

Relations Among Adolescent Motherhood, Caregiving Experience, and Perceptual
and Caregiving Responses to Infant Cries

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(ABSTRACT)

Prospective analyses suggest that young mothers may not be capable of perceptually discriminating between different infant cry stimuli. The purpose of the present study was to investigate the perceptual and caregiving responses of adolescent mothers to different infant cry stimuli. Twenty-five primiparous adolescents and 39 nulliparous adolescents listened to segments of three different infant cry types that varied in the amount of high-pitched, hyperphonation contained in the acoustic structure. Participants rated their responses to the low- and high-risk cries on perceptual rating scales, and selected a caregiving behavior in response to these same cries. Analyses of Variance showed that both groups of participants perceived the infant cry segments as more arousing, annoying, distressing, loud, and sick-sounding as the amount of hyperphonation increased across cries. Results also showed that adolescent mothers did not perceive high-risk cries as more arousing, annoying, urgent, loud, and sick-sounding than adolescents who were not mothers. However, primiparous participants perceived hyperphonated and partially-hyperphonated cries as less annoying and less loud than nulliparous adolescents. This study did not find significant differences between primiparous adolescents' and nulliparous adolescents' caregiving experiences. Chi-square analyses indicated no significant differences between the participant groups' caregiving response choice frequencies to all three infant cry types.

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Introduction

The cry of the newborn and young infant has long been recognized as a salient communicative behavior with adaptive value (Darwin, 1855; 1965). This early social behavior elicits responses from the caregiving environment that most typically meet the developing infant's needs and wants, and in turn, may facilitate survival and development. However, development is probabilistic, and the sound of crying may have differential functional consequences in different experiential milieus (Zeskind, 1985). Accumulating evidence suggests that the infant's crying behavior may contribute to the development of nonoptimal developmental consequences, and in some cases, physically abusive interactions ensuing between caregivers and their infants (Frodi, 1985; Zeskind & Lester, 1978). Crying often precipitates abusive episodes (Kadushin & Martin, 1981), and abusive parents report feeling more annoyed and less sympathetic than comparison parents when listening to infant cry sounds (Frodi & Lamb, 1981).

Adolescent Mothers

Overview: A population at risk for nonoptimal parenting practices.

For several decades adolescent mothers have been ascribed a socially and developmentally disadvantaged population (Botvin & Botvin, 1991; McAnarney, et al., 1979; McAnarney, 1985; Mednick, Baker & Sutton-Smith, 1979; Oppel & Royston, 1971). Accumulating empirical evidence demonstrates that young mothers may be less ready to meet the needs of their infants than postadolescent mothers. For example, adolescent mothers more often express insecurity about their role as a mother and are more uncertain in their attempts at interpreting their baby's needs and wants, in comparison to older mothers (Hales & Bergen, 1979). These mothers have been found to express fewer positive statements regarding their infant's behavior during the feeding situation, in comparison to older mothers (Zuckerman, Winsmore & Alpert, 1979).

Young mothers also spend less time with their infants (Lawrence & Merritt, 1981; McLaughlin, et al., 1975), and provide less verbal and auditory stimulation in interactions and provide more physical stimulation to their infants (Levine, Garcia-Coll & Oh, 1985).

Theoretical evidence suggests that adolescent mothers may not be capable of comprehending the meaning either of their infants' behaviors, or of the complex, interpersonal nature of their infants' behavioral repertoire (Botvin & Botvin, 1991; Elkind, 1978; Gruber & Chambers, 1987). For example, even though the high-pitched cry characteristic of infants at risk has been described as a "biological siren" (Ostwald, 1972), adolescent mothers reportedly misperceived the risk status of their own infant's low- and high-risk cry sounds (Lester, Garcia-Coll, Valcarcel, 1989). Brazelton (1984) suggested that if the caregiver misperceives her infant's cry sounds at the present time, she may be more likely to be under-responsive to her infant in the future, and thus, may not effectively learn to modulate and manage her infant's developing behavioral repertoire. This may be especially problematic for young mothers who, in contrast to older mothers, may not comprehend, and/or possess the knowledge of appropriate caregiving behaviors, along with a sufficient understanding of the dynamic, bidirectional nature of the infant-caregiver relationship.

Investigators have demonstrated that in such cases, infants may suffer cumulative effects associated with their initial high-risk status, further contributing to the maintenance and/or facilitation of this high risk status with future development (Merritt, Lawrence & Naeye, 1980; Vaughn et al, 1982; Zeskind & Lester, 1978; 1981). Studies of mothers of premature infants born to black adolescent gravidas of low socioeconomic status (SES) suggest that these early interactive behaviors can persist beyond infancy and distort the mother's subsequent care of her infant in a nonsupportive caregiving environment (Field, Widmayer, Stringer & Ignatoff, 1980). Therefore, it appears that the degree to which adolescent parenting contributes to developmental delays has serious implications for the young mother who may also be unable to comprehend the complex, interpersonal nature of caregiver-infant transactions, and in turn, may be socially,

psychologically, and emotionally less equipped to assume the responsibilities of parenting than more mature mothers.

Acoustic Features of Infant Cry Sounds

Just as there are differences in the individual listener that may increase the likelihood that cries are interpreted inaccurately or unusually aversive, there are differences in cry sounds that may contribute to these perceptions. For example, Zeskind & Lester (1978) investigated inexperienced and experienced adults perceptual discriminations of cries containing hyperphonation in the acoustic structure. Hyperphonation indicates a sudden shift in pitch between 1000-2000 Hz, so that the cry sounds like a high-pitched whistle. Compared to phonated cries that have a fundamental frequency (basic pitch) averaging 400-600 Hz, hyperphonated cries have a fundamental frequency averaging 1000-2000 Hz (Golub & Corwin, 1984). According to these researchers, both parents and nonparents perceived hyperphonated cries as more urgent, grating, sick, arousing, piercing, discomforting, aversive, and distressing than comparison cries. In addition, hyperphonated cries were perceived as both "urgent" and "sick", reflecting the health condition of the infant, whereas phonated cries were perceived as sounding unpleasant. More recent research has similarly demonstrated that mothers report that high-pitched, hyperphonated infant cry sounds are generally more distressing, sick, and urgent than are cries with less hyperphonation on perceptual indices (Zeskind & Shingler, 1991).

The results of these studies demonstrate that listener attributions of high- and low-risk infant cry sounds (e.g., aversiveness, urgency) were related to the fundamental frequency of the cry sound, regardless of listener characteristics of past history or future potential to abuse a child. These results suggest that variations in the fundamental frequency of the cry sound of high-risk infants may be an eliciting stimulus in the development of abusive caregiver-infant interactions. Based on the above-cited research, the fundamental frequency, or high-pitch, of the infant cry sound may be one salient acoustic property that impacts on listener perceptual and attributional processes.

In addition to these acoustic features, high-risk infant cries are characterized by rapid, sudden shifts in fundamental frequency. Thus, both the high-pitch and the less predictability in the cry sound may be associated with the perceived aversiveness of these infant cry sounds. In an investigation of the contribution of differential spectral characteristics to adult perceptions, Zeskind and Marshall (1988) had multiparous mothers listen to and rate their perceptions of pain cry segments varying in the mean, peak, and variability of the fundamental frequency. Increases in the mean, peak, and standard deviation of the fundamental frequency were mostly due to the occurrence of hyperphonation. The results indicated that the mean pitch of the cry accounted for the largest proportion of the variance in maternal ratings of distressing, urgent, and arousing. In addition, the largest proportion of the variance in the ratings of how sick the infant sounded was accounted for by the standard deviation of the fundamental frequency of the cry. These results suggest that increases in the fundamental frequency of the cry, associated with the occurrence of hyperphonation, are related to increases in the intensity of adult perceptual responses. These cry features characteristic of high-risk infants may communicate salient information to caregivers about the infant's needs, and thus may influence caregiver-infant interaction patterns (Zeskind & Marshall, 1988; Zeskind, Klein & Marshall, 1992).

Hyperphonated cry sounds are often emitted by low birth weight infants, that often also have a high number of obstetric complications. For example, studies show that cry sounds with the highest frequency, high maximum frequency, short durations, and fewer harmonics were related to thin, short gestation babies and babies with poor performance on the Neonatal Behavioral Assessment Scale (NBAS) (Lester & Zeskind, 1978; Zeskind, 1985). Similarly, the combination of poor performance on the NBAS, either a low or high ponderal index (PI), and a short gestation, have been associated with infant cries of short duration, high average fundamental frequency, high maximum frequency, and fewer harmonics in the cry sound (Zeskind, 1983b). These infants suffer an increased risk of early morbidity, and among survivors, are at risk for an array of signs of nervous system dysfunction (Prechtl, 1968).

Variations in the pitch of infant cry sounds have also been found to affect adult perceptions across studies using different infant populations. For example, Lounsbury and Bates (1982) investigated the impact of easy- average- or difficult-temperament infants on the subjective perceptions of unrelated primiparous mothers. The cries of difficult-temperament infants had higher fundamental frequencies on the fundamental frequency at peak and had longer pauses between cry bursts, in comparison to the cry sounds of easy- and average-temperament infants. Analyses also revealed that difficult infants tended to cry at higher fundamental frequencies at peaks of loudness, tended to pause longer than easy infants between the end of one expiratory cry segment and the inspiratory segment of the next cry, and demonstrated a longer total pause (which includes pausing within cry segments and between one segment and the next). Moreover, all listeners perceived difficult and average infant cry sounds as more spoiled than those of easy infants, and listeners expressed more anger and irritation in their ratings of the cries of difficult and average infants compared to their ratings of easy infant cries. In similar analyses, these researchers also found that listener attributions as to the causes of crying also varied according to infant temperament. Cries of easy infants were perceived as being due to hunger and minor physical discomfort, and as due to psychological and emotional causes, more often than were cries of difficult infants.

Studies also show that infants with these cry features are less responsive to the caregiving environment and are more difficult to arouse than are comparison infants (e.g., Zeskind & Collins, 1987; Zeskind & Lester, 1981). These findings also suggest that variations in cry features of infants with either retarded or accelerated growth patterns may also be related to differential behavioral reactivity, in comparison to infants with typical patterns of fetal growth. Importantly, characteristics such as responsiveness and alertness, are related to the evolution of early reciprocity patterns between caregivers and their infants (Field et al, 1980; Thompson et al, 1979). Moreover, neonatal behavioral organization has been related to the quality of mother-

infant interaction at 3, 6, 28, and 24 months of age (Vaughn et al, 1980; 1982, Zeskind & Ramey, 1978).

