programs with a specific focus on written dissemination, most closely related to the current project, are reviewed herein.

**Interventions with Written Temperament Guidance**

Three non-randomized trials (Cameron & Rice, 1986; Cameron, Rice, & Sparkman, 2013; & Ostergren, 1997), and one randomized controlled trial (Cameron & Rice, 1986), have
provided temperament feedback to parents as a mechanism for change in a promotion context. Cameron and Rice (1986) were the first to distribute unique temperament information to parents. Participating families in their initial non-randomized trial were provided with a mailed packet of information that included guidance for temperament related problems based on parent report of infant temperament at four months of age. Temperament guidance packets were mailed approximately every two months between five and 12 months of age. Problems, along with pertinent guidance for parents, were identified based on each infant’s unique temperament profile. For each mailing that the family received, two of 37 possible problems in the domains of sleep, eating, assertiveness, accident risk, sensitivity, and passivity/dependency with the greatest similarity to the profile of the child were selected based on the clinical experience and understanding of relevant literature of the authors. The mailings provided descriptions of the problems and why they occur, as well as suggestions for handling the problems. Parents in the study validated the predictive accuracy of the materials, as well as identified that the guidance material and behavioral management tips were useful. Due to the success of the predictive accuracy, and usefulness reported by parents, Cameron and Rice continued the project as a more widespread randomized controlled trial, utilizing the same procedures. The randomized trial, published in the same paper, also demonstrated significant predictive accuracy of the materials, with parents still reporting the feedback as helpful. Of note, parents who reported more temperament-related problems in their children reported significantly higher utility of the feedback.

Ostergren (1997) utilized a similar procedure, where a temperament questionnaire was sent to parents of four-month-old infants. Parents who returned the questionnaire received an individualized temperament profile in the mail, with instructions for how to interpret the
information. In addition, this study also utilized the same individualized guidance material for the 5-6 and 7-8-month age ranges that were developed by Cameron and Rice (1986) as described above, to provide parents with information about anticipated problems and management strategies. One month following distribution of the 7-8-month guidance material, parents were sent follow-up questionnaires asking them to rate the usefulness of the guidance materials. Qualitatively, the majority of parents reported that the guidance materials were useful and provided helpful behavior management strategies. Quantitatively, parents provided generally high overall usefulness rating for the temperament guidance materials, with the initial 5-6-month materials rated as most useful in explaining the child’s temperament, increasing understanding and anticipation of child behaviors. The 7-8-month guidance materials were also deemed useful based on the mean of parent-report usefulness scores. Further, parents who rated their infants as more globally difficult reported materials as significantly more useful, though specific temperament factors related to difficult temperament were not significantly predictive of higher utility of the guidance materials. Interestingly, parental education was a specific predictor of usefulness, with lower education predicting higher utility.

In the final study by Cameron and colleagues (2013), HMO members who were 3.5 years of age were alternatively assigned to the intervention or control group. In the intervention condition, parents received an individualized temperament profile for their child in the mail. In addition, parents were provided with general information about variations in temperament, discussion of behavioral issues related to a child’s specific temperament (from the same categories of behavior problems utilized in Cameron & Rice, 1986), and management strategies for temperament related behavioral issues. Eighteen months after receiving the guidance packet, parents were sent a guidance evaluation questionnaire. The majority of parents reported that they
saw their children more clearly because of the intervention, learned about how temperament influenced their child’s behaviors, and would recommend the intervention to other parents. Most interesting, however, was the impact of the intervention on medical visits. Medical files of the children were examined until age 19, and indicated that although there were not significant reduction of medical visits in girls in either group, there were significantly fewer medical visits in the boys in the intervention group as compared to controls, with reductions primarily seen between the ages of four and 10. The reduction in visits was specific to the domains of anxiety, with a near significant reduction in visits related to externalizing disorders and ADHD. Further, a significant interaction emerged, indicating that the reduction in medical visits was more prominent in boys with harder-to-manage temperaments.

Some of the results from interventions described above are consistent with the differential susceptibility model (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). Differential susceptibility, as defined by Belsky (1997), proposes that temperamental predispositions marked by reactivity and/or negative affect, viewed as primarily genetically based, cause heightened susceptibility to negative effects of risky environments, and to the beneficial effects of supportive environments (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). Thus, it has been suggested that children with more difficult or at-risk temperament profiles may benefit more from treatment, including parenting interventions (Anzman-Frasca, Stifer, Paul, & Birch, 2014). Parents of children with more difficult temperament profiles consistently rated the guidance materials as more useful. Further, differential treatment effects in the studies described here were found for boys, potentially related to gender differences in early childhood (e.g., boys have higher levels of surgency; Else-quest, Hyde, Goldsmith, & Hulle, 2006), and for parents with lower education, potentially because lower education parents do not seek out written
parenting resources on their own. These results suggest that future temperament guidance programs should continue to evaluate these factors as potential moderators of treatment effects.

Based on results from these studies, it is clear that dissemination of temperament information in the form of written guidance regarding children’s unique temperament profiles has an impact on families, and is a more cost-effective approach to educating parents, than in-person programs. It has been demonstrated that temperament guidance services have the ability to reduce medical visits (Cameron & Rice, 1986), with families reporting fewer trips to the emergency room or pediatrician due to temperament related problems (Cameron, Rice, Rosen, & Chesterman, 1996). Importantly, utilizing temperament feedback in a widespread health promotion effort will provide preventative intervention for temperamentally at-risk children, facing increased probability of psychopathology (e.g., Stringaris, Maughan, & Goodman, 2010). Despite these promising outcomes, few programs have attempted to integrate temperament information into parent training or pediatric care settings. Although previous evaluations of temperament programs have indicated significant improvement in temperament knowledge as a result of the intervention (Franyo & Hyson, 1999; Sheeber & Johnson, 1994); the impact of comprehensive written temperament information on such knowledge has not been examined. In an attempt to address this gap, the present project sought to distribute comprehensive, educational temperament information via brochures to parents of infants. If gains in temperament knowledge were reported by parents in the study, temperament information was deemed useful by parents, and/or changes were seen in important domains such as parenting stress and parent-child interactions, there would be increased support for the integration of temperament information as a health promotion effort targeting the general population.
Further, although numerous temperament-based guidance programs and interventions are currently in existence, no previous studies have utilized the psychobiological model of temperament in a psychoeducational parental guidance context. This is somewhat surprising, as the psychobiological model has become most widely used in the temperament literature (Gartstein, Putnam, Aron, & Rothbart, 2016). Due to the abundance of research that exists on temperament and outcomes utilizing this framework (e.g., Bridgett et al., 2013; Gartstein, Crawford, & Robertson, 2008; Kochanska, 1991), the psychobiological model would allow interventions to provide caregivers with specific information about likely risk and protective factors relevant to different temperament presentations. Information could be delivered in a manner than emphasizes the tension between the intensity of reactive tendencies and the efficiency of regulatory efforts, taking blame away from the child and parent alike. That is, parents could be encouraged to view their young children as struggling to develop regulatory capacity capable of regulating their significant reactivity, and at the same time could be provided with information that validates their perception of parenting being demanding in light of their child’s temperament profile. Importantly, conveying to parents that they can enhance child regulatory efforts and encourage positive change can provide an uplifting message, emphasizing the role that caregivers play in guiding their child toward a more positive developmental trajectory, with respect to social and emotional factors (Kochanska, 1995; Lengua, Horonado, & Bush, 2007). The present study was the first of its kind insofar as it utilized the psychobiological temperament framework in a psychoeducational effort with parents, providing temperament-related guidance. Positive results from the distribution of the temperament brochures in the present study would support a wider scope for dissemination of temperament information based in the psychobiological model in future health promotion and prevention efforts with families.
Potential Impact from Improved Knowledge of Temperament

The current study sought examination of the family and relational impact of comprehensive psychoeducational temperament materials. It is important to discuss the areas of expected improvements, with an emphasis on increased goodness of fit. Goodness of fit has long influenced temperament research, as various operationalizations of this construct were shown to have implications for family dynamics and developmental outcomes. These operationalizations have varied in terms of their content and approach to measurement and will be outlined in the discussion below.

Goodness of Fit

Thomas and Chess (1986) initiated the first temperament-based intervention following the New York Longitudinal Study, where they studied the classification of temperament and how temperament influences children’s adaptation to their environment. Based on their observations of interactions between child temperament and the environment, they developed the concept of “goodness of fit,” or the compatibility between a child’s temperament and their environment. During the course of this research, Thomas and Chess used temperament information to provide parents with informal goodness of fit suggestions based in their child’s unique temperament.

Since Thomas and Chess’ early work utilizing the concept of goodness of fit in an informal intervention, the concept has been commonly invoked, yet rarely examined empirically, and operationalized in a heterogeneous manner. There is general consensus that goodness of fit is a useful concept that highlights the interplay of biologically based temperament and the environment (e.g., parenting), expected to either result in positive adjustment or emergence of symptoms/behavior problems (Gartstein et al., 2016). At the same time, concerns regarding approaches utilized to operationalize goodness of fit have been raised (Newland & Crnic, 2016).
One approach, developed by Lerner, Lerner, and colleagues, emphasized the match between parental expectations of children and the children’s actual temperamental characteristics (Lerner & Lerner, 1987; Windle & Lerner, 1986). In a study utilizing this model, parents who indicated a better fit between adolescent temperament and expected behaviors reported less conduct and school related problems than parents rating their adolescents’ temperament fit with parental expectations as poor (Talwar, Nitz, & Lerner, 1990). Importantly, parental goodness of fit scores were associated with higher teacher perceived competence and scholastic achievement as well. Though this approach has provided promising results, limitations have also been noted (e.g., parents being idealistic in their expectations, etc.), and this approach has not been utilized in an intervention context of with young children (Newland & Crnic, 2016).

An additional approach to evaluating goodness of fit involves behavioral matching, wherein temperament profiles of children and parents were directly compared for level of congruence (Wallander, Hubert, & Varni, 1988). Wallander and colleagues, however, found no evidence that this approach to goodness of fit was predictive of behavior problems in a sample of physically handicapped children. A similar non-significant effect was found when the degree of match between infant and family rhythmicity was related to infant behavior problems and family adjustment (Sprunger, Boyce, & Gaines, 1985). One study did, however, find that the match between high child and parent novelty-seeking predicted child internalizing and externalizing problems (Rettew, Stranger, McKee, Doyle, & Hudziak, 2006). Overall, it has been suggested that the behavior matching approach does not accurately capture the original Thomas and Chess goodness of fit concept, as it is concerned more with direct comparability of temperament tendencies demonstrated by parents and offspring, rather than parent-child relationship
implications. It is not necessarily the case that temperament characteristics must match for optimal fit.

Most notably, goodness of fit has been evaluated as the interaction between child characteristics (e.g., temperament) and different parent personality characteristics and response styles. This approach suggests that an optimal fit depends on characteristics of both parent and child, and what combinations of these traits lead to more optimal child outcomes represent the crux of the empirical questions. For example, Mangelsdorf, Gunnar, Kestenbaum, Lang, and Andreas (1990) found that infants who were prone to distress and had mothers low on constraint (i.e., rigidity, traditionalism, and control) were more likely to demonstrate evidence of secure attachment. Thus, goodness of fit in relations between maternal and infant characteristics was deemed important in the context of attachment security. More recently, toddlers’ temperament reactivity was strongly associated with maternal report of insensitive maternal behavior and low observed maternal sensitivity among mothers with less engaged coping styles than mothers with more engaged coping styles (Gudmundson & Leerkes, 2012). In this study, it was suggested that mothers with more engaged coping styles may be more skilled at regulating arousal during toddler distress, responding more sensitively, creating better fit. Thus, maternal sensitivity was viewed as ultimately critical for creation of a good match, or goodness of fit, in the mother-child relationship.

One final approach to examining goodness of fit, considered more subjective in nature, has been titled the stress-appraisal-coping model (Seifer et al., 2014). This model defines objective stressors, in addition to the cognitive and affective appraisals of those stressors, and the social support, which aids in coping efforts (e.g., Hammen, 1992; Schaefer, Coyne, & Lazarus, 1981). Within this approach, the impact of infant temperament is viewed as a component in the
life stress model, with an emphasis on considering qualities of child behavior in relation to parental appraisals and adaptation strategies for dealing with mismatches. Following this approach to conceptualizing goodness of fit, Power and colleagues (1990) examined how differences in attribution regarding negative child behaviors lead to later temperament reporting, finding that mothers who attributed negative behaviors to physical discomfort in six-week-old infants rated the same youngsters as more temperamentally difficult at four months. Further, mothers who implicated resistance or disinterest in the same negative behavior later rated temperament as unpredictable. Collectively, these findings suggest that parental appraisals of child negative behaviors influence how caregivers subsequently perceive and report child temperament.