Crying, Risk, and Perceptual Responses Among Adults

Crowe and Zeskind (1992) examined the perceptual and physiological responses of nonparent adults to high-pitched, hyperphonated infant cries and "normal" phonated cries using adults who were classified as having a low or high score on the Child Abuse Potential (CAP) Inventory. The results indicated that both groups found the hyperphonated cry sounds to be more aversive, urgent, arousing, and sick on perceptual rating scales than the phonated cries. In addition, both groups demonstrated higher skin conductance levels (SCL) to hyperphonated cries, in comparison to phonated cries. However, although no differences in the resting heart rate and SCL were found between the Low-CAP and High-CAP groups before listening to the cry sounds, participants in the High-CAP group demonstrated marginally higher heart rates and SCL's at the conclusion of the study.

Boukydis and Burgess (1982) investigated the relation between parity and the impact of the affective message of cries on primiparous and multiparous parents' and nonparents' perceptions. Cries were those of easy- average- or difficult-temperament infants and participants' perceptions were assessed using self-report and skin potential response (SPR). The cries were the same as those used in the Lounsbury and Bates (1982) study. Boukydis and Burgess found an interaction between the type of cry and parental status. Whereas primiparous mothers showed the highest levels of arousal to the hunger cries of average-temperament infant cries, multiparous mothers rated hunger cries as less piercing than did both primiparous mothers and nonparents. Moreover, multiparous mothers and nonparent groups showed the highest levels of arousal to difficult infant cries. Lastly, both primiparous and multiparous mothers gave higher care responses to difficult infant cry sounds. These findings suggest that the nonrhythmic temporal patterning of these infant cries, as well as increases in the fundamental frequency, influence parents' physiological responses and perceived aversiveness. Thus, it may be that

certain acoustic features (e.g., high pitch) and temporal features (e.g., rhythmicity) provide information about the functional organization of these infants' nervous systems. Developmental work on crying suggests that these characteristics may be indicative of infants who are disorganized in the coordination of systems modulating their cry sounds (see Appendix A for a discussion of cry production mechanisms).

The high-pitched cry of premature infants has also been demonstrated to be more aversive and to elicit greater autonomic arousal in mothers and fathers than the cry of full-term infants (e.g., Frodi, Lamb, Leavitt, Donovan, Neff & Sherry, 1978). Moreover, Friedman, Zahn-Waxler and Radke-Yarrow (1982) found that mothers consistently rated the cries of medium-risk (estimated by the birth weight, obstetric history, length of hospital stay, and length of intensive care) premature infants as more negative (e.g., urgent, grating, sick, arousing, and immature) than cries of full-term infants. However, some low-risk preterm infant cry sounds were rated by these mothers as less urgent, more pleasing, healthy, soothing or mature than were cry sounds of medium-risk infants. The authors suggested that the low-risk infants may have made a more rapid recovery from the stress of preterm birth than the medium-risk infants. In the above study, it appears that the infant's risk status was reflected in the cry sound, as demonstrated by the perceived qualities of these infant cry sounds by mothers. Thus, as demonstrated by previous researchers, it appears that cry features may be a sensitive indicator of the risk status of the infant.

Freudenberg, Driscoll and Stern (1978) investigated the perceptions of cries of normal and Down's syndrome infants using inexperienced and experienced male and female college students. Down's syndrome is associated with a hoarse, low-pitched, "guttural" cry, lower than the pain cries of normal infants (Wasz-Hockert et al., 1968). Participants responded to the following two questionnaire items: (1) "How strong is your feeling that this infant needs immediate attention?" and (2) "How pleasant or unpleasant does this infant's vocalization sound to you?" The results of this study indicated that experience with infants did not affect

Participants' reactions to the cry sounds. Thus, the ability to distinguish between the type of cry and the response to the cry was independent of experience. However, all Participants rated the normal cries as more unpleasant and in need of more attention than the Down's syndrome cries. The authors suggest that perhaps it is not adaptive to expend energy on an abnormal infant. Alternatively, the low-pitch cry sound of the Down's syndrome infant may not be related to increased responsivity. For example, other work suggests that a high fundamental frequency of infant cry sounds is related to adult perceptual responses of aversiveness (Zeskind & Lester, 1978) and urgency (Zeskind & Marshall, 1988).

Research also indicates that differences in the perceptions of infant communicative behavior by parents (e.g., Donovan, Leavitt & Balling, 1978), and perceptions of cry features by caregivers (e.g., Frodi, et al., 1978; Frodi, 1985) may lead to differences in the emotions of caregivers which mediate behavioral responding to their infant. For example, to determine whether the facial appearance and cries of premature infants elicit differential physiological responses than do the facial appearance and cries of full-term infants, Frodi et al. (1978) had mothers and fathers listen to and view videotapes of both a premature and full-term infant when the infant was first quiescent, then crying, and then quiescent. The following four tapes were shown: a cry of a healthy full-term infant with a picture of a healthy full-term infant; a cry of a healthy full-term infant with a picture of a premature infant; a cry of a premature infant with a picture of a premature infant; and a cry of a premature infant with a picture of a full-term infant. Using measures of skin conductance and heart rate, Frodi et al. found that mothers and fathers demonstrated an increase in skin conductance in response to both infant cries when the premature face was viewed. Participants' responses were even higher when the premature cry was viewed and heard simultaneously. Using a mood-adjective checklist, Frodi et al. (1978) found that parents indicated that they felt more irritated, annoyed, disturbed, and less indifferent when hearing the premature cry. Moreover, fathers indicated that they were more sympathetic to the the full-term baby when it possessed its own cry than to cries with incongruous visual and

auditory characteristics. By contrast, mothers were most sympathetic to the premature baby with the normal cry and least sympathetic to the premature baby with the premature cry. Parents also indicated that they found the full-term baby more pleasant and would rather interact with this baby than the premature baby. Frodi et al. (1978) suggest that infants with aversive characteristics may be more likely to elicit aggressive behavior from caregivers. Child abusers have been found to rate themselves as more annoyed and less sympathetic toward a crying infant than have nonabusers (Frodi & Lamb, 1981). These researchers assert that "When a child's temperament renders it relatively inconsolable, or when a parent behaves ineffectively, the child may become an aversive stimulus regardless of whether or not it is crying" (Frodi & Lamb, 1981, p. 496). They also suggest that this response pattern has developed through transactions with children who because of their temperament, or because of the parent's incompetence, are difficult to care for. These statements have particular relevance to the adolescent mother who is more likely to deliver a premature, low birth weight, or small-for-gestational-age infant relative to postadolescent mothers. These high-risk infants may exhibit unusual or aversive cry features. The complex combination of a high-risk infant and a young adolescent mother (who is likely to be inexperienced in child care, unknowledgeable about developmental norms, and lacking the cognitive resources and abilities to develop optimal transactions with her infant) may provide some insight into the process of the developing caregiver-infant interactive relationship, in that maternal perceptions may be related to caregiving behavior. For example, one possibility is that the child may become an aversive stimulus over time.

Crying, Risk, and Caregiving Responses

Newborns who have hyperphonated cries have also shown evidence of cognitive delays (Parmelee, Kopp & Sigman, 1976; Zeskind & Lester, 1978), continuing into the second year of life (Lester, 1984; Zeskind & Lester, 1981). Investigators have found, however, that the experiential effects of subsequent placement in a supportive caregiving environment contributed to the amelioration of these early physical and biobehavioral indices of risk, that were further

associated with cognitive achievements, not found among comparison infants who were subsequently placed in a nonsupportive caregiving environment (Sameroff & Chandler, 1975; Zeskind & Iacino, 1987).

Zeskind (1980) suggested that while experienced and inexperienced adults can discriminate the cry sound, experience with infants may be necessary to translate the differential perceptions into "decisive actions". For example, cries from high-risk infants, perceived as urgent and sick, elicited parental responses that were intended to be more "tender and caring" and more "immediately effective at terminating the crying" than did the cries of low-risk infants. Non-parents revealed no differences in caregiving responses to low- versus high-risk infants. Moreover, responses by parents to high-risk infants were more consistent than were responses to low-risk infants cries, in comparison to non-parents' responses. Parents also gave responses that they considered to be more immediately effective in terminating the cries of high-risk infants than did nonparents. Lastly, parents gave more consistent responses than did nonparents to the cries of high-risk infants.

In addition, to determine a description of the pattern of caregiving choices by parents and nonparents, each subject's modal response to six caregiving choices was obtained. The six caregiving response choices were stratified into three categories by functional significance. The categories included: (1) Contact-comfort responses (pick up and cuddle); (2) Utility responses (feed and clean); and (3) Undirected responses (give pacifier and wait and see). Analyses of the differences in caregiving choices made by parents and nonparents to low- and high-risk cries indicated that the largest number of modal responses for nonparents were in the contact-comfort category, whereas the modal responses for parents were in the undirected caregiving category. Moreover, parents gave significantly more contact-comfort responses to high-risk infant cries than did nonparents. For example, parents chose responses that they perceived as being more "effective" at terminating a cry that was more "distressing" from an infant who was crying for a more "urgent" reason. Similarly, parents chose more "tender and caring" responses for infants

who were perceived as sounding "sick" than did nonparents. In other words, parents gave responses that paralleled the semantic structures underlying the perceptions of the cries of the risk infant. It is apparent from the above-mentioned studies that both experienced and inexperienced adults can discriminate differential infant cry sounds. However, these two groups did not respond uniformly to the cries of high-risk infants. Based on this research, it appears that parenting experience is not necessary to discriminate the infant cry sound. However, parenting experience may be related to caregiving response differences.