One recent study took a somewhat novel approach related to the stress-appraisal-coping model in evaluating goodness of fit, examining maternal expectations and perceptions in addition to parental behaviors in the context of mother-child interactions (Seifer et al., 2014). Seifer and colleagues created a goodness of fit interview for mothers, and found that goodness of fit (e.g., description of child characteristics, similarity to parent, match with expectations, mismatches between child and family members, parental adaptation to mismatches) was in turn associated with attachment security, controlling for other child, parent, and family characteristics. Additionally, parent-child interaction quality was evaluated during a play activity, which was coded to reflect parental sensitivity. Overall, mothers’ who were able to conceptualize their child positively as having a positive fit within the context of the family, as well as adjust their expectations and respond to their children in more sensitive ways during interactions, had more positive attachment relationships. Thus, parent perceptions of their child, their own ability to adapt, and their direct responses to the child (i.e., sensitivity) were shown to contribute to secure
attachment. Parental perceptions of their child and their child’s characteristics influence the way in which parents are able to interact with and be helpful to their children. For example, maternal perceptions of infant soothability moderated the relationship between infant temperament and maternal sensitivity, in that when mothers perceived soothability as high, they demonstrated higher sensitivity, with the opposite effect emerging when perceived soothability was low (Ghera, Hane, Malesa, & Fox, 2006). This is applicable to an intervention context, in that assisting parents with understanding their children’s characteristics may improve the quality of parent-child interactions and relationships, increasing goodness of fit. Thus, sensitivity again emerged as a critical ingredient of goodness of fit, linked with important child/family outcomes.

Though empirical approaches utilized to test the concept of goodness of fit have varied, some general conclusions regarding goodness of fit operationalizations can be offered. First, parental sensitivity and responsiveness appear particularly important to consider when examining goodness of fit, based on research conducted in early childhood. Research has consistently demonstrated that sensitivity and responsiveness lead to improved developmental outcomes (Lohaus, Keller, Ball, Voelker, & Elben, 2004; McElwain & Booth-LaForce, 2006), and integrating these into the conceptualization and measurement of goodness also provides an opportunity to evaluate the manner in which parents respond to their child’s characteristics and demands in a given situation, either meeting associated challenges appropriately, or contributing to a negative quality of exchanges. When children pose challenges to their parents, the manner in which parents respond to their children is critical for social-emotional developmental outcomes (Seifer et al., 2014). A meta-analytic review demonstrated that training mothers of irritable infants to be more sensitive and responsive greatly enhances the trajectory of social-emotional functioning for the offspring, otherwise at risk for insecure attachment and related difficulties.
(Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2005). Overall, these findings suggest that parents who are able to be sensitive and responsive despite frequent/intense manifestations of infant negative affect, improve the likelihood that their child will demonstrate healthy social-emotional development and positive adjustment, as s/he is more likely to experience a good match with caregivers’ demands and expectations. Thus, parent-child interaction factors, including sensitivity and responsiveness, were incorporated in the present study as indicators of goodness of fit.

Additionally, elements of the family and parent-child interaction context that serve to diminish the goodness of fit have also been emphasized in research. Namely, parenting stress has been examined extensively, and consistently shown to impact the quality of parent-child interactions and developmental outcomes. High parenting stress has been shown to undermine one’s sense of perceived mastery in parenting, in turn leading to maternal depressive symptoms (Farmer & Lee, 2011). Parenting stress has been demonstrated as related to the development of the acquisition of the child’s self-regulatory skills, with higher parenting stress linked to lower children’s self-regulatory abilities (Ayoub, Vallotton, & Mastergeorge, 2011). Higher parenting stress is also related to increased child externalizing behavior problems (Neece, Green, & Baker, 2012) and internalizing symptoms (Rodriguez, 2011). Higher levels of parenting stress can interfere with a parent’s ability to respond appropriately to their child in difficult situations (e.g., Belsky, 1984; Roberts, 1989), leading to poorer quality parent-child exchanges (e.g., less emotionally warm) and relational fit. The reverse direction has also been described, with a recent study, demonstrating that poor fit in mother-child interactions led to increased parenting stress (Newland & Crnic, 2016). Thus, the relationship between parenting stress and goodness of fit seems to be transactional in nature, related to parental perceptions and responses to the child.
Due to its demonstrated importance, parenting stress was also examined in the present study as a component of goodness of fit that may be impacted by increased knowledge of temperament, and goodness of fit in general.

**Goodness of Fit Constructs Measured in the Present Study**

No study to date has evaluated parent child interactions factors (e.g., sensitivity and responsiveness) and parenting stress together in the context of the goodness of fit relationships, let alone as part of a measurement scheme for evaluating the impact of temperament education materials, undertaken in the present investigation. Each of these components are described below.

**Parenting Stress**

Parenting stress is a well-established construct, often defined as the perceived discrepancy between parenting demands and the resources available to meet those demands (Abidin, 1995). To understanding parenting stress, it is critical to highlight its key attribute related to self-perception, namely it is to some extent “in the eye of the beholder”. Parenting stress is related to both parent and child characteristics in interactions (Misri et al., 2010), and entails how stressful the parent perceives the infant and their characteristics to be (Östberg & Hagekull, 2000; Spinelli, Poehlmann, & Bolt, 2013). Parental attributions regarding their child’s behavior can interfere with effective parenting behaviors, particularly when they lead to negative attitudes toward the disposition of their child or their own abilities to adequately parent. These negative attributions create difficulty with generating appropriate/adaptive parenting reactions (Bugentall, Brown, & Reiss, 1996). For example, higher levels of parent-reported perceptions of difficult behavior have been associated with emotional neglect of the child (Harrington, Black, Starr, & Dubowitz, 1998), and internal parental conflicts, leading to increased coercive
interaction styles (Lee & Bates, 1985). Parental perceptions of the child’s temperament influence parental behaviors during care-giving activities (Mäntymaa, Puura, Luoma, Salmelin, & Tamminen, 2006), and have direct effects on the parent-child relationship. Although parents alter their responses in accordance to situation, parents have been shown to anticipate certain behaviors from their children based on perceptions of temperament, which consequently influences their response patterns (Sanson & Rothbart, 1995). Negative expectations related to parental perceptions of child temperament being “difficult” have been linked with unresponsiveness in caregiving (Milliones, 1978), coercive discipline (Webster-Stratton & Eyberg, 1982), failure to encourage independence during play (Rubin, Nelsen, Hastings, & Asendorpf, 1999), and maternal rejection in problem solving tasks (Neitzel & Stright, 2004).

Parenting self-efficacy, or the belief that a parent has the ability to influence their children in a way that fosters development and success, impacts parenting motivation and behavior (Ardelt & Eccles, 2001). Caregivers with high parenting self-efficacy have been described as more likely to make changes they believe to directly benefit their child. For example, parents who perceive themselves as more efficacious in understanding and influencing the development of their child, and see themselves as able to meet demands of parenting, report higher levels of parenting competence, lower levels of stress in the parental role, and greater satisfaction with overall child functioning (Jones & Prinz, 2005).

It is critical to recognize that maternal perceptions of the child can be altered through intervention efforts aimed at increasing knowledge. Knowledge, including specific facts/information, and skills, can be gained through education as well as experience, directly impacting relevant areas of functioning; knowledge concerning child development assists families with implementing positive parenting practices (Morawska, Winter, & Sanders, 2009).
Parents with knowledge of evidence-based parenting practices, like how to soothe a crying infant, are more likely to engage in those positive parenting practices (e.g., in response to crying behavior; Breinher, Ford, & Gadsden, 2016). Psychoeducational parenting interventions have been repeatedly shown to improve perceived parenting competence by increasing knowledge of behavior and parenting responses (e.g., Cerezo, Dasi, & Ruiz, 2013; Reedtz, Handegard, & Morch, 2011).

Multiple parenting interventions aim to improve parental knowledge through education, in turn improving parenting related outcomes like parenting stress. Many intervention studies that have shown reductions in self-reported parenting stress have highlighted that parent education is an important treatment ingredient (e.g., Anastopoulos, Shelton, DuPaul, & Guevremont, 1993). Normalizing and educating parents about behavioral development through a temperament lens can be expected to have a positive influence on perceptions of the child and their behavior, as parenting has been described as more “stressful” for those who have less related knowledge (Deater-Deckard, 1998). Consequently, the reduction in parenting stress by providing temperament guidance may be twofold: directly altering negative perceptions of their child’s behavior and assisting parents with perceiving themselves as more knowledgeable about how to facilitate positive development in their child.

Parenting stress represents a multi-faceted construct, thus several underlying factors have to be considered in evaluating this caregiver variable. One frequently used measure, the Parenting Stress Index (PSI; Abidin, 1995), does just that, breaking parenting stress into multiple components, many of which have been evaluated in an intervention context. One such component, parenting sense of competence, has been shown to have improved through parenting guidance (e.g., Sanders, Markie-Dadds, & Turner, 2003). Previous parent training intervention
programs have been successful at lowering maternal depression (Feinberg & Kan, 2008), another factor within the parenting stress construct. Parental attachment, another component of the parenting stress index, has also been shown to be improved with more positive perceptions of children (Seifer et al., 2014). Two additional components of the parenting stress construct include maternal role restriction, or the feelings of how parenthood impacts their freedoms and other life roles, and maternal relationship with spouse. Participation in one lengthier parent focused program aimed at improving the quality of parent-child interactions was associated with reductions in role restriction and improved relationship with spouse (Armstrong & Morris, 2000), though changes in these domains of parenting stress have not been considered in the context of brief interventions. Results of these studies highlight the importance of considering parenting stress more generally, as well as examining the underlying factors that may be impacted by temperament-based parental guidance.

In the present study, we aimed to reduce parenting stress by altering parental perceptions of the child and their behavior, viewing these in a more favorable light, as well as perceptions of their own abilities as a parent, by increasing knowledge and understanding of temperament and its relationship to the parenting context. Temperament guidance provided to parents in the current project not only aimed to describe important infant temperament characteristics driving overt behavioral manifestations to increase temperament knowledge, but also highlighted ways in which caregivers could apply temperament information in the parenting context to influence positive outcomes. As previously mentioned, it has been suggested that knowledge of temperament can reduce parental blame of the child for difficult behaviors (e.g., fussiness) and assist parents with obtaining a less judgmental view of their infant’s behaviors (i.e., refraining from attributing intentionality to behavioral manifestations) and themselves. Relatedly, giving
parents “tips” for responding to temperament displays was expected to improve their knowledge and confidence in how to react in an appropriate and effective manner. We anticipated that through increasing caregiver knowledge of temperament, more positive perceptions of the infant would develop, and parental perception of their ability to competently meet the demands of parenting their infant would increase.

**Parent-Child Interactions**

As previously highlighted, the interaction between parent and child is a critical component of the goodness of fit construct. Sensitivity and responsiveness have been consistently shown to improve social-emotional trajectories for infants and children and have been studied most extensively in the parent-child interaction domain (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2005). It is important to mention that although maternal sensitivity and responsiveness are the two most studied parent-child interaction factors in relation to goodness of fit and developmental outcomes, other parent-child interaction factors are also important. For example, infants who received intermediate levels of interaction, rather than over or under stimulation, are more likely to develop secure attachment (Belsky, Rovine, & Taylor, 1984). Further, mothers who were more positive, (Ainsworth, Blehar, Waters, & Wall, 1978), less negative, more involved (Lyons-Ruth, Connell, Zoll, & Stahl, 1987) and paced their interactions more appropriately (Blehar, Leiberman, & Ainsworth, 1977; Egeland & Farber, 1984; Miyake, Chen, & Campos, 1985) also had better relational quality with their infants. Infants of mothers who interacted with their offspring in a more synchronous manner (Feldman, 2007; Isabella & Belsky, 1991), and interrupted their infants’ behaviors less frequently (Miyake et al., 1985) were also shown to have more positive developmental outcomes, such as attachment security and higher self-regulation. Though no other parent-child interaction factors besides sensitivity and
responsiveness have been examined in a temperament related intervention context in the past, it is possible that altering maternal perceptions of infant temperament may also influence other aspects of mother-infant exchanges. Thus, changes in additional parent child interaction factors (i.e., reciprocity, tempo, intensity, emotional tone, and child vs. parent directedness), as a result of receiving the temperament information, were also be examined, albeit in an exploratory manner.

**Behavioral Change in Brief Interventions**

Examining the impact of psychoeducational materials on behavioral change, in the form of parent-child interactions, involves additional complexity. The underlying assumption for the psychoeducational parenting program is that it will lead to changes in parenting behaviors as a mechanism for promotion of trajectory of health and adjustment for children (Gardner, Burton, & Klimes, 2006). Following acquisition of knowledge in a psychoeducational context, however, parents must be motivated, willing, and able to make behavioral changes in the context of interactions with their child. Parenting related motivation and desire to change has been cited as an important variable for intervention efficacy (Nock & Ferriter, 2005). The multifaceted nature of motivation for change is often described as involving somewhat independent components, such as decisions around whether changes are important or necessary, benefits and drawbacks of implementing change, belief that one can change, and desire to do things differently (Treasure & Schmidt, 2001). Thus, it is important to examine both internal processes and perceptions (like parenting stress and attitudes), as well as the translation of these internal processes into outward changes in parent-child interactions because change in one does not necessarily bode change in the other. The present study sought to address both of these domains.
Past research has demonstrated that psychoeducational interventions do have the potential for direct, observable change. In the fast-paced medical world, brief educational materials about various health topics are distributed to parents on a regular basis, with many studies examining the impact of written information on the promotion of positive health outcomes. One study demonstrated that providing parents with information about ways to improve children’s sleep created significant increases in parental knowledge about healthy sleep, and parents reported specific plans to create positive changes to their children’s sleep practices, more directly suggesting behavioral changes following the intervention (Jones, Owens, & Pham, 2013). Eleven NICUs in the California Perinatal Quality of Care Collaborative created a multihospital intervention around the topic of breastfeeding, finding that breast milk/nutrition change packets distributed to parents created a significant increase in breastfeeding behavior that was sustained over time (Lee et al., 2012). It is clear that general information materials about a range of health-related topics have the ability to improve parental knowledge, attitudes, and in turn, practice.

Despite social-emotional development being critical in early life for later positive outcomes, less written educational material related to social-emotional development, parent-child relationships, and related concerns have been examined in a research capacity. One study aimed to improve parent-child interactions by supplying parents with educational information about caregiving and development in infants, providing specific information about creating positive interactions during bath time, infant crying, and play (Lambermon & IJzendoorn, 1989). Results indicated that the brochures created significant increases in parental responsiveness in observed mother-infant interactions. This study demonstrated promise in the distribution of guidance for parents related to social-emotional concerns, however no others of its kind have been conducted.
In the present study, we aimed to address this gap in the research by examining the impact of psychoeducational materials on observable behavioral change in the form of parent-child interactions. Though these concepts have been studied more extensively within the medical field, less information is available about the impact of psychoeducational materials about social-emotional development on behavioral outcomes in parent-child interactions. It is important to acknowledge that changes in stress and attitudes do not necessarily translate into behavioral change, making it necessary to assess for this translation directly. The present study is one of the few available assessing the impact of psychoeducational materials on parent-child interactions directly, supporting further dissemination of similar materials in the future.

**Present Study**

**Research Questions**

The purpose of this study was to examine the efficacy of a psychoeducational guidance brochure for parents of infants using the psychobiological model of temperament. First, an evaluation of parental knowledge about temperament as a result of the intervention was examined. It was hypothesized that parents receiving the educational materials would demonstrate knowledge of temperament concepts after receiving the materials, as measured by a brief temperament mastery survey. It was anticipated that the guidance materials provided in this study would be sufficient to improve temperament knowledge in participating parents.

To justify a more widespread dissemination of the temperament materials after this stage of the project, parental attitudes toward the temperament information must be positive, and participants should value the usability of this information. It was anticipated that parental attitudes toward the temperament materials would be predominately positive, evaluated via an attitude questionnaire discerning the extent of program satisfaction. Attitudes related to the
usefulness of the material, the impact of the materials on understanding the child, the recommendation of the program to others, and other related concepts were examined in this context. Additionally, a usability questionnaire measured how understandable and accessible the various concepts in the temperament information were for parents. It was hypothesized that parents would report ease of understanding, indicating the potential for further utility across populations.

It was hypothesized that by learning more about temperament, parents would be able to improve goodness of fit with their child, or the match between child characteristics and parental demands and expectations (Chess & Thomas, 1991). To examine changes in the goodness of fit, both observational and self-report measures were utilized to measure several relevant variables. Self-report measures of the parenting stress domains were utilized to evaluate the hypothesis that improved understanding of temperament decreases stress via altered parental knowledge and expectations. Several components of the Parenting Stress Index (PSI; Abidin, 1995), specifically within the parent stress domain, were examined for intervention effects. First, it was hypothesized that there would be an increase in maternal sense of competence reported by mothers, as well as improved reported parental attachment. Scores on the maternal depression subscale of the PSI were also expected to decrease following the intervention. The final two parenting stress domains hypothesized to improve as a result of the intervention were the maternal role restriction scale and the maternal relationship with spouse scale. Though no written parenting guidance programs have directly evaluated role restriction or maternal relationship with spouse, improvements in these domains were expected.

Two parent-child interaction tasks, an unstructured free play and a structured teaching task, were used to evaluate for observed changes in parent-child interactions, with changes in
parent-child interactions expected in both tasks. As no previous temperament guidance programs have examined effects with respect to parent-child interactions, this aspect of the experimental design represents a novel component of the proposed project. It was hypothesized that following the intervention, parents would have increases in sensitivity and reciprocity in parent-child interactions. Whereas the majority of parent programs aimed at enhancing sensitivity have been more intensive in terms of demands on the caregivers and infants, the psychoeducational guidance materials described in this study represents a low-cost alternative more accessible with respect to implementation/dissemination, if shown to have efficacy.

Further, exploratory analyses were conducted to determine whether temperament guidance impacted other components of interactions between the mothers and their babies (i.e., tempo, intensity, emotional tone, parent vs. child directedness). Because it is known that parental perception of their children can influence interaction quality, it was suspected that the temperament materials may influence these other parent-child interaction factors in addition to sensitivity and responsiveness. As parents in the study were taught about many temperament characteristics, this was predicted to potentially alter their approach to interactions in different ways based on the information. For example, a parent with a child high in approach would shift interactions to allow their child to explore the environment more freely after learning about the surgency component of temperament. Each of these additional parent-child interaction factors were analyzed to evaluate for changes following the intervention, but all analyses with these variables should be considered exploratory in nature, as these aspects of interactional dynamics have not been examined with respect to the goodness of fit, or in the context of an education-based study such as this.
It was also hypothesized that differential susceptibility effects would emerge across outcome measures (Belsky, 1997). Based on previous research, it was suspected that infant negative emotionality would act as a moderator of treatment effects, as existing studies suggest that parents of infants and children with higher levels of “difficulty” and negative reactivity benefit more from interventions (McCormick, O’Connor, Capella, & McClowry, 2015; Ostergren, 1997). Further, one previous written temperament intervention demonstrated that lower parental education predicted more treatment efficacy (Ostergren, 1997), while another demonstrated that temperament education was more effective for parents of boys than girls (Cameron, Rice, Sparkman, & Neville, 2013). Thus, educational level and gender were also expected to play a role of moderators in the present study, shaping the strength/direction of treatment effects.
CHAPTER TWO

METHODS

Participants

Mothers with infants 3-12 months of age were recruited via Facebook advertisements, local birth announcements, university announcements, and in other local community settings (i.e., farmer’s market, pediatricians’ offices, etc.) in the greater Pullman, WA area starting in fall of 2011. Caregivers not fluent in English were excluded from the study, as study materials were only available in English. All families received a $10 gift certificate upon completion of the project. A total of 35 families agreed to participate in the study and were included in the analyses. Of these 35 participants, two families failed to complete portions of the initial pre-intervention questionnaires, while one family was missing the initial play interaction. Two families dropped out entirely prior to the second wave of data collection, with an additional eight families missing some to all of the post questionnaires, and one family missing only the final home visit.

Procedures

The intervention was a repeated measures design to examine change over time in the study participants as a result of the intervention. Once families agreed to participate in the study, parents were contacted via phone or email. Initial home visits were scheduled with the mothers at this time, and they were mailed a questionnaire packet containing the project consent form, the Infant Behavior Questionnaire-Revised (IBQ-R; Gartstein & Rothbart, 2003) and other questionnaires. Mothers were asked to complete the packet of questionnaires prior to the first home visit, to be picked up by research assistants at the time of the visit. Home visits lasted approximately 15-20 minutes and consisted of a free-play and a structured teaching task.
Following the first home visit, individuals received a packet of comprehensive temperament information (for full brochure, see Appendix A), which described temperament according to the psychobiological model (Rothbart & Derryberry, 1981). Brochures were provided to families within two weeks of the initial home visit. In the brochures, each of the three main temperament factors (i.e., positive emotionality, negative emotionality, regulatory capacity) were outlined in the information, as well as risks and benefits associated with each factor. Information about goodness of fit was also provided, alongside information on how to navigate some difficult temperament profiles. For example, it was noted that parents of shy and fearful children should prepare children in advance for difficult situations, while standing firm in their expectations and demands to assist children with gaining familiarity and facing difficult situations. The provided temperament materials also described how temperament relates to feeding and sleeping, two common parent-reported areas of difficulty in infancy that are influenced by temperament. A final component of the information pamphlet encouraged parents to enjoy interactions with their baby no matter what their temperament characteristics, focusing on more opportune moments for social exchanges.

Following the temperament information dissemination portion of the project, a second packet of questionnaires was mailed to the mothers within one to two weeks, to allow mothers time to review the temperament brochures prior to the second wave of data collection. At the time that the final questionnaires were mailed, mothers were also contacted to schedule the second, final home visit, which involved the same free-play and teaching task completed in the first visit. On average, visits were completed one and one-half months after the final questionnaire packets were mailed. Due to variability in scheduling and difficulty coordinating
with families, completion time of the intervention varied, ranging from 2 to 4.5 months ($M = 2.86$ months) from the time of enrollment to completion.

**Measures**

**Demographic information.** A background information form was administered at the initiation of the project. Mother’s provided information about age, relationship status, race/ethnicity, education, occupation, and income. Information about maternal education level from this demographic form was utilized as a moderator variable, as parental educational attainment has been linked with differential utility in the context of temperament interventions (Ostergren, 1997).

**Infant Behavior Questionnaire-Revised (IBQ-R; Gartstein & Rothbart, 2003), Negative Affectivity Subscale.** Mothers were asked to complete the IBQ-R, a parent-report measure of infant temperament, upon study enrollment. The IBQ-R consists of 191 items resulting in 14 scales that combine into 3 factors (Extraversion/Surgency, Negative Affectivity, and Regulation/Orienting), and has demonstrated good psychometric properties (Gartstein Bridgett & Low, 2012; Parade & Leerkes, 2008). Cronbach’s alphas typically range from .70 to .90 (Gartstein et al., 2009). In the present study, Negative Affectivity was exclusively utilized for analyses, functioning as a moderator. Some previous temperament-based interventions have shown greater effects for children with higher levels of negative affectivity (Cameron & Rice, 1986; Cameron, Rice, Sparkman, & Neville, 2013; McCormick, et al., 2015; Ostergren 1997), supporting differential susceptibility/utility. Negative affectivity is composed of four fine-grained scales: Distress to Limitations, Fear, Sadness, and Falling Reactivity (i.e., rate of recovery from peak distress, excitement, or general arousal).
Parenting Stress Index (PSI; Abidin, 1995). The PSI assesses the level of stress that parent’s experiences in relation to the parenting role, resulting from the child or parent characteristics, and/or situational variables. For the purpose of this project, several PSI parent domain scales were used. The sense of competence scale, which assesses security in the parenting role, was utilized as an indicator of parenting efficacy. The parental attachment scale was used to evaluate the parent’s attachment relationship with the baby, including the intrinsic investment in the role of the parent. The role restriction scale evaluated the impact of parenthood on the parents’ personal freedom and other life roles. The depression scale of the PSI was used to evaluate the extent to which the parents’ emotional and physical energy is compromised, and the parental availability to the child is impaired. The relationship scale evaluated for marital satisfaction and relationship quality between parents as it facilitates functioning in the parenting role. Maternal domain subscales of the PSI have shown moderate to high internal consistency and test-retest reliability in the literature, with Cronbach’s alpha ranging from .88 to .96 (Abidin, 1995).

Coding of Mother-Child Interactions. The mother-child interaction episodes were conducted in the home in a standardized manner and consisted of two parts. First, in a 10-minute free-play task, mothers were asked to play with their baby as they typically would. Second, a teaching task was administered where mothers were asked to choose an activity from a list that their baby could not yet do (e.g., squeak a frog, scribble on a paper), taken from The Nursing Child Assessment Teaching Scales battery (NCATS; Sumner & Spietz, 1995). They were asked to teach their baby to complete the task and told that they could take as much time as they needed (with a maximum of 10 minutes given to the dyad to complete the task). Interaction tasks
were video-recorded to be coded later by trained coders with adequate inter-rater reliability (ICC’s>.60).

Coding of mother-child interactions was done using a 7-point Likert coding scale that was validated in previous research (Gartstein, Crawford, & Robertson, 2008), looking at the following six factors globally in the interactions: sensitivity/responsiveness, reciprocity, tempo, intensity, emotional tone, and child vs. parent directedness.

For the Responsiveness/Sensitivity scale, a 1 represented extremely non-responsive/sensitive interactions, operationalized as interactions where mothers avoid, ignore, or reprimand the child, lack genuine interest and empathy toward the child, and do not accurately interpret communication from the child. Moderately responsive/sensitive interactions, coded as 4, were operationalized by mothers providing only perfunctory, half-hearted responses, showing moderate interest in the child, moderate levels of empathy toward the child, and periodically accurately interpreting communication from the child. For extremely sensitive/responsive interactions, coded as 7, mothers provide prompt, warm, contingent, and supportive responses, appeared genuinely interested and empathetic toward the child, and accurately interpreted information from the child.

For the Reciprocity/Synchrony scale, 1 represented extremely asynchronous/non-reciprocal interactions, operationalized as interactions with a) low frequency of simultaneous movement, low levels of tempo similarity in the dyad, and low levels of coordination/smoothness. In contrast, a 7 on the synchrony/reciprocity scale was operationalized as interactions with a) high frequency of simultaneous movement, high level of tempo similarity, and high levels of coordination/smoothness.
For Tempo, 1 represented extremely slow-paced interactions, which were operationalized as interactions with a) low frequency of changing objects/activity – few instances of the parent switching toys/materials, or type of activity carried out w/these objects; b) low levels of physical activation - low rate/degree of movement for the interacting dyad; and c) low levels of verbal activation - slow speech and/or few transitions in the topic of conversation. 7 on the tempo coding scale represented extremely fast paced interactions, including a) high frequency of changing objects/activity – many instances of the parent switching toys/materials, or type of activity carried out w/these objects; b) high levels of physical activation – high rate/degree of movement for the interacting dyad; and c) high levels of verbal activation – fast speech and/or many transitions in the topic of conversation.