These findings have also been documented among different cultural groups. Zeskind (1983a) investigated whether the perceptions of and caregiving responses to the pain cries of low- and high-risk infants differed among Anglo-American, Black-American, and Cuban-American mothers, using the same cry stimuli and the perceptual and caregiving rating scales used in previous work on parental perceptions of high-risk infant cry sounds. Participants rated their perceptions of the cries on four of the seven-point perceptual scale items, including distressing-nondistressing, urgent-nonurgent, arousing-nonarousing, and sick-healthy. Participants also rated the appropriateness of the six caregiving choices of pick up, cuddle, feed, clean, give pacifier, and wait and see. Similar to the results of previous studies, the analyses of these mothers' perceptual responses indicated that the high-risk infant cries were rated as more distressing, arousing, urgent, and sick sounding than were the cries of low-risk infants by all parents in all three cultural groups. Thus, mothers in all three cultural groups were able to differentiate the cries. Perceptual responses to high-risk infant cries also varied as a function of cultural group and parity. Multiparous Black-American mothers rated the cries of the high-risk infant as less distressing, urgent, and sick sounding than did the Anglo-American multiparous mothers and less distressing than did the Cuban-American multiparous mothers. However, primiparous Cuban-American mothers rated the high-risk cries as less urgent and sick sounding than did the Black- and Anglo-American primiparous mothers. Analyses of the caregiving items indicated that the high-risk infant cries elicited stronger caregiving responses from all mothers on

the Pick Up and Feed items, and lower ratings on the response Give Pacifier, regardless of parity. Lastly, Anglo-American mothers appeared to choose higher amounts of physical intervention with higher ratings on the response Pick Up and Cuddle.

Similar to the wide range of studies demonstrating that infant cry sounds may elicit differential perceptions and responses among experienced and inexperienced adult listeners, the above study indicates that experienced and inexperienced Anglo-American mothers do not differ in their perceptions of cry sounds. However, Cuban-American primiparous mothers found the cries of the infant at risk as both less urgent and sick sounding than did Cuban-American multiparous mothers. In addition, cultural differences in the perceptions of the cries of the infant at risk were apparent only among the multiparous mothers of the three cultural groups. These findings suggest that the effects of parenting experiences may not be the same across cultures (Zeskind, 1983a). It is also important to note that the high-risk infant cries elicited maternal perceptual responses of "distressing", "sick", and "urgent" and also more contact-comfort (e.g., pick up) responses than did low-risk infant cries across maternal cultural groups. This finding indicates that the cries of the high-risk infant are perceived across cultures as requiring more attention, perhaps facilitating their care.

Although it is likely that many different features of the cries of infants from different populations may influence adult perceptions, the above research suggests that the fundamental frequency of infant cry sounds appears to be strongly related to perceptual attributions across different adult populations. Gradiated increases in the fundamental frequency are related to parallel increases in adult perceptual responses of urgency, distress, arousal, and sickness (Zeskind & Marshall, 1988). Thus, within one cry stimulus, variations in pitch communicate salient information to adult caregivers. Ecological validity for these findings has also been reported. For example, Zeskind and Collins (1987) observed the responses of professional caregivers to high-pitched cries in a preschool environment. They found that the higher-pitched cry sounds were related to more urgent responses on perceptual rating scales. In addition,

higher-pitched cry sounds were related to more comforting responses than lower-pitched cry sounds. Specifically, whereas higher-pitched cry sounds generally elicited holding and rocking responses, lower-pitched cry sounds generally elicited picking up and holding responses.

As previously discussed, researchers have demonstrated that adults are more physiologically aroused and perceive higher arousal levels in infant cries that are irregular, having longer pauses between cry bursts, and long pauses in the overall cry, in comparison to regular, rhythmic cries. Because reliable perceptual discriminations between these cries have been demonstrated among the adult population, this ability has been suggested to be universal. Common among these studies, parents did not rate their own infant's cry sounds.

Until recently, in the only available study investigating parental responses to one's own infant's cry sounds, Wiesenfeld, Jander, Malatesta & DeLoach (1981) found that both primiparous adult mothers and fathers, but particularly mothers, rated their own infant's low- and high-risk cries to be more unpleasant than comparison cries, on perceptual indices. In addition, both parents were better able to correctly identify the risk status of their own infant's, as compared to ambiguous infants', high- and low-risk cries. Lastly, both mothers and fathers reported more tension in response to their own infants' cries, than in response to ambiguous infant cries. These results support previous findings of adults' ability to reliably discriminate between low- and high-risk infant cry sounds, and additionally suggest that adults may be even better able to correctly discriminate the risk status of their own infant's cries, than that of ambiguous cries.

In addition, these parents' perceptual and physiological reports indicated that they experienced more unpleasantness and higher degrees of self-tension, respectively, in response to their own infant's cries, than in response to the cries of ambiguous infants. Moreover, it is also a possibility that the demand characteristic of perceptually responding to, evaluating, and rating the degree of aversiveness, distress, and sickness of one's own infant's cries, impacts on parents physiological, and in turn, perceptual responses to their own infant's low- and high-risk cries.

Perceptions of Cries by Adolescents

Lester et al. (1989) investigated whether primiparous, low SES adolescent (13-17 yrs) and postadolescent (20-28 yrs) mothers differentially respond to their own infant's cry sound. In this study, eight of the 19 adolescent mothers and 11 of the 18 postadolescent mothers had delivered infants with compromised fetal growth (i.e., below the 10th percentile in birth weight or birth length for gestational age, or below the 10th percentile in PI). Participants were asked to rate the cry of their own infant on the following twelve 7-point Likert-type rating scales: (a) pleasant-bothersome, (b) soothing-aversive, (c) piercing-not piercing, (d) grating-not grating, (e) arousing-not arousing, (f) intense-not intense, (g) fearful-not fearful, (h) bad-good, (i) disagreeable-not disagreeable (j) strident-not strident, (k) a good cry-a bad cry, and (l) irritating-not irritating.

Results indicated that postadolescent mothers rated the cries of their infants with compromised fetal growth toward the negative sides of the perceptual scales, whereas adolescent mothers rated the cries of their infants with compromised fetal growth toward the positive sides of the perceptual scales. Specifically, postadolescent mothers rated the cries of their infants with compromised fetal growth as more disagreeable, aversive, grating, bothersome, arousing, piercing, intense, fearful, and as having a worse cry, in comparison to adolescent mothers with infants of compromised fetal growth. Importantly, correlations between the rating scale scores and the acoustic characteristics of the cries indicated that higher values on acoustic measures, such as fundamental frequency, and variability in fundamental frequency (meaning that the features are more unpleasant), were related to negative perceptual ratings for postadolescent mothers, whereas these features were related to positive perceptual ratings for adolescent mothers. The results of this study suggest that adolescent and postadolescent primiparous mothers differ in how they perceive their own infant's cry, regardless of caregiving experience.

Therefore, in Lester et al.'s study, both young and older mothers reported reliably similar levels of self-tension in response to their own infant's cries, as did Wiesenfeld et al.'s sample of

adult mothers and fathers; however, the adolescent mothers in Lester and colleague's study misperceived the associated risk of their own infant's cries. According to Lester and colleagues (1989), the disconfirmation of a parent's perceptions can point to directions for clinical intervention. For example, the basis of the perception may not be apparent in the cry sound; rather, the basis may be more parent- or more infant-based.

Importantly, regardless of the powerful eliciting properties of the high-risk infant cry sound, and regardless of adults' perceptual ratings of this cry sound as a noxious stimulus, Lester et al. (1989) demonstrated that adolescent mothers of infants with compromised fetal growth rated their infants' high-risk cry sounds toward the positive ends of the rating scales.

Alternatively, adolescent mothers of infants with normal fetal growth patterns rated their infants' low-risk cry sounds toward the negative ends of the rating scales. The reverse pattern was demonstrated for postadolescent mothers' ratings of their own infants with both normal and atypical growth patterns. Lester et al. (1989) suggested that adolescent mothers may respond this way as a defensive reaction to their own infant's health status. This is plausible since in this study mothers were rating their own infant's cry sounds. One question left unanswered is whether adolescent mothers perceive high- and low-risk infant cry sounds in a similar manner as postadolescent mothers.

Statement of the Problem and Theoretical Rationale

The infant's cry sound is a particularly salient communicative behavior that may affect the quality of the caregiving environment. However, the cry sounds exhibited by infants may not provide the basis for differential responsivity when mothers accurately perceive their infant's needs and/or they possess the caregiving experience with infants necessary to provide the special care that their infants may require. Whether adolescent mothers perceptually respond to infant cry sounds in the same manner as older mothers needs to be explored. Lester and colleagues demonstrated that adolescent mothers rated their own infant's cry sounds on perceptual rating scales in a fashion opposite to that demonstrated by postadolescent mothers. Postadolescent

mothers' ratings of their own infant's cry sounds were similar to the manner in which experienced and inexperienced adults across cultures rate infant cry sounds. The reasons for this apparent effect associated with these adolescent mothers' perceptual responses are unknown. However, two variables that potentially affect differences in perceptions of infant behavior are an individual's knowledge of young infants derived from an individual's previous caregiving experience with young infants, and from experience as a mother to a young infant.

The purpose of this study was two-fold. First, to the extent that the infant's cry sound is its primary means of communicating its health status and needs to its primary caregiver, the primary purpose of this study was to explore adolescent individuals' (16-19 yrs) and adolescent mothers' (16-19 yrs) perceptual responses to unfamiliar low-risk, i.e., phonated, and high-risk, i.e., partially-hyperphonated and hyperphonated infant cry sounds. For comparative purposes, these cry stimuli used with adults in past studies (i.e., Zeskind & Shingler, 1991). Based on this research, all participants in this study were expected to demonstrate the ability to perceptually discriminate low- from high-risk infant cry sounds. Specifically, all participants were expected to assign higher rating scores to all five of the perceptual items in response to listening to both high-risk, i.e., hyperphonated and partially-hyperphonated, as compared to low-risk, i.e., phonated, infant cry sounds. Second, this study assessed the caregiving behavioral choices of adolescent individuals (16-19 yrs) and adolescent mothers (16-19 yrs) to these same low- and high-risk infant cry sounds.

Hypothesis

The specific hypotheses of this study were as follows:

H₁ Based on studies by Zeskind and Shingler (1990) and Crowe and Zeskind (1992), all participants, regardless of parity differences, were expected to perceive infant cries as sounding significantly more urgent, arousing, sick, annoying, and loud, as the degree of hyperphonation in the cry sounds increased, evidenced by scores on perceptual rating scales.

H₂ Based on the work of Boukydis and Burgess (1982) and Frodi (1984), primiparous participants were expected to assign significantly higher ratings to cries with increasing degrees of hyperphonation in the cry sounds on perceptual scale items, as compared to nulliparous participants.