For Intensity, 1 represented an extremely low intensity interaction. This extremely low intensity interaction was defined by a) very quiet verbal exchange/background noise – overall, (1) the dyad talks in low/quiet tones; (2) low levels of background noise, if any; b) low levels of complexity – (1) few toys/materials available for play; (2) available materials are low in levels of afforded stimulation for dyadic interaction; and c) low levels of parental exuberance – (1) caregiver is not very animated; (2) participates in the interaction with the child, but without enthusiasm. A 7 on the Intensity scale indicated extremely high intensity interactions. Extremely high intensity interactions were categorized by a) loud verbal exchange/background noise – overall, (1) dyad talks loudly; (2) high levels of background noise, if any ; b) high levels of complexity – (1) a large number of toys/materials available for play; (2) at least some of the available materials are highly stimulating, with respect to the dyadic interaction; and c) high levels of parental exuberance – (1) caregiver is highly animated; (2) participates in the interaction with the child with high levels of enthusiasm.
For Emotional Tone, a code of 1 represented extremely negative emotional tone of the interaction, operationalized as a) frequent critical/negative verbal remarks, frequent displays of distress, and frequent negative physical displays. A code of 4 represented neutral emotional tone, operationalized as a) mostly neutral remarks/exchanges, b) few, if any, displays of affect (positive or negative), and c) few, if any, displays of physical affect (positive or negative). Finally, a code of 7 represented an extremely positive emotional tone, operationalized as a) frequent enthusiastic/positive verbal remarks/exchanges, b) frequent displays of positive emotion/joy/pleasure, and c) frequent positive physical displays.

For Child vs. Parent Directedness, 1 on the Likert scale represented extremely child directed interactions, operationalized as a) frequent instances of the child verbally directing the activity – overall, the dyad’s activity follows directions offered by the child; b) frequent instances of dyadic activity shifting following the child’s shifts in activity – many instances of the dyadic activity changing, after the child’s behavior has changed, either with respect to the (1) type of activity; or (2) materials being used; and c) few instance of the parent attempting to direct the activity – few instances of the parent attempting to direct the dyadic activity through (1) verbal commands; (2) demonstrations; (3) other non-verbal behavior. The middle of the Likert scale (4) described balanced control of interactions, with the mother and child contributing equally to the direction of the interaction. A balanced interaction was operationalized as one with a) moderate number of instances of the child and the parent verbally directing the activity – overall, the interactions seem balanced with respect to control, b) moderate number of instances of dyadic activity shifting following the child’s and the parent’s shifts in activity – many instances of the dyadic activity changing, after the child’s and the parent’s behavior has changed, either with respect to the (1) type of activity; or (2) materials being used; in a seemingly
balanced manner; and c) moderate number of instance of the parent and the child attempting to
direct the activity – both the parent and the child demonstrate attempts to direct the dyadic
activity through (1) verbal commands; (2) demonstrations; (3) other non-verbal behavior; in a
balanced manner. Lastly, a 7 on the Child vs. Parent Directedness scale represented extremely
parent directed interactions. Extremely parent directed interactions were characterized by a)
frequent instances of the parent verbally directing the activity – overall, the dyad’s activity
follows directions offered by the parent; b) frequent instances of dyadic activity shifting
following the parent’s shifts in activity – many instances of the dyadic activity changing, after
the parent’s behavior has changed, either with respect to the (1) type of activity; or (2) materials
being used; and c) few instance of the child attempting to direct the activity – few instances of
the child attempting to direct the dyadic activity through (1) verbal commands; (2)
demonstrations; (3) other non-verbal behavior.

**“Knowing Your Baby Matters” Knowledge/Mastery Survey.** The
Knowledge/Mastery quiz was administered to parents after receiving the temperament
information, designed specifically for this study to evaluate level of parental knowledge of the
temperament concepts introduced in the information pamphlet. It contained eight multiple-choice
questions examining knowledge of the temperament factors, the importance of goodness of fit,
and other related ideas (for full questionnaire, see Appendix B).

**Program Usability Inventory.** The Program Usability Inventory was created to assess
for accessibility of the information in the program, to identify whether the information was easy
for mothers to read and understand. The questionnaire contained nine questions asking mothers
to circle the response for each question which best expresses how they feel, with all questions
utilizing a 5-point scale from “very difficult” to “very easy.” Sample questions include “How
easy to read was the “Knowing Your Baby Matters,’” and “How easy was it to understand the information about “Goodness-of-Fit”.” The instructions additionally stated that if parents circled a 1 or 2 (i.e., very difficult or somewhat difficult), that they should provide us with more information about the difficulty on the line below the question or the back of the form (for full questionnaire, see Appendix C).

**Program Attitude Inventory.** The Program Attitude Inventory was created to assess for maternal attitudes about participation in the program, also administered after mothers received the guidance materials. The questionnaire contained 11 questions asking mothers to circle responses that best express how they felt, with all questions utilizing 5-point scales. Sample questions include “Regarding my understanding of temperament, I feel I have learned a lot of useful information,” with ratings from “strongly disagree” to “strongly agree,” and “My general feelings about participating in this program is,” with a scale from “I disliked it very much” to “I liked it very much.” Attitudes related to the content of the information, the impact of the information (e.g., helping to improve their approach as a parent in managing their child), and whether they would recommend this program to friends or relatives (for full questionnaire, see Appendix D).

**Analytic Plan**

Data were analyzed using version 20.0 of SPSS statistical software. To evaluate answers to the knowledge/mastery questionnaire, frequencies and simple percentage calculations were chosen examine accuracy of responses to each question. For the attitude and usability questionnaires, averages were examined, as well as frequencies of each of the responses to determine the overall accessibility and acceptability of the information. To evaluate for pre-post changes in parenting stress and parent-child interactions, paired samples t-tests were conducted.
to determine if significant changes occurred across multiple domains examined in this study, including parenting stress domains and parent-child interaction domains, examined across each of the two interaction tasks. One-within/one-between ANOVAS were utilized to examine changes across similar domains, determining whether infant gender, maternal education, and/or negative affectivity moderated intervention effects.

ANOVA models, without imputation or deletion were selected as the primary analytic tool, after examination of strategies to manage missing data. Though the simplest strategy to manage missing data in repeated-measures is through listwise or pairwise deletion, this strategy can result in losing valuable information and statistical power due to the reduction of sample size (van Ginkel & Kroonenberg, 2014). The present study was already subject to difficulty in detection of significant results due to low sample size and power. Further, the missing data was not the same for each participant. For example, removal of a participant who was missing post questionnaires, but completed both parent child interactions in home visits, would remove important information in other areas of analysis. Thus, deletion was ruled out as a method for managing missing data in the present study. Although multiple imputation, wherein plausible random values are substituted for each missing value in the incomplete data set (Rubin, 1987), represents an increasingly popular alternative approach to managing missing data, it is not yet available for all statistical tests via the most commonly used statistical platforms. SPSS, utilized for analyzing data in this study, does not enable imputation in the context of repeated measures ANOVAs. The problem of multiple imputation in the context of repeated measures ANOVAs is that general rules surrounding the pooling of the significance tests have not been explicitly addressed in the literature, in that most software (including SPSS) does not provide pooled $F$-tests for any type of ANOVA (van Ginkel & Kroonenberg, 2014).
CHAPTER THREE

RESULTS

Preliminary Analyses

Preliminary analyses were conducted to determine the normality of distribution of the dependent variables. Acceptable limits for skew and kurtosis were deemed ±2, as supported in the literature (e.g., Gravetter & Wallnau, 2014; Trochim & Donnelly, 2006). Normal distribution was evaluated through an examination of histogram plots, residual scatterplots, and indicators of skewness and kurtosis. Indicators suggested that dependent variables were normally distributed in the present sample, with the exception of three areas. In the pre-intervention teaching task, higher than acceptable kurtosis was also seen in the reciprocity scale (4.25). In the PSI scales, both the post-intervention depression domain and the total post-intervention parenting stress domain had kurtosis scores above the acceptable level (3.10 and 4.29, respectively). High kurtosis levels were not surprising, given that the majority of “real world” datasets are not in fact distributed normally (Blanca, Arnau, López-Montiel, Dolores, & Bendayan, 2013). Due to the homogeneity of the sample (e.g., highly synchronous, low depression levels, low parenting stress overall), and the small sample size, outliers from this homogenous group influenced kurtosis levels. Attempts at transforming kurtotic variables were implemented, utilizing the most commonly recommended transformation procedures (i.e., natural log and square root; McDonald, 2014). Transformations were not successful in managing difficulties with kurtosis, and in fact led to increasingly non-normal distributions. Additional transformations were also explored (i.e., inverse, log10, cube root), without success in terms of providing a remedy for the kurtosis assumption violation. This pattern of results is unfortunate, yet consistent with literature suggesting that transformations can be problematic for many reasons, including that they fail to
restore normality and can reduce power (Erceg-Hurn & Mirosevich, 2008). Due to inability to utilize basic transformation methods to improve normality, these methods were not utilized in the present study. Beyond general transformation methods being unsuccessful, it has been suggested that in samples larger than 30, the violation of normality should not cause major problems, and that the sampling distribution will likely be robust to deviations in normality for analytic purposes (Ghasemi & Zahediasl, 2012). Research has indicated that ANOVAs are robust to both type I and type II error (e.g., Glass et al., 1972; Harwell et al., 1992). One recent study tested the proposed robustness directly with random, non-normal data, and found strong support for robustness to Type I and Type II error as well (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010).

**Missing data.** Missing data analyses were conducted to determine if data were missing at random. Analyses were run for each area of analyses (i.e., questionnaires, parent-child interactions, moderating variables). Utilizing the Little’s MCAR test of missing data (Little, 1988), based on a chi-square distribution, non-significant results supported the assumption that data were missing completely at random (Parent-Child Interactions, Chi-Square = 38.24, \( p = .14 \); Parenting Stress Index, Chi-Square = 5.24, \( p = .86 \); Moderating Variables, Chi-Square = 6.25, \( p = .181 \)).

**Internal Consistency.** Internal consistency was examined for measures in the present study, including the Negative Affectivity Subscale of the IBQ-R, and the domains of the PSI, pre and post. Cronbach’s alpha for the Negative Affectivity Subscale was .74, deemed acceptable in the present study. Lack of internal consistency in the PSI led to the removal of the Attachment scale altogether (dropping all six items), as well as dropping one item from the Relationship scale, three items in the Competence scale, and three items in the Depression scale. Following the
removal of these items, the pre-PSI subscales had Cronbach’s alphas that ranged from to .61 to .79, with a total PSI Cronbach’s alpha score of .93. The post-PSI subscales had Cronbach’s alphas that ranged from to .63 to .93, with a total PSI Cronbach’s alpha score of .97.

Demographics

Among the 35 mothers who participated in the intervention, the mean age of participants was 29.8 years (Range = 21-35.5 years, $SD = 3.59$). The sample was predominantly Caucasian (94.3%), consistent with the population of the area, with the additional 5.7% identifying as Asian. All women reported being married or cohabitating. The mean level of education amongst mothers was 16.97 (Range = 12-24 years, $SD = 2.83$). 57.1% of the babies in the sample were male. For additional demographic information, see Table 1.

Temperament Knowledge

Each of the 8 questions on the Temperament Knowledge Mastery Questionnaire were evaluated for frequency of responses and percentage correct. Overall, results indicated generally moderate to high levels of temperament knowledge, with correct responses ranging from 56.5% correct to 95.7% correct. The full distribution and frequency of each response can be seen in Table 2. The most difficult question and domain by far, with a correct response rate of only 56.5%, was surrounding the importance of goodness-of-fit. While the correct response was all of the above, many parents chose just one of the responses exclusively as their choice. Additional difficulty was seen on questions 5 and 7 (both with 78.3% correct response rates). These questions inquired about the relationship between more difficult to soothe babies and feeding/eating and sleeping problems, as well as the importance of Effortful Control and Regulatory Capacity. The accuracy for the remainder of the questions were above 80%.

Program Usability
Analysis of the Program Usability Inventory examined responses to each question individually to determine accessibility and understanding of the temperament materials.

Responses were on a scale of one to five, with one indicating “very difficult,” two indicating “somewhat difficult,” three indicating “in-between,” four indicating “somewhat easy,” and five indicating “very easy.” “Somewhat easy” was the most frequently reported response for each of the nine usability questions, with the exception of one question asking about the easy of understanding of how temperament traits relate to feeding/eating and sleeping, which had an equal number of answers in the “somewhat easy” and “very easy” categories. Only two of the questions (understanding the information in the brochure generally and understanding the information about the three broad temperament traits) received one response each of “very difficult” to understand. All of the questions had between two to four responses indicating that the information was “somewhat difficult” to understand. For full distribution of usability scores, see Table 3.

**Program Attitude**

Analysis of the Program Attitude Inventory looked at each individual question to determine attitudes toward the temperament guidance program. Each item was answered on a one to five scale, with one indicating very dissatisfied/poor attitude, three indicating neutral attitude, and five indicating very positive attitude. Of note, there were no participants that responded with a one to any of the questions (indicating that none of the participants were very dissatisfaction or had very poor attitudes toward the program). The majority of the responses indicated attitudes that were neutral to very positive. More specifically, participants most frequently answered four (indicating somewhat positive attitudes) with regard to the usefulness of the temperament information, the information on the three broad temperament factors, the
ideas surrounding improvement of parent management strategies, feeling that the temperament program was worth their time, and general feelings about the program. Participants most frequently reported that they had neutral attitudes regarding how well they get along with their child as a result of the intervention (“the same as before,”). Additionally, “neutral” was the most frequent response regarding feelings toward their confidence in their ability to understand their child as a result of the program, progress made in approaches to interactions and daily activities with their child as a result of the program, the degree to which the program helped with other general personal or family problems not directly related to their child in the program, and their recommendation of the program to friends/relatives with infants. For additional information regarding the distribution of responses see Table 4.

**Pre-Post Intervention Differences**

Descriptive statistics and results of 2-tailed paired samples t-tests for parenting stress and parent-child interactions can be seen in Table 5. Of note, paired samples t-tests were run both with and without imputed data to determine if differences existed. Multiple imputation was performed for the pre-post measures (parent-child interactions and PSI scales), resulting in just one minor difference in outcomes. Specifically, a previous statistical difference trending toward significance in the PSI Competence domain became non-significant with imputed data. Due to trivial differences in outcomes, non-imputed data were reported for both t-tests and ANOVAs.

**Parenting Stress.** Paired samples t-tests were conducted for each of the five included parenting stress domains (i.e., competence, role restriction, depression, and relationship), as well as total parenting stress, to compare parenting stress before and after the temperament guidance intervention. No significant differences emerged in any of the PSI domains, including total parenting stress, which was not significantly different from pre to post-intervention. The paired
samples t-test examining the difference in parenting competence before and after the intervention trended toward significance ($p < .10$).

**Parent-Child Interactions.** Twelve paired samples t-tests were conducted to determine differences before and after the temperament program: each of the six parent-child interaction factors (i.e., sensitivity/responsiveness, reciprocity/synchrony, tempo, intensity, emotional tone, and parent vs. child directedness) were compared across both of the interactions tasks (i.e., free play and teaching tasks). In the free play task, there were no significant differences observed from pre to post-intervention across any of the parent-child interaction domains. The paired samples t-test examining the difference in directedness before and after the intervention during the free play task trended toward significance ($p < .10$).

In the teaching task, results indicated a significant difference in the sensitivity/responsiveness domain, with higher observed sensitivity post-intervention ($t(31) = -2.20, p = .035$). There was an additional significant difference in directedness observed in the teaching task, with interactions rated as more parent directed prior to the intervention, and more balanced following the intervention ($t(31) = 3.16, p < .01$). Significant differences were not found in observed reciprocity/synchrony, tempo, intensity, or emotional tone pre to post intervention in the context of the teaching task.

**Moderation of Intervention Effects**

Moderation effects were examined, with negative emotionality, parent education level, and infant gender entered as moderators of intervention effects. One-within/one-between ANOVAs were utilized to assess the interaction between moderators (infant gender, infant negative emotionality, maternal education) and time (pre and post) for the PSI subscales and Parent-Child Interaction scales (for both the free play and teaching tasks). F-values for each of
the ANOVAs can be seen in Table 6. Estimates of effect size were examined using partial eta
squared ($\eta^2$), in which small, medium, and large effects were operationalized as .01, .06, and .14
respectively (Cohen, 1988). Partial eta squared is the proportion of variance in the dependent
variable accounted for by the independent variable after all other variables in the equation are
controlled for. Significant interactions were graphed, and tests of simple main effects were
conducted to elucidate the nature of the moderation effects.

**Infant Gender.** Infant gender was entered as a moderator of each of the parenting stress
domains, as well as each of the parent-child interaction domains, to determine if intervention
effects varied for boys and girls. Two significant interactions emerged, both in the context of the
teaching task.

The analysis revealed a significant interaction between infant gender and
reciprocity/synchrony in the context of the teaching task ($F(1, 30) = 8.75, p < .01, \eta^2 = .23$),
which indicated a large effect size. The interaction was graphed to elucidate the nature of the
effects (see Figure 1), and simple main effects were analyzed. Tests of simple main effects
indicated that there was a significant difference between males and females at time one ($p = .03$),
with the interactions between mothers of boys showing significantly less reciprocity prior to the
intervention. The difference in reciprocity/synchrony between boys and girls was no longer
significant following the intervention. Further, while there was no significant difference in
reciprocity/synchrony in the interactions between mothers and female infants over time, there
was a significant increase in reciprocity/synchrony in interactions between mothers and male
infants during the teaching task before and after the intervention ($p < .01$).

An additional interaction emerged between infant gender and directedness in the teaching
task ($F(1, 30) = 4.23, p < .05, \eta^2 = .12$), which indicated a medium effect size. The interaction
was graphed to elucidate the nature of the effects (see Figure 2). Tests of simple main effects indicated that while there were no significant changes in directedness in parental interactions with male babies during the teaching tasks, interactions with female infants became significantly more balanced in terms of directedness, previously more parent-directed, following the intervention ($p < .01$). Although there was no significant difference in directedness between male and female infant interactions at time one, interactions with infant girls were significantly more balanced than were interactions with infant boys following the intervention ($p = .03$).

The remainder of the interactions involving infant gender were non-significant, although an additional interaction between infant gender and emotional tone trended toward significance, also in the context of the teaching task ($p < .10$).

**Negative Emotionality.** Negative emotionality was entered as a moderator of each of the parenting stress and parent-child interaction domains to determine if intervention effects were stronger for more emotionally negative infants. Negative emotionality was dichotomized into high ($n = 17$) and low ($n = 15$) negative emotionality using a median split (median = 4.33). No significant interactions emerged, nor did any interactions approach significance.

**Maternal Education.** Maternal education was entered as a moderator of each of the parenting stress and parent-child interaction domains to determine if intervention effects were stronger for mothers of lower education levels. Maternal education was dichotomized using a median split (median = 16), with 18 mothers in the lower education group, and 14 mothers in the higher education group. One significant interaction emerged.

The analysis revealed a significant interaction between maternal education level and tempo during the teaching task ($F(1,30) = 4.23, p = .05, \eta^2 = .12$), which indicated a medium effect size. The interaction was graphed to elucidate the nature of the effects (see Figure 3), and
simple main effects were examined. Tests of simple main effects showed that although no significant changes in tempo were observed in the lower education group, there was a significant increase tempo between time points for higher educated mothers, with interactions moving from somewhat lower tempo to more moderate tempo ($p = .035$). There were no significant differences in tempo between lower and higher educated mothers at either time point.

The remainder of the interactions involving maternal education were non-significant, although two additional interactions approached significance ($p < .10$). First, the relationship subscale of the PSI neared significance in the interaction with education level across time points. Additionally, parent-child directedness approached significance in its interaction with education level across time during the free play task.
CHAPTER FOUR

DISCUSSION

The present study explored numerous aspects of a brief intervention that provided comprehensive temperament guidance brochures to mothers of infants. Overall results indicated that parents did gain knowledge of temperament and related concepts as a result of the intervention, as measured by the temperament knowledge/mastery quiz. Generally, quiz responses showed accuracy of over 80 percent, suggesting that the majority of mothers learned temperament information. Although previous in-person temperament interventions have demonstrated improvements in temperament knowledge (Franyo & Hyson, 1999; Sheeber & Johnson, 1994), no previous written temperament guidance programs to date have directly examined the parental knowledge of temperament, as done in the present study. Results suggest that it is quite possible for parents to gain temperament knowledge in written form as well, as anticipated.

It should be noted, however, that some areas examined by the knowledge quiz were more difficult for parents to understand, based on a lower number of correct responses. Difficulty with understanding goodness of fit, the relationship between more difficult to soothe babies and eating/feeding and sleeping problems, and effortful control/regulatory capacity appeared to be challenging areas within the guidance materials for parents to understand. Thus, some components of the brochure were somewhat difficult for parents to digest. Ideally, knowledge outcomes would have been higher across the board, which is an important consideration for future work. It is somewhat unsurprising that some difficulty with the acquisition of knowledge occurred in some areas, given the reading level of the brochure. The reading level of the brochure was analyzed using The Flesch-Kincaid Reading Ease and Grade-Level tests,
calculated based on the average sentence length and average number of syllables per word according to Microsoft Word 2007. The Flesch Reading Ease score was 30.5, with a Flesch Kincaid Grade-Level score of 15.2. This indicated that the reading level of the brochure was at college level and fell into the “difficult to read” category (with the “difficult” category scores ranging from 30.0-50.0, and lower scores indicating higher difficulty). Importantly, however, a large majority of the complex, multi-syllable words were temperament words (e.g., regulatory, emotionality, extraversion, etc.), which were broken down and explained thoroughly in the document. Thus, it is suspected that accessibility of the brochure may have been underestimated by this approach but was still significantly higher than the reading level of the general population.

Fortunately, the present sample was highly educated, and included mostly individuals with college level education or higher. This likely buffered some of the potential challenges with the high reading level presented in the brochure. Although the brochure was reviewed and discussed with mothers in focus groups prior to the initiation of the study, it is likely that these mothers also fell into the highly educated demographic, as many mothers were recruited directly through the university. It has been suggested that literacy must be taken into account when creating publicly distributed health materials, particularly because health related literacy may be lower than general literacy due to difficulty with understanding jargon (Davis, Williams, Marin, Parker, & Glass, 2002). Educational materials should be simplified and made more accessible, research dictates, with suggested strategies including lowering literacy levels and using pictures (Pignone, DeWalt, Sheridan, Berkman, & Lohr, 2005). Despite the brochure functioning relatively well in creating knowledge gains in our highly educated sample, significant alteration to create a brochure with a lower reading level would be necessary to expand the present study to
include a more diverse sample. Varying levels of temperament knowledge observed in this study suggests that this is also important for future temperament guidance programs to continue to consider monitoring the acquisition of knowledge as a way to ensure that key concepts are understood and retained.

Usability and accessibility of the temperament guidance brochures was also examined in the present study. Results suggested that overall, the information in the brochure was reported as generally being “somewhat easy” for mothers to understand. A small handful of participants reported some difficulty with understanding the information across domains, while on average, the information was reported as relatively understandable. Additionally, there were more mothers who indicated a very high ease of understanding the information than those who reported difficulty. This suggests that the information in the temperament brochure was largely suitable for the present sample in terms of the accessibility of the information as expected, although ideally, the information would be deemed accessible by all participants. Though accessibility was primarily neutral to positive, the lack of accessibility to some participants suggests that alterations to the brochure are likely necessary prior to further dissemination. Similar considerations surrounding accessibility and readability should be addressed, as discussed above.

In examining attitudes, mothers primarily reported neutral to very positive attitudes towards the temperament program. Areas in which the program was most well received, based off of response patterns indicating that parents were most commonly satisfied, included the usefulness of the temperament information, and parent management strategies, feeling that the program was worth their time, and general feelings about the program. This is consistent with past temperament studies involving written guidance reporting that parents found temperament
materials and related behavior management tips useful (Cameron & Rice, 1986; Cameron, Rice, & Sparkman, 2013; Ostergren, 1997). Somewhat in contrast to these studies and hypotheses, however, parents reported being generally neutral about their desire to recommend the program to friends or relatives with infants, and neutral toward their confidence in their ability to understand their child as a result of the program. Discrepancies between previous programs utilizing written temperament guidance and results of the present study may be because past studies provided individualized information and recommendations to families related to temperament concepts, whereas the present study did not. Results of prior parenting and family-based interventions indicated that individualized information and supports, tailored to the specific difficulties of the child and/or family, were deemed more beneficial than general information or strategies (e.g., De Bourdeaudhuij & Brug, 2000; Keen, Couzens, Muspratt, & Rodger, 2010). It may also be the case that the psychobiological model of temperament, not previously considered in the context of temperament interventions but utilized in the present study, was more challenging for parents to understand and apply than other models of temperament. It has been suggested that the psychobiological model involves more complex terminology than other temperament frameworks, and thus may be more complex for parents to grasp (Carey, 2016).

The next important contribution of the present study was the examination of differences in mother reported parenting stress and observed parent-child interactions before and after the temperament guidance program, utilized in the present study to reflect changes in the goodness of fit. In the parenting stress domains, all paired samples t-tests and moderation analyses were non-significant, inconsistent with the predictions. It was initially hypothesized that by improving knowledge of temperament, there would be a shift in maternal perception regarding the ability to
meet the demands of the child and fulfill the parenting role, reducing parenting stress in turn. Past research has demonstrated that parents with greater understanding of the development of their child perceived themselves as more competent and less stressed about their roles as a parent (Jones & Prinz, 2005). Though increases in temperament knowledge were observed in the present study, this knowledge did not translate into improved stress levels. One possible reason is that participants reported generally low levels of parenting stress levels prior to the intervention, leaving little room for improvement. It is also possible that a brief psychoeducational program was not sufficient for improving parenting stress, as past parenting interventions that have demonstrated decreases in parenting stress have been more comprehensive (e.g., Armstrong & Morris, 2000). It should also be noted that low statistical power likely limited the ability to detect significant results. Further examination of the impact of brief interventions on parenting stress is warranted in larger samples, particularly in mothers with higher initial parenting stress levels, to determine if brief psychoeducational programs have the capacity to reduce parenting stress.