H₃ Based on Zeskind (1980), primiparous participants were expected to choose contact-comfort and utility caregiving behaviors significantly more often than undirected caregiving behaviors, in response to cries manifesting hyperphonation, as compared to cries not containing hyperphonation.

Method

Participants

The final population comprising this study included 64 female participants from city health centers, high schools, alternative high schools, and colleges, classified as middle socioeconomic status (SES), from similar suburban demographic regions in south central Minnesota, based on Hollinghead's 2- and 4-factor indices of social status (see Appendix C). Participants volunteered to participate in a study of cry perception, agreed to listen to tape recordings of vocalizations of infants, and agreed to complete several questionnaires.

Participants were selected on the basis of age, and parity, and were stratified into the following two parity groups: Primiparous 16-19 yrs ($\underline{n} = 25$) and nulliparous 16-19 yrs ($\underline{n} = 39$). The rationale for age stratification was as follows: First, because 16-19 year old gravidas are at an increased risk for nonoptimal pregnancy outcomes, and since the birth rates in this particular age group remain stable, it appears important to determine adolescents' perceptual response discriminations to infant behavioral signals. Second, it was important to determine if adolescents also differ in their perceptual and caregiving responses to infant cry segments because of parity status, i.e., bearing and rearing an infant, which may lead to differential infant caregiving experiences.

Previous studies have failed to differentiate between Caregiving Experience and Parity. First, researchers have operationalized Parity as being a parent of an infant, equating Parity with Caregiving Experience. Second, researchers have compared parent and nonparent samples' perceptions of infant crying behavior, where these two different samples were stratified solely on the basis of parity, by using these two terms interchangeably, and by not considering that nulliparous adults do have Caregiving Experience, while not simultaneously being a parent (e.g., Zeskind & Lester, 1978; 1981; Zeskind, 1980; 1983a; 1983b). By contrast, in the present study, first, in regard to Parity, all infants of primiparous mothers were not more than one year of age. Second, Caregiving Experience was defined as having the sole or full responsibility for an infant under one year of age, and responsibilities/activities performed with the infant, among both nulliparous and primiparous participants.

Materials

Cry stimuli.

The procedure for recording and classifying these cry sounds was as follows. Cries were elicited by a rubber band snap to the heel of the foot of 2-day-old infants residing in the normal newborn nursery of an urban hospital and were recorded at a constant volume with a directional microphone held 20 cm midline from the infant's mouth, according to procedures used in previous infant cry perception studies (e.g., Zeskind, 1983a; Zeskind & Lester, 1978). The first 15 s of each cry was used for the stimulus tape. Cries were spectrum analyzed with a Voice Identification PM model Pitch Analyzer and a Microsystems Lab (MSL) analysis system, both of which produced a digital display of the fundamental frequency. The MSL system also produced a power density spectrum and a sonographic display which graphically detailed the acoustic structure of the cry sounds. The stimulus tape was composed of four-s cry segments from each of three different frequency patterns: (a) Hyperphonated cries were defined as showing a fundamental frequency above 1000 Hz (standard criterion; see Golub & Corwin, 1985) throughout the entire 15-s segment; (b) Partially-hyperphonated cries begin with hyperphonation,

but change to normally phonated sounds approximately halfway through the 15-s period; and (c) Phonated cry sounds were characterized by a normally pitched (400-600 Hz) acoustic structure throughout the 15-s segment. Measures of the mean, standard deviation, and peak of the fundamental frequency (in Hz) of the three cry sounds were: (a) hyperphonated cries: $M = 1189$, $SD = 551$, peak = 3063; (b) partially-hyperphonated cries: $M = 643$, $SD = 286$, peak = 2370; (c) phonated cries; $M = 494$, $SD = 98$, peak = 868. The stimulus tape was the same as that used in previous studies which examined adult's perceptual response choices (Zeskind & Shingler, 1991) to low- and high-risk infant cry sounds. Each cry was followed by a 20-s silent period. The cries were arranged in two random orders so that each participant heard 12 different cries in one random order followed by the same 12 cries in a second random order.

Dependent Variables

Perceptual Rating Scales. The study employed five perceptual items scored on a 5-point Likert scale. The first three perceptual rating scales described below were previously used with college students, with adults (Zeskind, 1980; Zeskind & Lester, 1978), and across cultures (Zeskind, 1983a) to differentiate low- and high-risk infant cry sounds; these were used because of their previously shown utility in differentiating cries varying in pitch. The anchors for the five items were: arousal (1: soothing; 5: arousing), urgent (1: not urgent; 5: urgent), sick (1: healthy; 5: sick), and annoying (1: not annoying; 5: annoying). Participants were also asked to respond to the question "how loud does this cry sound?" and to rate their responses on a 5-point Likert scale, i.e., loud (1: not loud; 5 loud).

Caregiving Rating Scales. The caregiving responses were adopted from Zeskind (1980) and comprised a list of 6 caregiving behaviors: feed, cuddle, pick up, clean, give pacifier, and wait and see.

Procedure

After the purpose of the study was explained to participants, consent for participation was obtained (see Appendix B). Participants were tested in groups of four to seven during a one hour session. Participants in both junior high school and high school were either tested during their free periods, or at the end of their school day in a classroom at their respective schools. Participants in college were tested at various times in a classroom at their respective college. All other participants were recruited from programs available for pregnant adolescents and adults in Southern Minnesota and tested at the respective center. All participants were provided with a test booklet containing the instructions, perceptual rating scales, and caregiving behavioral response choices (Appendices D and E, respectively). All participants were informed that they would hear a taped recording of 12 different infant cry sounds, each cry presented three times at different locations in the tape. The verbal instructions were read aloud for all participants and participants received several practice trials. Participants were naive to the risk condition of the infant and to the reason why the infant was crying.

The procedure for listening to the cry tape was as follows: Cries were played at a constant volume on a Marantz PMD # 360 stereo tape deck. Participants were instructed to listen to the 4-s cry segment and during each 20-s intercry interval following each 4-s cry segment to rate their perception of the cry sound based on the 5 perceptual items. During a second randomized presentation of the same cries, participants chose a caregiving behavioral response choice that seemed most appropriate for that cry sound from a list of 6 possible caregiving behaviors. The order in which participants rated their perceptual responses was counterbalanced across participants.

After participants listened to the infant cry sounds and completed the perceptual and caregiving response inventories, participants completed a demographic information form (Appendix C). The demographic information was used to determine each participant's SES, as determined by the Hollingshead 2- or 4-factor index of social status.

Caregiving Experience Questionnaire.

This assessment assessed whether participants possessed caregiving experience obtained from being the primary individual responsible for the care of a young infant over repeated occasions. The reliability of the Caregiving Experience Questionnaire was calculated using Chronbach's alpha. Results indicated that the reliability of the caregiving experience measure was $\alpha = 88\%$.

Data Analysis.

As suggested by O'Brien & Kaiser (1985), Multivariate Analysis of Variance (MANOVA) procedures were used to calculate all within-subjects effects. All reported F-tests for within-subjects effects were Hotelling's T^2 . All follow-up analyses for within-subjects factors were calculated using Bonferroni's method, $p < .05$. All follow-up tests on between-subject's effects were Student Neumann-Keul multiple range tests, $p < .05$.

Results

A 3 Cry Type (Phonated vs. Partially-Hyperphonated vs. Hyperphonated) x 2 Parity (Primiparous vs. Nulliparous) x 2 Caregiving Experience (Low vs. High) Mixed Model Multivariate Analysis of Variance (MANOVA) was calculated using the five perceptual scales (Urgent-Not Urgent, Arousing-Soothing, Sick-Healthy, Annoying-Not Annoying, Loud-Quiet). Cry Type was a within Participant factor. Both Parity and Caregiving Experience were between-Participants factors.

Results of the MANOVA showed significant main effects for both Cry Type, $F(2, 59) = 274.18$, $p < .001$, and Parity, $F(1, 60) = 5.28$, $p < .05$. The main effect for Caregiving Experience and all other interaction terms were not significant, $p < .05$. Based on these findings, the Cry Type and Parity main effects were examined for each perceptual scale item.

Cry Type

As depicted in Table 1, results of the univariate tests indicated a significant Cry Type main effect for Arousing, $F(2, 61) = 152.65$, $p < .01$, Urgent, $F(2, 61) = 124.69$, $p < .01$, Sick, F

(2, 61) = 184.76, $p < .01$, Annoying, $F(2, 61) = 67.92$, $p < .01$, and Loud, $F(2, 61) = 107.48$, $p < .01$. Post-hoc analyses using Bonferonni's, indicated significant differences among all three Cry Types for all perceptual items (see Table 1). Participants perceived phonated cries as sounding the least arousing, urgent, sick, annoying, and loud, than both partially-hyperphonated and hyperphonated cries. Hyperphonated cries, characterized entirely by hyperphonation, were perceived as sounding the most arousing, urgent, sick, annoying, and loud, in comparison to both partially-hyperphonated and phonated cries.

Parity

Examination of the univariate tests for Parity showed significant main effects for Annoying, $F(1, 61) = 8.25$, $p < .01$, and Loud, $F(2, 61) = 5.62$, $p < .05$. There were no significant main effects for Arousing, $F(1, 61) = .87$, $p > .20$, Sick, $F(1, 61) = .51$, $p > .20$, and Urgent, $F(1, 61) = .11$, $p > .20$. Follow-up analyses using SNK, indicated that primiparous adolescents perceived the infant cries as sounding less annoying and less loud than did nulliparous adolescents, $p < .05$ (see Table 2).

Caregiving Behavioral Responses

A second interest of this study was to investigate primiparous adolescents Caregiving Behavioral Responses to high-risk infant cry sounds. For these analyses, both hyperphonated and partially-hyperphonated infant cry segments were grouped together, comprising the high-risk Cry Type. Phonated cry segments comprised the low-risk Cry Type for these analyses.

Participants' Caregiving Behavioral Responses for each of the eight segments of the high-risk Cry Type and for each of the four segments of the low-risk Cry Type were then categorized as Contact-Comfort (Pick Up, Cuddle), Utility (Feed, Clean), or Undirected (Give Pacifier, Wait and See) responses, based on the categories described by Zeskind (1980). The Caregiving Behavioral Response frequencies to both high- and low-risk Cry Types was determined by totaling the Caregiving Behavioral Responses across cry segments. The modal Caregiving Behavioral Response for each of the two Cry Types was then determined, yielding each

participant groups' pattern of responses to both Cry Types. Participants with bimodal Caregiving Behavioral distributions were dropped from analyses ($n = 1$, High-risk; $n = 15$, Low-risk).

Table 1

Mean Ratings for Perceptual Scale Items by Cry Type

Perceptual Item	Cry Type					
	Phonated		Partially-Hyperphonated		Hyperphonated	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Arousing	2.93	0.70	3.83	0.54	4.50	0.47
Urgent	2.81	0.79	4.09	0.58	4.66	0.48
Sick	2.14	0.73	3.47	0.57	4.22	0.53
Annoying	2.77	0.84	3.80	0.80	4.43	0.81
Loud	2.64	0.60	3.48	0.57	4.09	0.60

$n = 64$

Arousing (2,61) = 152.65, $p < .001$.

Urgent (2,61) = 4.09, $p < .001$.

Sick (2,61) = 184.76, $p < .001$.

Annoying (2,61) = 67.92, $p < .001$.

Loud (2,61) = 107.48, $p < .001$.

Table 2

Mean Ratings for Perceptual Scale Items by Parity

Perceptual Item	Parity			
	Primiparous		Nulliparous	
	\bar{X}	SD	\bar{X}	SD
Arousing	3.67	0.43	3.79	0.47
Urgent	3.88	0.48	3.84	0.46
Sick	3.21	0.40	3.30	0.45
*Annoying	3.35	0.52	3.82	0.63
*Loud	3.21	0.55	3.49	0.40

n = 64

Arousing (1,61) = , p < .001.

Urgent (1,61) = , p < .001.

Sick (1,61) = , p < .001.

Annoying (1,61) = 8.25, p < .01.

Loud (1,61) = 5.62, p < .05.

To test the third hypothesis of this study, a 2 Parity (Primiparous vs. Nulliparous) x 3 Caregiving Behavioral Response (Contact-Comfort vs. Utility vs. Undirected) Chi-square was calculated for both Cry Types. Results of these analyses demonstrated no reliable differences in the distribution of Caregiving Behavioral Responses for either Phonated, $\chi^2(2) = 3.50$, $p > .05$, or Partially- Hyperphonated and Hyperphonated, as a group, $\chi^2(2) = 5.03$, $p > .05$, cry segments (see Tables 2 and 3, respectively).

According to Lester (1984), different caregiving behavioral responses may have differential meanings, functions, and associated developmental outcomes. Based on this reasoning, the frequency of each of the six caregiving behavioral response choices used in the present study were examined. Specifically, post-hoc exploratory analyses were performed to determine whether the frequency of each of the individual six caregiving behavioral responses used in this study differed between subject groups. A 2 Parity (Primiparous vs. Nulliparous) x 6 Caregiving Behavioral Response (Pick-Up, Cuddle, Clean, Feed, Give Pacifier, Wait and See) Chi-square was calculated for each of the three different cries. Results indicated no reliable differences in the distribution of caregiving behavioral responses for Phonated, $\chi^2(5) = 7.25$, $p > .05$, Partially-Hyperphonated, $\chi^2(5) = 5.75$, $p > .05$, or Hyperphonated, $\chi^2(5) = 10.81$, $p > .05$ (see Tables 5, 6, and 7, respectively).

Discussion

Adolescent mothers have long been thought to respond differently than postadolescent mothers to the emotional signals of their infants. The present study provides some of the first data which examines the effects of infant cries varying in pitch on the perceptual and caregiving responses of adolescent mothers. The present study investigated the effects of differences in both the infant's cry sound and characteristics of the listener on perceptual responses. In particular, this study was interested in the responses of young mothers, since it is unclear whether they are able to discriminate between low- and high-risk infant cry sounds. First among the results of the present study was the finding that parity and chronological age do not interact to affect

perceptions of infant cries; adolescent mothers are capable of the same reliable perceptual discriminations of infant cry stimuli as adults. The results of this study also showed both similarities and differences between adolescents who were mothers and adolescents who were not mothers in their perceptions of and caregiving responses to different infant cry signals. Generally, the similarities between the two groups investigated in the present study may be partially due to the comparable caregiving experiences of the two samples.

Table 3

Modal Caregiving Response and Percentage of Total Responses
for Phonated Cries

Group	Modal Caregiving Response		
	Contact- Comfort	Utility	Undirected
Primiparous 16-19 Year-Olds			
Number of Responses	13	4	1
Percentage of Responses	72.2%	22.2%	5.6%
Standardized Residuals	1.8	-1.2	-1.1
Nulliparous 16-19 Year-Olds			
Number of Responses	14	12	5
Percentage of Responses	45.2%	38.7%	16.1%
Standardized Residuals	-1.8	1.2	1.1
Total			
Number of Responses	27	16	6
Percentage of Responses n= 49	55.1%	32.7%	12.2%

Table 4

Modal Caregiving Response and Percentage of Total Responses
for Hyperphonated and Partially-Hyperphonated Cries

Group	Modal Caregiving Response		
	Contact Comfort	Utility	Undirected
Primiparous 16-19 Year-Olds			
Number of Responses	10	11	0
Percentage of Responses	47.6%	52.4%	.0%
Standardized Residuals	-.9	1.9	-1.6
Nulliparous 16-19 Year-Olds			
Number of Responses	25	12	5
Percentage of Responses	59.5%	28.6%	11.9%
Standardized Residuals	.9	-1.9	1.6
Total			
	35	23	5
Percentage of Responses	55.6%	36.5%	7.9%
n = 63			

Table 5

Individual Modal Caregiving Response Items and Percentage of Total Responses
for Phonated Cries

Group	Modal Caregiving Response Items					
	Pick Up	Cuddle	Feed	Clean	Give Pacifier	Wait and See
Primiparous 16-19 Year-Old						
Number of Responses	7	3	5	0	0	0
Percentage of Responses	46.7%	20.0%	33.3%	.0%	.0%	0%
Standardized Residuals	.2	.9	.8	-1.2	-1.2	-.6
Nulliparous 16-19 Year-Olds						
Number of Responses	11	2	5	4	4	1
Percentage of Responses	40.7%	7.4%	18.5%	14.8%	14.8%	3.7%
Standardized Residuals	-.2	-.7	-.6	.9	.9	.4
Total	18	5	10	4	4	1
Percentage of Responses n= 42	42.9	11.9	23.8	9.5	9.5	2.4

Table 6

Individual Modal Caregiving Response Items and Percentage of Total Responses for Partially-Hyperphonated Cries

Group	Modal Caregiving Response Items					
	Pick Up	Cuddle	Feed	Clean	Give Pacifier	Wait and See
Primiparous 16-19 Year-Old						
Number of Responses	5	1	3	1	0	0
Percentage of Responses	50.0%	10.0%	30.0%	10.0%	.0%	.0%
Standardized Residuals	.1	-.7	.8	1.5	-.7	-.7
Nulliparous 16-19 Year-Olds						
Number of Responses	15	7	5	0	2	2
Percentage of Responses	48.4%	22.6%	16.1%	.0%	6.5%	6.5%
Standardized Residuals	0	-.7	-.6	.9	.9	.4
Total	20	8	8	1	2	2
Percentage of Responses n= 41	48.8	19.5	19.5	2.4	4.9	4.9

Table 7

Individual Modal Caregiving Response Items and Percentage of Total Responses for Hyperphonated Cries

Group	Modal Caregiving Response Items					
	Pick Up	Cuddle	Feed	Clean	Give Pacifier	Wait and See
Primiparous 16-19 Year-Old						
Number of Responses	6	3	3	3	0	0
Percentage of Responses	40.0%	20.0%	20.0%	20.0%	.0%	.0%
Standardized Residuals	2.2	-.5	.1	-.2	-1.4	-.6
Nulliparous 16-19 Year-Olds						
Number of Responses	2	10	6	8	6	1
Percentage of Responses	6.1%	30.3%	18.52%	24.2%	18.2%	3.0%
Standardized Residuals	-1.5	.4	-.1	.2	.9	.4
Total	8	13	9	11	6	1
Percentage of Responses n= 48	16.7	27.1	18.8	22.9	12.5	2.1

The results of the present study indicated that, independent of listener characteristics, i.e., parity and caregiving experience, both hyperphonated and partially-hyperphonated cry sounds were perceived as more aversive, urgent, annoying, sick, and loud, than were phonated cries. Results indicated that all participants perceived significant differences among hyperphonated, partially-hyperphonated, and phonated infant cry sounds that were significantly related to increasing degrees of hyperphonation in the infant cry sounds. For instance, hyperphonated infant cry sounds were perceived by all participants as the most arousing, annoying, loud, urgent, and sick, in comparison to both partially-hyperphonated and phonated cry sounds. In contrast to hyperphonated infant cry sounds, phonated infant cry sounds are characterized by a complete absence of hyperphonation. This study's sample of adolescents perceived these infant cry sounds as the least arousing, urgent, annoying, loud, and sick; significantly less than their perceptions of both hyperphonated and partially-hyperphonated infant cry sounds. The demonstrated perceptual responses of this study's sample of adolescents suggest that adolescents are similarly capable of the reliable perceptual discriminations between low- and high-risk infant cry sounds demonstrated by adult listeners. These differences in the perceptual attributes of cries varying in the amount of hyperphonation are similar to those of several studies which indicate that, across several cultural groups, parents and nonparents of both genders find hyperphonated cries to sound more aversive, arousing, distressing, urgent, and sick than phonated cries (Zeskind, 1980; 1983; Crowe & Zeskind, 1992; Zeskind & Lester, 1978; Zeskind & Shingler, 1991).

These findings are in contrast, however, to an earlier report that adolescent mothers may be unable to discriminate between low- and high-risk infant cry sounds. As previously indicated, Lester et al. (1989) found that adolescent mothers reported the phonated cries of their infants to sound particularly aversive, and the hyperphonated cries of their infants as not sounding particularly aversive. By contrast, postadolescent mothers perceived the low-risk cries of their own infants as not sounding particularly aversive, and the high-risk cries of their infants as

sounding aversive. However, based on this single study it appears premature to conclude that adolescent mothers' perceptions of infant cry sounds may be dissimilar to postadolescent mothers' perceptions of infant cry sounds, since, in this study, mothers only listened to their own infant's cry sounds. Thus, these mothers possessed some degree of familiarity with these cries. Perhaps listening to one's own infant's cries may exert a modifying influence on maternal perceptions.