Examining changes in observed parent child interactions, significant differences were found in two areas, specific to the context of the teaching task. First, a significant difference was found in observed sensitivity in the expected direction, with an increase in sensitivity seen after the intervention. This is consistent with hypotheses and past research. It has been demonstrated that parents who have more positive representations of their children’s attributes engaged in more sensitive interactions with their child (Seifer et al., 2014), which could account for the observed pattern of results. Increases in maternal sensitivity following the intervention is a promising result, as maternal sensitivity has been highlighted consistently as a critical component of healthy parent-child interactions and goodness of fit (e.g., McElwain & Booth-LaForce, 2006). It should also be noted the change in sensitivity was unlikely a function of
maturation effects, as a recent latent growth curve modeling investigation of mother-infant interactions revealed a flat linear trajectory for sensitivity/responsiveness across the first year of life (Gartstein, Iverson, Desmarais, & Hancock, 2017).

An additional significant difference was found in directedness during the teaching task, specifically in that interactions went from being more parent directed to more balanced following the intervention. One possible reason for this change is that as parents increased understanding of their children’s temperament characteristics, they felt less compelled to shape or challenge the infant’s behavior and were more apt to allow their babies to “drive” the interaction. It is also possible that these changes occurred as a result of the longitudinal study design. Over the first year of life, infants move from more passive involvement to more active involvement in play activities related to advancements in both motor and social development (Gustafson, Green, & West, 1979). As infants attain a more active role in interactions, it has been suggested that mothers become less directive in their commands (Evans & Porter, 2009). This was additionally demonstrated through growth curve modeling, which showed a steady decrease in parent directedness across the four to 12-month period in a linear fashion (Gartstein et al., 2017). It should also be noted that through additional analyses, the observed reduction in directedness during the teaching task was moderated by infant gender, described in more detail below.

The remainder of the paired samples t-tests examining changes in parent-child interactions were non-significant. This is not necessarily surprising, as the present sample already engaged in high levels of positive interactions with their babies prior to the intervention. Lack of change in these additional interaction domains may also be due to the brief nature of the guidance program, which did not directly “push” for changes in interactions or provide individualized suggestions for improving interactions. Thus, parents would have had to infer
such changes based on the information provided. Further, as discussed above, changes in knowledge and understanding do not necessarily translate into behavioral changes, as parents must have motivation and the desire to change (Treasure & Schmidt, 2001). Regardless, it is quite promising that some behavioral changes were observed, including in sensitivity, which is regularly identified as the most central component of positive mother-infant relationships.

Finally, significant interaction effects in the present study contribute to the research and indicate the need for continued investigation of differential utility effects in the context of temperament-based interventions. Infant gender, maternal education, and infant negative emotionality were examined as potential moderators of intervention effects, as these factors have each been shown as past moderators in temperament-based interventions. Two significant interactions emerged with gender as a moderator, both in the context of the teaching task. First, gender moderated the effect of the intervention on synchrony. Prior to the intervention, interactions between mothers and infant boys showed less observed synchrony than in interactions between mothers and infant girls. Following the intervention, however, this difference disappeared, as there was a significant increase in synchrony observed in the interactions between mothers and male babies. This improvement in synchrony specifically with boys is consistent with differential effects found in past temperament-intervention studies (Cameron, Rice, & Sparkman, 2013), where treatment effects were stronger for boys than girls. Temperament differences between males and females in infancy and early childhood may drive this effect. For example, boys have demonstrated lower levels of regulatory capacity, and higher levels of surgency than their female counterparts (Else-Quest et al., 2006). Higher infant surgency and associated activity level often demand more parental energy, and lower regulatory capacity can create challenges with tasks such as soothing or transitioning from one daily activity.
to another. These challenging behaviors, seen more frequently in boys, were framed through a temperament lens, and it may be that parents of boys viewed such traits less judgmentally, which allowed them to engage in a more synchronous manner, after reviewing temperament information provided in this study.

An additional interaction emerged in the context of the teaching task, with gender moderating the effect of the intervention on directedness. Prior to the intervention, there was no significant gender difference in directedness, with somewhat more parent directedness observed across interactions with both male and female babies. While there were no significant changes in directedness in interactions with male babies over the course of the intervention, interactions with female babies were observed to be significantly more balanced following the intervention. Although this is inconsistent with hypotheses that intervention effects would be stronger for boys, it can also likely be explained through early gender differences. The nature of the teaching task required parents to attempt to teach their babies an unknown skill. As discussed, females demonstrate lower surgency and activity level on average, as well as higher regulatory capacity (Else-Quest et al., 2006). It is possible that girls were more able to slow down and tolerate the demands of the teaching task, whereas boys required more parental control to sustain focus on the task at hand. A parent’s ability to adjust their approach to interaction based on the temperament of their child is consistent with the concept of goodness of fit, so results may suggest that high levels of goodness of fit were present. For example, parents of more surgent babies (more common in boys) likely needed to employ higher levels of direction and redirection to engage their infants successfully in the task, whereas parents of less surgent babies (i.e., girls) were likely able to give up some parental control in structured interactions, demonstrating an adjustment in parenting to match the temperament of the child. Additionally, girls between 6 and
12 months of age have been shown to initiate more social interactions with parents than do boys (Gunnar & Donahue, 1980), so interactions with girl infants may have appeared more balanced in the present study as the infants aged, as female infants contributed more to directing and initiating during the teaching activity than did boys. None of the additional parent-child interactions in either the free play or teaching tasks were moderated by gender.

One additional interaction emerged in the current study, also novel to this field of research: maternal education was found to moderate tempo in the context of the teaching task. Although no significant changes in tempo emerged between time points for the lower education group, there was a significant increase in tempo between time points for the higher education group, with interactions moving from somewhat lower tempo to more balanced tempo. There were no significant differences between groups at either time point. Results were somewhat unexpected, though deemed positive, insofar as that babies have been shown to prefer play at either a moderate or quick pace (Arco, 1983), and show less positive affect during slow paced interactions (Arco & McCluskey, 1981). Results of the present study did not suggest more beneficial intervention effects for less educated mothers, as one previous temperament-based program report (Ostergren, 1997). This discrepancy is likely a function of differences between samples, insofar as primarily college educated (or higher) caregivers participated in this study, whereas the previous study included many more mothers with lower education (i.e., some high school, high school diplomas, technical degrees, and some college).

Importantly, negative emotionality was not demonstrated to moderate any intervention effects. Though differential susceptibility has been demonstrated in past temperament-based interventions, with stronger intervention effects for parents with more emotionally negative children (McCormick, O’Connor, Capella, & McClowry, 2015; Ostergren, 1997), this finding
was not replicated. It is potentially the case that the brief nature of the current intervention did not provide support substantial enough to alter the impact of parenting stress for parents of these more emotionally negative infants. More comprehensive intervention may be necessary for differential susceptibility effects to emerge with regards to negative emotionality. It is also possible that the opposite is true, in that temperament interventions produce the same effect for both high and low negative emotionality infants and are equally beneficial for families of babies with all temperament profiles. Finally, it is quite possible that in this “low-risk” sample of highly attuned mothers that there were not enough high negative emotionality infants to observe true differential susceptibility, as environmental factors like more sensitive parenting (seen in the present study) have been associated with lower levels of negative affectivity in infancy overall (e.g., Pauli-Pott, Mertesacker, & Beckmann, 2004). Differential susceptibility should continue to be explored in future temperament interventions with larger samples that have more statistical power.

It is worth discussing that all three significant interactions emerged during the observed teaching task. It seems likely that the structured nature of the teaching task, which demanded more from both mother and baby, would draw out more need for parents to adjust their interaction styles for the purpose of completing the task. Thus, temperament information may have been most influential, and/or more “natural” to apply, under increased task demands when adjustment of behavior was necessary. A parent’s ability to adjust and adapt their responses to the child to meet the demands of the situation is inherent to the concept of goodness of fit, and parents who do this more successfully promote more positive social-emotional developmental outcomes (Seifer et al., 2014). Thus, we can tentatively conclude that since the observed behavioral changes in the present study were all in expected, positive directions (e.g., increased
sensitivity, increased synchrony), and occurred in the context of a more demanding task, that goodness of fit was at least somewhat improved.

It is also interesting that while changes in perceived self-reported parenting stress were not found, behavioral changes were observed. It is likely that parents who agreed to participate in the study were seeking information to improve understanding of their babies and/or strategies for managing behavior and were thus motivated or inclined to apply changes. Parents did, in fact, most frequently report that they found parent management strategies provided in the temperament brochure to be helpful, per the attitude questionnaire. Thus, it appears that learning about temperament through the comprehensive temperament guidance brochure contributed to the behavioral changes observed over the course of the study, as parental knowledge of temperament and related parenting strategies were reported. It is also quite likely that in this low-stress sample, changes in parenting stress were not necessary to observe positive behavioral changes. Regardless, the positive changes in parent-child interactions found in the present study, conceptualized here as improvements in goodness of fit, supports continued implementation and examination of temperament-based interventions in the future.

The present study was the first of its kind to evaluate the construct of goodness of fit using both self-perceptions of parenting stress and observed parent child interactions. Expected changes in parenting stress were not noted, yet some promising changes were observed in the parent-child interaction domain. This pattern of results suggests that alterations in perceptions of parenting stress may not be necessary for behavioral change to occur, with observed interactional changes indicative of improvement in the goodness of fit. Further evaluation of the goodness of fit is warranted to determine a more consistent operationalization of this important construct.

**Limitations**
There were a number of limitations in the present study that should be addressed in future research. The characteristics of the sample is one such limitation. The overall sample included predominately Caucasian, highly educated, in-tact families. Mothers in this low-risk sample were also sensitive, responsive, and in-tune with their babies to begin with. The results of this study should thus be generalized with care, and additional research is required to extend this pattern of results to other racial/ethnic groups, educational levels, and family contexts. Future studies should recruit more diverse samples in order to address this limitation.

There was a high level of drop out and missing data in the present study due to the longitudinal nature of the project. This, in combination with the relatively small sample size in the current study, may have resulted in insufficient power to detect differences resulting from intervention effects. Future studies examining the effects of temperament information should aim to recruit larger samples. Relatedly, although median splits have been suggested as preferred and parsimonious by some (e.g., Iacobucci et al., 2015), and are quite popular in research (MacCallum, Zhang, Preacher, & Rucker, 2002), this method of statistics provides additional limitations. It has been suggested that median splits increase the loss of individual variability (e.g., Farewell et al., 2004), which increases the likelihood of Type II errors by reducing effect sizes and power (Lagakos, 1988). Thus, non-significant moderation results for infant negative affectivity and maternal education in the present study may be in part a result of a loss of power related median splits. Relatedly, the low-risk nature of the present sample may have reduced variability in negative emotionality, limiting the ability to find significant effects.

Additional problems with non-normal data must be highlighted. Common methods of data transformation were examined but unable to correct the non-normality of the distributions in three domains. Thus, analyses for these scales did not meet the normality assumptions for both t-
tests and ANOVAs. Although these tests are robust to violations of normality, it should not be ruled out that non-normality contributed to increases in type I and/or type II error for analyses using these scales.