The results of the present study suggest that adolescent mothers are able to differentiate semantically among infants' emotional signals. The cry sounds used in the present study may be particularly salient social signals and provide the basis for the similarities between the findings of the present and previous studies. This study showed that young mothers can accurately discriminate among different low- and high-risk infant cry stimuli on perceptual rating scales. Importantly, not only were these cry sounds unfamiliar to mothers, but these cries were also particularly salient cry stimuli.

In addition, Lester and colleagues explain that the adolescent mothers' performance in their study may be indicative of these young mothers' denial of their infant's risk status, suggesting that the psychological denial of their infants' risk status functions as a psychological and emotional defense mechanism. It is suggested that their findings may be due to the effects of adolescent mothers' denial of their own infant's risk status, which acted as a psychological and emotional safeguard. Presumably, these young mothers adopted this temporary emotional defense in response to the high degrees of physiological self-tension that they reportedly experienced in response to their own infant's cries, whereas older mothers did not because, "as older mothers" they were more emotionally and psychologically equipped to cognitively acknowledge their infant's risk status and/ or understanding of the meanings and expressions of the acoustic features of their infant's cries (Lester et al., 1989).

Future studies are needed to both determine whether adolescent mothers' perceptual responses to their own infant cries are different from postadolescent mothers, and whether

adolescent mothers' perceptual responses are defensive responses to their own infant's risk status, as opposed to postadolescent mothers' perceptual responses. For example, because hyperphonated cries have been found to be salient social stimuli that both adolescent and postadolescent mothers have been found able to accurately discriminate from phonated cry sounds, adolescent mothers should listen to the hyperphonated cries of their own infants, with compromised fetal growth patterns and the phonated cries of their own infants with normal fetal growth patterns. In addition, adolescent mothers should listen to the hyperphonated cries of their own infant's as well as the hyperphonated cries of ambiguous infants, with compromised fetal growth patterns. In addition, adolescent mothers' perceptual responses to the cries of their own vs. ambiguous infant cry stimuli should be compared to the perceptual responses of postadolescent mothers to these same infant cry stimuli.

The Relation Between Chronological Age, Parity, and Perceptual Responses

The present study also showed that the reports of adolescent mothers' levels of arousal, urgency, and sickness perceived in response to these cry sounds were not significantly different from adolescent nonmothers' reports. By contrast, Zeskind (1980) found that both parents and nonparents reported that high-risk infant cry sounds sounded more arousing and distressing than low-risk infant cry sounds; however, parents reported lower levels of arousal and distress to high-risk cries than did nonparents on perceptual indices. Zeskind's (1980) findings suggest that maternal perceptions of infant crying patterns are mediated by parity. The similar perceptual reports of arousal, urgency and sickness of nulliparous and primiparous adolescents in this study are at variance with the findings of comparisons between nulliparous and primiparous adults' perceptual reports to these same infant cry stimuli.

According to Zeskind (1980), since parents have had more exposure to crying, in general, as compared to nonparents, they may be able to make more distinctions between different cry sounds, and, consequently, may perceive high-risk cries as more aversive and distressing, than would nonparents. In addition, mothers, as a group, have a greater investment in focusing their

attention on differential infant cry stimuli, and in attempting to formulate accurate perceptual discriminations, in comparison to individuals who are not mothers. Furthermore, finding that primiparous adult parents exhibited greater perceptual and physiological arousal than did nulliparous adult parents to the cry sounds of infants of differing behavioral temperaments, Boukydis and Burgess (1982) suggested that mothers were responding to distress-related cues apparent in the cry stimuli. However, based on the present study's findings, perhaps this study's sample of adolescent mothers were not as likely to hold numerous associations of various perceptual discriminations of differential infant cry stimuli and respective caregiving behaviors, as were postadolescent mothers.

The findings of the present study also indicated that primiparous adolescents perceived hyperphonated and partially-hyperphonated cries as significantly more annoying and less loud than did nulliparous adolescents. As suggested by Zeskind and Shingler (1991), it may be that the perceptual set of mothers influences their attributions of infant cries. For example, the likelihood of an infant having hyperphonated cry sounds is less than that of an infant having a typically phonated cry sound. Hyperphonation is a relatively less common phenomenon. If the mothers in the present study perceived hyperphonated cries to be less similar to the cries of their own infants as the amount of hyperphonation increased, perhaps they found hyperphonated cries to be particularly annoying, in comparison to their own infant's cries. In a similar manner, perhaps the young mothers in this study perceived the cries that they were presented with as less loud than their own infant's cries. This does not preclude the possibility that these young mothers were responding to the distress-related features of the infant cry stimuli.

Zeskind suggested that caregivers may respond to future exposures of high-risk infant cry sounds in terms of their own internal reactions to infant cry sounds. In addition, these initial perceptual experiences may also exert a modifying influence, accounting for parents' subsequent perceptions of high-risk cry sounds as both aversive and more deserving of special attention, as compared to nonparents (Zeskind, 1983a). Furthermore, other researchers have suggested that a

caregiver's first perceptual responses to infant cry stimuli were likely to have been to her own infant's cry sounds, and, as such, have the potential to become classically conditioned perceptual responses (Frodi, 1985; Murray, 1979). As classically conditioned perceptual responses, these responses may be reexperienced in similar situations, and may possibly modify the mother's perceptions of arousal and distress in response to her own infant's cries, in such a way as to increase or decrease these perceptions. Parental perceptions of one's own infant's daily behavioral and temperamental patterns may impact on future perceptions of infant cry sounds.

Relation of Parity and Chronological Age to Caregiving Responses to High-risk Infant Cries

Brazelton (1962; 1984) suggested that the primary caregiver's reception and processing of her infant's messages may be related to her subsequent responses and feedback given to her infant. Previous studies using adults show that one's perceptual responses to low- and high-risk infant crying behavior lead to the discrimination of caregiving behaviors that parallel perceptual responses (e.g., Zeskind, 1981; Zeskind, 1983a). These findings suggest that the ability to accurately perceive the risk status characterizing one's infant's cry sounds may increase the probability that one's caregiving behaviors may be more appropriately directed toward meeting its needs, as compared to less accurate perceptions. For example, the caregiving behavioral choices in response to high-risk cries, perceived as sick-sounding and urgent (consistent with the perceptual reports of adults in previous studies) may be different from, and more appropriate than, caregiving behavioral choices corresponding to perceptions of these same cries as sick-sounding and annoying (as the present study's sample of adolescents reported). This suggests that adolescent mothers' perceptions of infant's cry sounds may not translate into caregiving behaviors capable of meeting the developing infant's needs.

For these reasons, the present study also investigated adolescent mothers' caregiving responses to different infant cry stimuli. Chi-square analyses were performed to determine the distribution of caregiving behavioral responses chosen in response to the three cry types across adolescent groups. Results showed no reliable differences among both primiparous and

nulliparous adolescents' caregiving behavioral response distributions, in response to hyperphonated, partially-hyperphonated, and phonated cry types. For instance, this study's results showed that primiparous mothers reported nearly equivalent frequencies of contact-comfort (n = 10, 47.6 %) and utility (n = 11, 52.4 %) responses, and no undirected responses to hyperphonated and partially-hyperphonated cries combined. In comparison, nulliparous participants reported 25 instances (59.5 %) of contact-comfort responses, 12 instances (28.6%) of utility responses, and 5 instances (11.9 %) of undirected responses to these high-risk cries.

These comparisons also indicated that adolescent mothers reported 13 instances (72.2 %) of contact-comfort responses, followed by 4 instances (22.2 %) of utility responses, and a single (5.6) undirected response, to phonated cries. In comparison, adolescents who were not mothers reported 14 instances (45.2 %) of contact-comfort responses, followed by 12 instances (38.7 %) of utility responses, and 5 (16.1) undirected responses, in response to phonated cries. The above findings may simply be because adolescent mothers in this study share a limited repertoire of similar caregiving experiences, since this study also demonstrated the caregiving experiences between the two adolescent groups were not significant different.

Both the tendency for primiparous adolescents to frequently chose both contact-comfort and utility caregiving behaviors and the observation that undirected caregiving behaviors were rarely chosen in response to low-and high-risk infant cry sounds, are consistent with the direction of the expectations of this study. In comparison, Zeskind (1980) reported that parents rated their expected caregiving behavioral responses to high-risk cries as more tender and caring and included more contact-comfort caregiving behavioral response choices to these cries, than did nonparents. Zeskind (1983a) found that Anglo-American mothers chose "cuddle" as a possible response to high-risk cries more frequently than did Black-American mothers, whereas these mothers chose "wait and see" as a possible response to high-risk cries more often than did Anglo-American mothers. "Pick up the baby" was a high-frequency response to the high-risk cries by all mothers. Zeskind suggested that parents, having had more previous exposure to

infant crying, in general, perceived these cries as less aversive, and as more deserving of special attention, than did nonparents.

It is noteworthy that a lower frequency of passive caregiving behaviors was observed among primiparous adolescents, in comparison to nulliparous adolescents, in response to low- and high-risk infant cry sounds. In regard to undirected responses, not responding immediately to an infant's crying behavior may indicate that additional behavioral cues and/or information are needed in order to determine appropriate caregiving responses. In situations wherein the infant's behavioral signals are perceived as ambiguous, the caregiving behavioral response choice "wait and see" may provide the time necessary to gather information. These response choices, i.e., "give pacifier" and "wait and see", may also suggest that no need to respond was perceived. Moreover, these behavioral responses, are less complex, do not require knowledge or experience, are less demanding, and are less time-consuming, as compared to the caregiving behavioral responses "feed" and "clean".

It may also be that certain motivational factors characterizing primiparous adolescents cannot be shared among nulliparous adolescents. Boukydis (1979) suggested that nulliparous adults do not share the same incentive in their attempts to derive behavioral responses to different infant cry sounds, as do parents. In comparison, for primary caregivers, being directly confronted with an infant who is crying loudly is a regular experience. Such situations are inescapable because of their very nature, and by the primary caregiver's foremost responsibility for the infant's well-being. Primary caregivers are repeatedly confronted with attempts to process what qualitatively different needs her infant is trying to express through particular acoustic features of its crying behavior.