Conclusion

The present study was novel in the examination of the use of comprehensive temperament brochures in a brief, cost-effective intervention with mothers of infants. It was also the first temperament intervention to utilize the psychobiological model of temperament, the current most widely accepted framework in the study of temperament. Consistent with hypotheses, increases in knowledge of temperament were observed following the review of the temperament brochures, suggesting this was an effective method of teaching parents about temperament. Attitudes towards the program were generally neutral to very positive, and materials were overall somewhat easy for participants to understand. Adjustments to the temperament brochure with regard to increasing accessibility and lowering reading level were deemed necessary prior to further dissemination to clientele lower in their level of education, relative to the present sample. Contrary to hypotheses, no changes in perceived parenting stress were reported, suggesting that the brief nature of the intervention was not sufficient for altering parental perceived levels of stress associated with parenting. Importantly, behavioral changes were observed in the context of the teaching task, suggesting that sensitivity and directedness may be altered and improved as a result of a brief educational temperament-based psychoeducational intervention. Further analyses revealed infant gender and maternal education as important moderators, with differential effects emerging in synchrony, directedness, and tempo in parent-child interactions. No previous temperament-based interventions have utilized observation of parent-child interactions directly, but the current study supports future
examination of such observational measures in the temperament-based treatment outcome context. As the present study was unable to confirm the importance of considering both parenting stress and parent-child interactions as components of goodness of fit, future studies should continue to work toward operationalizing and experimentally examining key ingredients of this important construct. An iterative implementation of the temperament intervention is required to hone this approach, and should be conducted, as helping parents to understand the underlying temperament characteristics that drive their child’s behavior is important for promoting positive perceptions and interactions. After all, knowing your baby matters!
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75


doi:10.1037/a0034652


Multivariate Behavioral Research, 49(1), 78-91. doi: 10.1080/00273171.2013.855890


Table 1

Descriptive Statistics for Demographic Variables and Relevant Factors

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<th>Variable</th>
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<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>Percentage</th>
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<td>3.59</td>
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<tr>
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<td>Asian</td>
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<tr>
<td>Remarried</td>
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<td>$16,001-$20,000</td>
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<td>Infant Age (Months)</td>
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<td>8.12</td>
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<td>Birth Order</td>
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<td>26.5%</td>
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<td>3</td>
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<td></td>
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<td>5.9%</td>
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<td>4</td>
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<td>8.8%</td>
</tr>
<tr>
<td>5</td>
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<tr>
<td>Infant Negative Emotionality</td>
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<td>4.84</td>
<td>2.91</td>
<td>-0.1-13.68</td>
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Table 2
Temperament Knowledge and Mastery Quiz Results

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<th>Question</th>
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<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Percentage Correct</th>
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<tbody>
<tr>
<td>1</td>
<td>23</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>21</td>
<td>91.3%</td>
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<tr>
<td>2</td>
<td>23</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>95.7%</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>4</td>
<td>-</td>
<td>19</td>
<td>-</td>
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<td>4</td>
<td>23</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>13</td>
<td>56.5%</td>
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<tr>
<td>5</td>
<td>23</td>
<td>18</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>78.3%</td>
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<tr>
<td>6</td>
<td>23</td>
<td>1</td>
<td>1</td>
<td>21</td>
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<td>91.3%</td>
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<tr>
<td>7</td>
<td>23</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>18</td>
<td>78.3%</td>
</tr>
<tr>
<td>8</td>
<td>23</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>19</td>
<td>82.6%</td>
</tr>
</tbody>
</table>

*Note.* Bolded numbers represent the correct response.
<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>SD</th>
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<td>1</td>
<td>25</td>
<td>1</td>
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<td>7</td>
<td>8</td>
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<td>3.72</td>
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<td>3.72</td>
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<td>4</td>
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<td>3.88</td>
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<td>-</td>
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<td>3.68</td>
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<td>-</td>
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<td>2</td>
<td>18</td>
<td>2</td>
<td>3.76</td>
<td>0.78</td>
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<td>2</td>
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<td>3.88</td>
<td>0.88</td>
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<td>8</td>
<td>25</td>
<td>-</td>
<td>3</td>
<td>5</td>
<td>12</td>
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<td>3.76</td>
<td>0.93</td>
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<tr>
<td>9</td>
<td>25</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>6</td>
<td>3.84</td>
<td>0.94</td>
</tr>
</tbody>
</table>

*Note.* Each question is on a 1 to 5 Likert scale, including the following responses: 1 = “very difficult,” 2 = “somewhat difficult,” 3 = “in-between,” 4 = “somewhat easy,” and 5 = “very easy.” ‘-‘ represents zero responses.
Table 4

*Program Attitude Inventory Results*

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>SD</th>
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<tbody>
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<td>1</td>
<td>25</td>
<td>-</td>
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<td>9</td>
<td>15</td>
<td>-</td>
<td>3.56</td>
<td>0.58</td>
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<td>2</td>
<td>23</td>
<td>-</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>3</td>
<td>3.65</td>
<td>0.76</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>-</td>
<td>-</td>
<td>17</td>
<td>5</td>
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<td>3.17</td>
<td>0.87</td>
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<tr>
<td>4</td>
<td>24</td>
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<td>-</td>
<td>13</td>
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<td>3.54</td>
<td>0.66</td>
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<td>24</td>
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<td>-</td>
<td>8</td>
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<td>0.81</td>
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<td>5</td>
<td>3.65</td>
<td>0.83</td>
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<td>3.64</td>
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<td>8</td>
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<td>8</td>
<td>3.96</td>
<td>0.82</td>
</tr>
</tbody>
</table>

*Note.* Each question is on a 1 to 5 Likert scale, with 1 representing the most negative attitude, 3 representing a neutral attitude, and 5 representing the most positive attitude toward the program. ‘-‘ represents zero responses.
Table 5
*Descriptive Statistics and t-test Results for the Parenting Stress Index (PSI) and Parent-Child Interactions (Free Play and Teaching Tasks)*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest</th>
<th>Posttest</th>
<th>N</th>
<th>t</th>
<th>df</th>
<th>p</th>
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</thead>
<tbody>
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<td>PSI Total</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competence</td>
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<td>.47</td>
<td>2.18</td>
<td>.54</td>
<td>26</td>
<td>-.22</td>
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<td>Role Restriction</td>
<td>1.70</td>
<td>.34</td>
<td>1.78</td>
<td>.36</td>
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<td>-1.77*</td>
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<td>.89</td>
<td>2.67</td>
<td>.93</td>
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<td>.73</td>
</tr>
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<td>.71</td>
<td>1.97</td>
<td>.79</td>
<td>26</td>
<td>.01</td>
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<td>Free Play Task</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sensitivity/Responsiveness</td>
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<td>.92</td>
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<td>31</td>
<td>-.15</td>
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<tr>
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<td>1.15</td>
<td>5.13</td>
<td>1.52</td>
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<td>.42</td>
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<td>Tempo</td>
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<td>31</td>
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<td>1.14</td>
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<td>.94</td>
<td>5.68</td>
<td>1.17</td>
<td>31</td>
<td>.00</td>
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<td>1.61</td>
<td>4.42</td>
<td>1.52</td>
<td>31</td>
<td>1.73*</td>
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<td>Teaching Task</td>
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</tr>
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<td>.90</td>
<td>5.72</td>
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<td>32</td>
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<td>1.27</td>
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<td>4.38</td>
<td>1.52</td>
<td>32</td>
<td>3.16**</td>
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</table>

**p < .01. *p < .05. #p < .10.**
Table 6
Interaction Effects of Baby Gender, Maternal Education, and Negative Affectivity on Time

<table>
<thead>
<tr>
<th>Source</th>
<th>Time x Gender (F)</th>
<th>Time x Education (F)</th>
<th>Time x Negative Affectivity (F)</th>
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</thead>
<tbody>
<tr>
<td>PSI Total</td>
<td>.01</td>
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<td>.76</td>
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<td>.83</td>
</tr>
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<td>Role Restriction</td>
<td>.00</td>
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<td>.74</td>
</tr>
<tr>
<td>Depression</td>
<td>1.07</td>
<td>.11</td>
<td>.62</td>
</tr>
<tr>
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<td>3.95#</td>
<td>.94</td>
</tr>
<tr>
<td>Free Play Task</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sensitivity/Responsiveness</td>
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<td>.56</td>
<td>.54</td>
</tr>
<tr>
<td>Reciprocity</td>
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<td>.00</td>
<td>1.14</td>
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<tr>
<td>Tempo</td>
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<td>2.28</td>
<td>1.60</td>
</tr>
<tr>
<td>Intensity</td>
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<td>.05</td>
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<tr>
<td>Emotional Tone</td>
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<td>1.46</td>
<td>.00</td>
</tr>
<tr>
<td>Directedness</td>
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<td>4.00#</td>
<td>.32</td>
</tr>
<tr>
<td>Teaching Task</td>
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<td>-</td>
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<tr>
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<tr>
<td>Reciprocity</td>
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<tr>
<td>Directedness</td>
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<td>.01</td>
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</tbody>
</table>

Note. One-within/one-between ANOVAs, examining moderation of intervention effects over time.

** p <.01. * p < .05. # p < .10.
Figure 1. Moderation of changes in observed reciprocity by gender during a teaching task.
Figure 2. Moderation of changes in observed parent versus child directedness by gender during a teaching task.

Note. Directedness was coded on a scale from 1 to 7: 1 represents extremely child directed interactions, 4 represents balanced interactions, 7 represents extremely parent directed interactions.
Figure 3. Moderation of changes in observed tempo by maternal education during a teaching task.
Appendix A

“Knowing Your Baby Matters”

This educational pamphlet is designed for parents of infants. Its purpose is to familiarize caregivers with temperament concepts that are known to be important for positive/happy parent-child interactions, and a healthy social-emotional development in general. Although temperament is in part a result of genetically-based predispositions, it is also open to influences surrounding children, especially parents and their efforts. A lot of your actions will serve to shape how your child’s personality develops and it is our hope that this information will be helpful as you move forward in caring for your baby and helping him/her be all that s/he can be!

Positive Emotionality/Extraversion

Positive Emotionality, or also called Extraversion, consists of several underlying traits that researchers study as early as the first year of life. These temperament traits include (1) the amount of excitement shown by a baby when approaching a parent or a new interesting toy, such as kicking or babbling; (2) a baby’s “talkativeness” and excitement when playing stimulating games, like peek-a-boo; (3) an overall amount of smiling and laughter shown by the infant; (4) baby’s motor activity (moving around or attempts to move around); and (5) a sensitivity to the subtleties of the outside world, such as noticing certain fabric structure, wool, for example, when compared to fleece, or birds in a tree when venturing outside. Although you may not see all of these traits coming together in expressions of positive emotions in your baby, research shows that overall they tend to form a constellation that is fairly consistent and stable in the first year of life. In a nutshell, Positive Emotionality or Extraversion has to do with the baby’s expression of positive emotions, how quickly s/he approaches new situations, objects and people, and the amount of motor activity and sensitivity to more subtle elements in the course of the daily
routine. This trait continues to be important in adulthood, when it is studied as one of the primary areas of personality.

Unlike Negative Emotionality, signs of Positive Emotionality/Extraversion are not present at birth; rather these appear later, usually around 3 months of age. The so called “social smile” - smiling at caregivers when they bring their faces closer, makes its appearance first, followed by smiling and possibly making first attempts at laughter when performing a pleasurable activity, usually around 3-4 months. Interestingly, motor activity typically coincides with moments of distress until that time, when around 3-4 months of age motor activity begins to be shown along with more positive emotions, for example, during the approach of caregivers and around objects and situations that the infant anticipates as being pleasant. This change in how behaviors or traits come together is largely due to the emerging organization of movement, in particular reaching and gasping of objects. Infants usually begin babbling and “talking”, making rhythmic speech-like sounds and repeating syllables by 6 months. Individual differences in activity levels (e.g. actively resisting being held, being passive in an activity), become more noticeable at this time as well, such as when playing, taking a bath, or dressing. Baby boys are often viewed as showing higher activity and approaching potentially pleasant objects or situations more compared to girls.

Similarly to Negative Emotionality, moderate levels of Positive Emotionality or Extraversion are linked with a number of positive outcomes, such as greater social support, more meaningful relationships, higher motivation to achieve mastery over tasks (and thus academic success), better physical health, and overall healthier psychological development. High levels of this trait, on the other hand, might not be as beneficial. Researchers found that high Positive Emotionality or Extraversion predicted later childhood impulsivity and aggression. In addition,
high Positive Emotionality/Extraversion was described as adding to the risk for Attention Deficit/Hyperactivity Disorder (ADHD) in childhood. On the other hand, particularly low levels of Positive Emotionality/Extraversion, together with large amounts of Negative Emotionality, can contribute to the risk for depression. All this is likely to sound alarming, so it should be noted that high levels of Positive Emotionality/Extraversion in infancy in no way “guarantee” psychological problems or disorders. Rather, the probability of having these difficulties later in childhood increases slightly for those showing the greatest amount of behaviors or emotions that are a part of this temperament trait. In addition, research indicates that teaching children how to accept their emotions and deal with their problems effectively goes a long way in limiting any negative influences of Positive and Negative Emotionality traits. Perhaps most importantly, the child’s own ability to regulate these emotional processes, which comes “online” in the first year of life, limits the risk described above, and this self-regulation can be influenced by parenting and other environmental inputs, along with one’s genetic endowment.

**Negative Emotionality**

Negative Emotionality represents how often and with what intensity a baby expresses different negative emotions. Negative Emotionality is expressed by the amount of sadness (low mood/little pleasure), frustration and anger (displayed by crying and fussing) when he or she cannot or is not allowed to do something, and fear in response to new situations, objects, or people. Additionally, Negative Emotionality has to do with how long it takes an upset baby to return to a neutral or satisfied state, after s/he has experienced any of these negative emotions.

Although general distress is present at birth, recognizable contributors to Negative Emotionality (i.e., anger/frustrations and sadness) do not begin to develop until 2-3 months of age, and fear takes even longer to make its appearance, usually at about 6 months of age, when
the baby starts to fear new situations, objects, and strangers. Signs of fear, however, can often be seen before 6 months of age, such as when the baby begins to cry and/or kick because he or she was startled or surprised. This area of Negative of Emotionality continues to develop into the second year of life, with fear of strangers becoming more noticeable later. While fear and sadness steadily increase through early development, anger/frustration decreases by 2-6 months, and then increases again through the second half of the first year of life. We think that babies show less anger/frustration because they get better control of their visual system and orient to the world around them more flexibly, which helps them self-soothe by looking away from upsetting things. Later, the amount of anger/frustration increases again, likely because as babies begin to get around better (e.g., when they start to crawl and walk), they find themselves being prohibited from approaching objects and situations that are dangerous or inappropriate, resulting in feelings of anger/frustration. Thus, Negative Emotionality, in general, seems to increase throughout the first year of life. Interestingly, while there appear to be no gender differences in most Negative Emotionality traits during infancy, researchers have found that baby girls, on average, seem to be more hesitant and fearful of new situations than boys.