Young adolescents remain the risk group most likely to deliver low birth weight and preterm babies with these associated behavioral characteristics. In addition, hyperphonated cries are more frequently found among these infant groups and are at an increased risk for physical abuse (for a review see Frodi, 1985). Typically, parents perceive the sounds associated with

hyperphonation to be a signal that the infant sounds sick and needs special care (Zeskind, 1985), and the resultant ameliorative care may feedback to facilitate optimal infant development (see Zeskind & Ramey, 1981; Zeskind & Iacino, 1987). Ideally, when the infant transmits messages to its caregiving environment, they are received and processed by the caregiver, after which time the caregiver returns feedback to the infant. However, the probability of abuse may increase when infants with hyperphonated cries are paired with caregivers who show heightened arousal to their infant's social signals, as did Lester et al.'s (1989) adolescent mothers.

The present study lacks the data of both 12-15 yr old mothers' and fathers' perceptual and caregiving responses to different infant cry stimuli. Further studies are necessary in order to determine this sample's responses for several reasons. The pregnancy rates of 12-15 yr old females remains high. Furthermore, in recognition of the poor adaptability tendencies of this population's infants, in conjunction with the cognitive and social limitations characterizing adolescents, this participant population deserves research focus. Moreover, a sophisticated understanding and knowledge of the process of development, in combination with a thorough, comprehensive, and realistic understanding of adolescents' social and emotional needs, and of the developmental capabilities, i.e., perceptual, cognitive, and social abilities and limitations, should also included as fundamental prerequisites to the provision of successful intervention contexts. This may then increase the likelihood that our attempts are capable of successfully decreasing the risk among the infants born to adolescent mothers.

Another important problem for future investigations is to develop a more exact measure of caregiving experience. This study contributed to this overall goal by considering nulliparous and primiparous adolescents' caregiving experiences, i.e., babysitting experience, experience with young (< 1 yr) infants, and with infant crying behavior, separately from parity. However, it is also an accepted practice in certain cultural contexts, e.g., Puerto Rican, Hispanic, for teenage siblings to assist in the primary care of their young siblings, on a consistent basis, essentially assuming the role of a primary caregiver. As such, this type of caregiving experience cannot be

ignored. A more comprehensive assessment of caregiving experience, however, may also include one's experience with caring for younger siblings and relatives. Nonoptimal caregiving patterns could exacerbate the condition of the infant's biobehavioral organization, thus establishing a cycle of irritating infant behavior operating in an environment that will continue to provide nonoptimal experiences. In extreme conditions, this cycle could lead to failures in the parent-infant interaction process, with the result that the child is abused or neglected.

According to Wolff (1985), with time, active caregiver responsivity and feedback to the infant, the feedback, the responding, and the caregiver-infant interaction may become rhythmic, taking on the characteristics of early interaction patterns. From a developmental perspective, this temporal patterning and sequencing provide a structure for the infant to organize its cognitive and affective experiences. In doing so, temporal patterning also provides a structure that the infant can use in order to predict its social environment. Essentially, temporal patterning may contribute to the development of differentiated forms of social communication and to the expression of complex emotions during the later stages of developmental adaptation. Evidence also suggests that as the infant shows recovery, the distinctive high-pitched cry components may disappear (Michelsson, Sirvio & Wasz-Hockert, 1977), thus optimizing future transactions.

The bidirectional influences of both the caregiving context and the infant are apparent in the evolution of the caregiver-infant relationship. For example, Lester (1984) studied the early development of the caregiver-infant relationship between adult mothers and their preterm newborns. According to Lester, the acoustic features of these newborns' cry sounds were correlated with the rhythmic structures of infant-mother face-to-face interactions at three months of age. The coherence between infant and maternal cycles of affective displays was one measure of the synchrony in the interactions. As reported by Lester, the infant-maternal interactions in term infants were significantly more synchronized than in preterm infants. Moreover, preterm infants also showed lower Bayley scores than term infants. Lester suggested that cry features may have a direct effect on infant development through the indirect effects of infant crying on

infant-maternal interactions. In another study, parents either viewed a videotape or heard a 5-month-old infant who was either crying or smiling. In addition, parents were told that the infant was "difficult", normal, or premature. Results indicated that parents who viewed the crying baby reported more annoyance, irritability, distress, disturbance, and indifference, and less happiness and attentiveness, in response to this infant, as compared to parents who viewed the crying infant. In addition, parents who viewed or listened to the premature infant demonstrated more autonomic arousal, than parents who viewed or listened to the normal infant, regardless of the infant's emotional expression, on a measure of skin conductance.

From a probabilistic developmental perspective, different developmental trajectories have a range of probabilities of occurring, each contingent on the specific experiences encountered by the infant. Important to this conceptualization of development are maternal perceptual responses to her infant's behavior. The infant's behavior has been shown to play an equally important role in the creation of its caregiving environment. Research focusing on the mother's perception of her infant suggests that maternal attitudes of the child's appearance and behavior may modify the mother-infant relationship and ultimately the child's growth and development (Broussard & Hartner, 1971). For example, when mothers responded promptly to their infants cries within the first year of life, the infants were subsequently more likely to communicate to their mothers with alternative, more developmentally advanced forms of social behaviors, such as bodily gestures, facial expressions, and vocalizations. In contrast, infants of mothers who did not respond promptly to their cries were more likely to use crying as an instrumental behavior for communication at one year of age (Ainsworth & Bell, 1974; Bell & Ainsworth, 1974). These findings suggest that maternal responsiveness in social transactions during infancy is related to increases in infant competence. It may be concluded that these conditions may provide the experiences necessary for optimal development of the biobehavioral system of the infant at risk.

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Appendix A

Cry production mechanisms

As previously discussed, particular features (e.g., increased pitch, shorter duration, longer latency) of the cry sounds of neurologically healthy infants with either a higher number of obstetric complications or with atypical fetal growth patterns are recognized as perceptually distinct from the cry sounds of medically noncompromised infants. For example, investigators have demonstrated that both of these infant groups exhibited a higher fundamental frequency than comparison infant groups (e.g., Lester & Zeskind, 1978; Zeskind & Lester, 1982). Since the infant cry sound is thought to be at least partially controlled by the Autonomic Nervous System (ANS), these observations suggest that if the infant's ANS experiences stress, this stress may then be reflected in characteristics of the cry sound (Zeskind & Lester, 1982). These experimental and clinical observations have led to a neural model of infant cry production (Porter, Porges & Marshall, 1988; Zeskind & Lester, 1982). This neural model of cry production provides a physiological explanation for the mechanisms involved in differences in pitch associated with different types of infant cry sounds.

The cry sound is generated by air expired from the lungs at the larynx. The mucous membrane of the larynx is arranged into two pairs of folds - an upper pair called ventricular folds and a lower pair called vocal folds (true vocal cords). Beneath the mucous membrane of the true vocal cords are bands of elastic ligaments stretched between pieces of rigid cartilage. The skeletal muscles of the larynx (i.e., intrinsic muscles) are attached internally to the pieces of rigid cartilage and to the vocal folds. When the muscles contract they pull the strings of the elastic ligaments tight and stretch the cords out into the air passageways so that the glottis (i.e., the space between vocal folds in the larynx) is narrowed.

If air is directed against the vocal folds, they vibrate and set up sound waves in the column of air in the pharynx, nose, and mouth. This is subglottal (respiratory) pressure which is necessary to cause (glottal) laryngeal vocal folds to vibrate, producing the fundamental frequency (lowest tone of a complex waveform), and harmonics (Golub & Corwin, 1984). In other words, the fundamental frequency (basic pitch) is controlled by the tension on the true vocal cords. Increases in the pressure of air leads to increases in sound. If the cords are pulled taut by the muscles, they vibrate more rapidly and increases in pitch results (Porter et al., 1988).

According to this model, increases in the fundamental frequency of cry sounds are mostly modulated by the tension in the vocal folds by the contraction of the intrinsic laryngeal muscles (i.e., the vocalis and the cricothyroid); these muscles are innervated by both sympathetic nervous system (SNS) and parasympathetic nervous system (PNS) input from the ANS (Zeskind & Lester, 1982). The PNS is primarily involved in the restoration and conservation of bodily energy, whereas the SNS is primarily involved in energy expenditure. However, when the body is in homeostasis, the main function of the SNS is to counteract the PNS effects just enough so that normal processes requiring energy may be carried out. Further, impulses transmitted by the fibers of one division stimulate the induction or maintenance of organ activity, whereas impulses from the other division decrease or halt the organ's activity, resulting in dual innervation to the respective tissue. The larynx, pharynx, esophagus, stomach, and heart receive dual innervation from the SNS fibers with PNS input through the vagus nerves (Zeskind & Lester, 1982). PNS vagal inhibitory innervation or decreased vagal tone helps control the tension of the laryngeal muscles, preventing contraction of laryngeal muscles. If, as suggested by Golub & Corwin (1984), the increased tension on the laryngeal muscles may control the frequency of vocal fold

vibration, then variability in the fundamental frequency of the infant cry sound may be due to decreased vagal innervation (Zeskind & Lester, 1982).

A central element of intrauterine neurological development is characterized by a balance between SNS and PNS divisions of the ANS (Porter et al., 1988). The dual innervation of the larynx results in a well-modulated cry which is characterized by a smooth and symmetrical spectral pattern between 200-600 Hz (Porter et al., 1988; Zeskind & Lester, 1982). By contrast, in a physiologically stressed infant decreased vagal innervation is hypothesized to result in a decreased inhibitory effect of vagus nerves on the constriction of the laryngeal muscles. The dominant cry feature associated with decreased vagal innervation is sudden increases in the fundamental frequency of the cry sound of approximately 1000-2000 Hz (Porter, et al., 1988). Truby and Lind (1965) described three types of expiratory pain cry sounds that appear to represent different types of vibration of the vocal folds. The first type of cry sound is referred to as a phonated-basic where vocal folds are fully vibrating at an F_0 range of approximately 250-750 Hz. The second type of cry sound is referred to as hyperphonation-shift, where presumably, only a thin portion of the vocal ligament is vibrating and the F_0 is approximately 1000-2000 Hz. The last type of cry sound is referred to as dysphonation-turbulence, that occurs when turbulence noise is generated at the vocal folds. The turbulence noise is thought to be produced by turbulence created by forcing air through a small opening left by incomplete closure of the vocal folds. Each type of cry sound is hypothesized to represent shifting vocal registers by quantal, noncontinuous control of the intrinsic laryngeal muscles (Golub & Corwin, 1984).