Over time, higher Negative Emotionality can (although does not always) lead to proneness to experience stress more intensely which in turn can lead to weakened physical health, anxiety, and depression. More specifically, more fearfulness has been linked with later childhood anxiety, while high scores on sadness have been related to child and adult depression. Additionally, elevated infant anger/frustration can result in more aggression later in childhood, resulting in a greater risk for later conduct problems (e.g., getting in trouble at school and in the community, making friends with youngsters who get in trouble) and anger management difficulties. However, having low to moderate levels of Negative Emotionality has been found to
be beneficial in infants and children to avoid dangerous situations or curb impulsive actions because of a “healthy” fear of consequences. Similarly, some researchers proposed that a certain level of frustration might be adaptable in difficult situations by making a person more assertive, and possibly more effective when confronted with challenging problem-solving situations. Frustration may here serve as a signal to try different approaches to completing the difficult task, and children who do not have this experience may be at a somewhat of a disadvantage. Too much anger/frustration, on the other hand, will likely derail such efforts. So, one might say that the “Goldie Locks” principle applies to at least fear and anger, two of the three parts that make up the overall Negative Emotionality.

**Regulatory Capacity /Effortful Control**

While the domains of Negative Emotionality and Positive Emotionality/Extraversion generally represent reactive temperament categories (e.g., reacting in a fearful manner or approaching a novel object), the third category referred to as Regulatory Capacity/Effortful Control serves even young children to *regulate* their emotional and motor responses. In this way, Regulatory Capacity/Effortful Control can be conceptualized as what one might call a “super-ordinate” category (see diagram below) that enables children to control their positive and negative responses, thereby perhaps approaching a situation they may otherwise have avoided because of fear, or inhibiting actions they might otherwise have desired, from fear of negative consequences, such as parental prohibitions.
By the middle of the 2\textsuperscript{nd} year of life, Effortful Control includes a number of abilities: (1) focusing on a task; (2) shifting attention from one thing to another; (3) stopping and starting different actions; not just in a response to emotional reactions, but based on set goals or instructions from caregivers. Effortful control is also thought to include sophisticated abilities like detecting errors and planning. As one might guess given these descriptions, effortful control is closely linked to the development of different areas of attention. In particular, it is thought that effortful control and related regulatory abilities are a result of the development of the so called “executive attention system,” which is in charge of other areas of attention, as well as emotions and behavior, as the name implies.

Given the complexity of these skills, the self-regulatory abilities do not develop as early as reactive temperament attributes (i.e., Positive and Negative Emotionality); rather, these changes in attention and the emergence of Effortful Control do not begin to appear until the end of the first year of life, with considerable development occurring in this area between 2 and 7 years of age, and continuing into one’s mid 20’s. Once these sophisticated attentional skills begin to develop at the end of the first year, improvement in regulatory abilities can be anticipated with age. In fact, it is the development of these attentional skills, and related self-regulation that ultimately ushers in the end of the “terrible twos.” Pre-school children will therefore begin to
display more flexibility in their attention and will gain better control over their emotions and behaviors when asked to do so. At the same time, older children who are low in effortful control may also have a number of difficulties ranging from attention problems to difficulties controlling their behavior and emotions, especially if their reactive tendencies are particularly powerful – regulation is a far more difficult job for these children.

With all this being said, you may be thinking that it is not reasonable to expect any regulation from infants, other than basic regulation of state (i.e., awake to alert, and back to sleepy). Although studies are just beginning to ask questions about what exactly in infancy may set the stage for this later development Effortful Control, research has already demonstrated a strong relationship between later Effortful Control and what is referred to as “regulatory capacity/orienting” in infancy. This area includes strategies that even very young infants utilize to control their arousal and attention, such as (1) duration of their orienting reactions, or how long they look, when given a toy, for example; (2) soothability, or how easily they can be comforted by caregivers; and (3) cuddliness - enjoyment of physical closeness with caregivers.

Similar to Effortful Control, these skills are thought to be early signs of babies’ abilities to regulate their reactive responses (e.g., fear, approach), with the primary difference being that these infancy regulation-related skills are directly linked to the caregivers’ efforts to soothe, comfort, and calm.

As previously mentioned, because more sophisticated attention abilities are just beginning to develop towards the end of the first year, you cannot always expect stability in early regulatory abilities. In this regard, one recent study found that although researchers can reliably identify orienting attention when infants are 6 months old, only infants older than 10 months showed stability in being able to shift their attention away from upsetting objects (e.g., masks).
 Nonetheless, even these early markers of regulatory abilities may have important consequences for the development of other temperament characteristics, Negative Emotionality in particular. For example, more developed Regulatory Capacity/Orienting in infancy was shown to lead to fewer and less intense negative emotional reactions in preschool. Such results remind us that temperament in infancy and beyond involves a constant interplay between areas of reactivity and regulation, with the latter having a lot to do with caregivers’ input, especially in infancy.

What can parents do to apply this information in everyday situations?

With respect to parenting and the role of parents in “shaping” their child’s temperament development and its consequences, the idea of “Goodness-of-Fit” has been popular in the world of temperament studies for some time. “Goodness-of-Fit” basically has to do with how well parental demands and expectations match up with the child’s temperament profile. Although this idea is certainly appealing, and has gained some support in research, it is also true that it is easier to provide a better match, as far as these demands and expectations are concerned, for infants who are not upset at minor disturbances or events, show a good deal of positive emotions (e.g., smile often), and are better regulated (e.g., can calm down quickly if they have been disturbed).

Of course, not everyone has a baby with this kind of an “easy going” profile. So, what advice can be given parents who have not “won the temperament lottery”? In general, the principle of balance applies to how parents react to their baby’s display of emotions, and other early signs of temperament. So, accommodation needs to be balanced with some gentle but firm nudging, when appropriate. Let’s take the fearful infant or shy child for example. Of course, parents are going to want to approach novel social situations with care, explaining and framing these in a positive way ahead of time for the older children. However, if the new experiences and/or unfamiliar places are important (e.g., daycare, family gatherings), the parents need to be prepared to stand
firm in their expectations and demands of the child, remembering that crying does not always equal a problem, and that the new will become familiar over time. For children who are playful, like to explore and push boundaries, the answer shouldn’t always be “no” – it’s in their nature to want to approach new things and find out if anything positive is in store. However, sometimes the limits should be set firmly and held, such as when inappropriate behaviors make their appearance (e.g., aggression), or the desired object or situation is dangerous or otherwise unsuitable.

I could not finish this educational piece without saying a few words about sleeping, and eating and feeding, which are so central to the well-being of all family members in the baby’s household. Overall, research on these topics suggest that babies who are more easily upset, and more difficult to calm/soothe, have more problems with eating and feeding interactions, as well as with sleeping through the night. However, our own research suggests that some additional temperament characteristics may be important. For example, babies described as showing a lot of positive emotions, and a powerful drive to approach potentially pleasant objects or activities in particular, may experience some struggles with eating/feeding. We understand these results to mean that in general, these babies are more interested in activities other than eating, and when they perceive these other activities as options; they will want to pursue these instead of focusing on the meal at hand. Another result that may seem counter-intuitive at first has to do with the fact that some babies described as more soothable actually experience more night waking. This likely happens because parents who feel like they can easily soothe their infants make the decision to try and do so more often in the course of the night. Although this certainly makes sense in the moment, in the long run, they may actually be encouraging these night wakings.
In closing, allow me to state the obvious – try to enjoy this precious time with your baby no matter what temperament characteristics s/he shows the most, or how challenging some areas of their emotional reactions or behaviors may be. Also, don’t forget that as parents we have a powerful avenue for helping our young children develop self-regulation that will surely have life-long benefits, buffering them from a variety of adversities.

¹This information is largely based on the book by Mary Rothbart (2011), “Becoming who we are: Temperament and personality in development”, published by Guilford Press, as well as our research conducted at the Washington State University (WSU) Temperament Laboratory, supported by grants from the National Institutes of Health and WSU
Appendix B
“Knowing Your Baby Matters” Knowledge/Mastery Questionnaire

1. The Negative Emotionality temperament trait includes the baby’s:
   a. Sadness
   b. Fear
   c. Frustration or anger
   d. All of the above

2. The Positive Emotionality/Extraversion temperament trait includes the baby’s:
   a. Excitement
   b. Smiling and laughter
   c. Motor activity
   d. All of the above

3. “Goodness-of-fit” can be basically described as:
   a. Child’s regulatory capacity
   b. Child’s display of negative emotions when faced with an unfamiliar situation
   c. How child’s temperament matches with his/her parent’s expectations or demands
   d. None of the above

4. “Goodness-of-fit” is important because:
   a. When it improves, the child’s adjustment is likely to improve as well
   b. It can be successfully altered by the parent if s/he makes that a goal
   c. It is dependent of the child’s temperament
   d. All of the above

5. Babies who are more easily upset and more difficult to calm and soothe show:
   a. More problems with feeding/eating, and sleeping
   b. Fewer problems with feeding/eating, and sleeping
   c. About the same number of problems with feeding/eating and sleeping as babies who
      are not easily upset and are easier to calm and soothe
   d. None of the above

6. Which is the last to develop:
   a. Negative Emotionality
   b. Positive Emotionality
   c. Regulatory Capacity/Effortful Control
   d. They all develop at the same time

7. Effortful Control and Regulatory Capacity are important for:
   a. The development of attention
   b. Regulation of emotions
   c. Planning
   d. All of the above

8. Effortful Control and Regulatory Capacity are important because:
   a. These traits help regulate other more reactive parts of temperament
   b. These can be helped in their development by the parents’ approach/interactions
   c. These involve extreme displays of emotions
   d. a and b only
## Appendix C

**PROGRAM USABILITY INVENTORY**

*Please circle the response for each question which best expresses how you feel. If you circle 1 or 2, please provide us with more information about the difficulties on the line below to help us improve the program; use the back of the form, if needed.*

I. Overall, understanding the information provided in the “Knowing Your Baby Matters” was:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>very difficult</td>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
</tr>
<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

II. Understanding the information on 3 broad temperament traits provided in the “Knowing Your Baby Matters” was:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>very difficult</td>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
</tr>
<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

III. How easy to read was the “Knowing Your Baby Matters” brochure:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
</tr>
<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

IV. How easy to understand was the information about the “Goodness-of-fit”:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
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<td>2.</td>
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<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

V. Understanding the information about risk and protection for later outcomes that comes from the temperament traits was:

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<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
</tr>
<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

VI. How easy to understand was the information about how temperament traits relate to feeding/eating, and sleeping:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>1.</td>
<td>very difficult</td>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
</tr>
<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

VII. Understanding the information about how temperament develops in childhood was:

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<th>Description</th>
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<td>2.</td>
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<tr>
<td>3.</td>
<td>in-between</td>
</tr>
<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

VIII. How easy was it to understanding the information about how different temperament traits affect each other:

<table>
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<th>Level</th>
<th>Description</th>
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</thead>
<tbody>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
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<tr>
<td>3.</td>
<td>in-between</td>
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<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>

IX. Understanding the information about how parents influence the development of their children’s temperament was:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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<td>very difficult</td>
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<tr>
<td>2.</td>
<td>somewhat difficult</td>
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<tr>
<td>3.</td>
<td>in-between</td>
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<tr>
<td>4.</td>
<td>somewhat easy</td>
</tr>
<tr>
<td>5.</td>
<td>very easy</td>
</tr>
</tbody>
</table>
### Appendix D

**PROGRAM ATTITUDE INVENTORY**

*Please circle the response for each question which best expresses how you feel.*

<table>
<thead>
<tr>
<th>I. Regarding my understanding of temperament, I feel I have learned a lot of useful information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. strongly disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Regarding the information on 3 broad temperament factors provided in the “Knowing Your Baby Matters”, I feel:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. very dissatisfied</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Regarding the relationship between me and my child, I feel we get along:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. much worse than before</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV. Regarding my confidence in my ability to understand my child, I feel:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. much less confident</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V. Regarding the description of child temperament, I feel that the program was:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. not accurate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VI. Regarding the progress I made in my approach to interactions and daily activities with my child, I am:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. very dissatisfied</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VII. To what degree has the program helped with other general personal or family problems not directly related to your child in the program?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. hindered much more than helped</td>
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</table>

<table>
<thead>
<tr>
<th>VIII. I feel the ideas presented to help me improve my approach as a parent in managing my child were:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. very poor</td>
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<table>
<thead>
<tr>
<th>IX. I feel that my participation in the temperament program was worth my time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. strongly disagree</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>X. My general feeling about participating in this program is:</th>
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</thead>
<tbody>
<tr>
<td>1. I disliked it very much</td>
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</table>

<table>
<thead>
<tr>
<th>XI. I would recommend this program to friends and/or relatives with an infant:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. strongly disagree</td>
</tr>
</tbody>
</table>