Appendix B

Letter of Informed Consent

Dear Student (Dear Mom):

As you know, babies cry at times. We think that babies may be telling us what they need when they cry. For example, some mothers tell us that they can tell if their baby is hungry or uncomfortable by her/his crying. We also think that the perceptions of people who are not yet parents may tell us something about how people interpret babies' cries. For this reason I would like you to listen to the cries of babies.

As another part of the project, I need information on peoples' ideas about the kind of care that babies should receive in order to remain healthy, the types of activities that you would perform daily if you were a mother in order to care for your baby, and how your baby would spend her/his time when s/he is at your home.

First, I would like you to listen to some babies' cries. Then, I would like you to record your responses to the cries. Lastly, I would like you to fill out some questionnaires about babies and about yourself.

I understand that all information will be kept confidential. I understand that any questions I may have concerning this project will be answered by the examiner. I understand that I may withdraw from participation at any time and for any reason.

I AGREE TO PARTICIPATE

(Your signature)

(Date)

(Guardian's signature, if a minor)

(Date)

Lisa Daleo, M.S., ABD

(Date)

Philip Sanford Zeskind, Ph.D.

(Date)

Appendix C

Subject Demographic Information

Please circle or write in the answer to each question which relates to you.

1. Your age is _____
2. The highest grade of education that you have completed is
 - A. 8th grade
 - B. 9th grade
 - C. 10th grade
 - D. 11th grade
 - E. 12th grade
 - F. Other _____
3. Do you work?
 - A. Yes
 - B. No
4. If you work, what is your job? _____
5. Have you ever babysat for an infant who was less than one year old?
 - A. No
 - B. Yes
6. Were you the main person "in charge" of the infant while you were babysitting?
 - A. Yes
 - B. No
7. The highest grade in school that your mother has completed is
 - A. 8th grade
 - B. 9th grade
 - C. 10th grade
 - D. 11th grade
 - E. 12th grade
 - F. Other _____
8. What type of job does your mother have? _____

9. The highest grade in school that your father has completed is

- A. 8th grade
- B. 9th grade
- C. 10th grade
- D. 11th grade
- E. 12th grade
- F. Other _____

10. What type of job does your father have _____

11. The marital status of your parents is

- A. Single
- B. Married
- C. Separated
- D. Divorced

12. Your marital status is

- A. Single
- B. Married
- C. Separated
- D. Divorced

If you are NOT MARRIED, skip questions 16, 17, and 18, and move on to question 19.

13. Does your husband work?

- A. Yes
- B. No

14. If your husband works, what is his job? _____

15. The highest grade in school that your husband has completed is

- A. 8th grade
- B. 9th grade
- C. 10th grade
- D. 11th grade
- E. 12th grade
- F. Other _____

IF YOU HAVE A CHILD PLEASE ANSWER THE REMAINING QUESTIONS.

16. Did you attend any classes about how to care for your baby before or during your pregnancy?

- A. No
- B. Yes

17. If you attended any child care classes, when did you begin the class?

- A. First trimester
- B. Second trimester
- C. Third trimester
- D. Other time, please indicate when you began the class _____

18. How long did you attend the class?

- A. Less than one month
- B. Two months
- C. Three to five months
- D. Six to eight months
- E. More than nine months
- F. Other time, please indicate how long you attended the class _____

19. What type of things did you learn in this class?

- A. How to feed your baby
- B. How to change your baby's diaper
- C. Different ways that babies may be like
- D. Different ways that babies may cry
- E. Different times that babies may cry, like when they are hungry or tired

20. If there are other things that you learned in the class that you thought were important would you please list or describe them? _____

21. How much do you feel you know about infants, compared to the "average" person?

_____ _____ _____ _____ _____
a lot less than others less than others about the same a little more a lot more

Appendix D

Cry Perceptual Response Instructions and Items

The study we are conducting has two purposes. First, we would like to look at what certain newborn cries mean to you. Second, we would like to look at what you would do for a baby after hearing a certain cry. We would like you to listen to a recording of different cries and describe what each cry means to you.

We would like you to listen to three recordings of different cries. The first two times you will only decide what each different cry sound mean to you. The third time you will decide what you would do for the baby after hearing each particular cry. It is important that you decide what each cry means to you.

INSTRUCTIONS FOR PART ONE

1. This is how to do the first part. On the answer sheet you will see the word CRY and under it you will see some words and spaces so that you may describe the cry. Each baby's cry will last for 10 seconds and will be followed by 20 seconds of silence. Listen to the complete cry sound and then describe it on the four lines below the word CRY, during the period of silence. Then get ready for the next cry.

Here is an example for one cry sound. This example shows you how to describe the cry on one of the given lines

CRY

SOOTHING ____:____:____:____:____AROUSING

If you feel that your decision is closest to one of the given choices place your "X" mark like this:

SOOTHING X : ____ : ____ : ____ : ____ AROUSING

OR

SOOTHING ____:____:____:____: X AROUSING

If you feel that your decision is near the given choices, but not the closest to it, you should place your "X" mark like this:

SOOTHING ____: X : ____ : ____ : ____ AROUSING

OR

SOOTHING ____:____:____: X : ____ AROUSING

If you feel that your decision does not come closer to one side than the other
place your "X" mark like this:

SOOTHING ____:____: X :____:____ AROUSING

Appendix E

Cry Caregiving Response Instructions and Items

INSTRUCTIONS FOR PART TWO

This is how to do part two. On the answer sheet you will see the word CRY and under it you will see six lines. Each line will describe a certain type of care which could be done for the baby. The following are the six different things you could do for the baby:

- (1) PICK-UP (4) GIVE PACIFIER
 (2) FEED (5) CLEAN
 (3) CUDDLE (6) WAIT & SEE

As before you will hear 12 different babies crying. This time you will choose one of the six different things you would do for the baby after hearing the particular cry.

Here is an example for one cry sound:

CRY

- (1) PICK-UP (4) GIVE PACIFIER
 (2) FEED (5) CLEAN
 (3) CUDDLE (6) WAIT & SEE

Thank you for your time and cooperation.

Curriculum Vitae

Lisa Daleo, Ph.D.

Home Address: 20 Lower Notch Road
Little Falls, NJ 07424

Business Address: Hudson County Community College
Division of Business, Allied Health, and Social Science
21 Journal Square
Jersey City, NJ 07306

Home Phone: (973) 890-0133

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Education

B.A. William Paterson College, December, 1984

Major field of study: Psychology, Biopsychology Honors Program

M.S. Virginia Polytechnic Institute and State University, December, 1987

Major field of study: Developmental Psychology

Title of thesis: The Relation Between Young Adolescent Pregnancy and Neonatal Behavioral State

Major Advisor: Philip S. Zeskind, Ph.D.

Ph.D. Virginia Polytechnic Institute and State University, December, 1998

Major field of study: Developmental Psychology

Title of dissertation: Relations Among Adolescent Motherhood, Caregiving Experience, and Perceptual and Caregiving Responses to Infant Cries

Major Advisor: Philip S. Zeskind, Ph.D., 1990-1993; Robert Lickliter, Ph.D., 1996-1998

Professional Experience

January 1999 - Present: Part-time Faculty Professor, Department of Psychology, Ramapo College, Mahwah, NJ. Spring course load includes one section of Child Psychology.

January 1999 - Present: Part-time Faculty Instructor, Department of Psychology, Hudson County Community College, Jersey City, NJ. Fall course load includes General Psychology and Human Relations.

September 1998 - January 1999: Part-time Faculty Instructor, Department of Psychology, Hudson County Community College, Jersey City, NJ. Fall course load included two sections of General Psychology, and Faculty Development Seminar. Spring course load included General Psychology, and Development of the Child and Adolescent.

September 1990 - 1996: Full-time Faculty Instructor, Department of Psychology, University of Minnesota, Morris. Fall course load included Personality Psychology, Developmental Psychology I: The Child, two weeks of the Developmental, Personality or Social Psychology section in General Psychology, and one or two sections of Inquiry: Changing Values in a Changing World. Winter course load included Developmental Psychology II: Adolescence. Spring course load included Developmental Psychology III: Adulthood, Aging, and Death, and Research Methods in Psychology (team-taught).

September 1994 - 1996: Fall and Winter course load also included Development of the Child and Adolescent, which in September, 1994 was added to the Education Department's curriculum. Satisfactory completion of this course was a mandatory prerequisite to the application into both the Elementary and Secondary majors. Duties also included academic advising in Psychology, and Liberal Arts for the Human Services, supervising undergraduate research in Developmental, Personality, Social, and Educational Psychology, independent studies, work studies, directed studies, teaching assistants, and research assistants.

September 1989 - June 1990: Instructor, Department of Psychology, Sweet Briar College. Fall course load included General Psychology, and Development of the Child. Winter course load included Contemporary Issues in Psychology: High-risk Pregnancy and Parenting and Developmental Outcomes. Spring course load included General Psychology, and Development of the Child.

February 1988 - August 1989: Undergraduate Tutor, Virginia Tech Athletic Association, Jamerson Athletic Center/Cassell Coliseum, Virginia Polytechnic Institute and State University. Duties included tutoring athletes in developmental, clinical, experimental, and introductory psychology courses, general biology courses, and sociology courses.

January, 1989 - May, 1989: Graduate Instructor, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA , Duties included teaching statistics and research design, conducting laboratories in the motivation of learning, and grading.

April, 1985 - May, 1989: Graduate Teaching Assistant for Developmental Psychology, Advanced Developmental Psychology, Nervous Systems and Behavior, Animal Behavior, Introductory Psychology, Virginia Polytechnic Institute and State University, Blacksburg, Va. Duties included comprising and grading exams, teaching, course organization, and tutoring.

January, 1988 - August, 1988: Certified Geriatric Nursing Assistant, Affiliated Home Health Care, Radford, Virginia. Duties included providing health care, social skill training, and companionship to quadriplegics, stroke victims, severely mentally retarded, and the elderly.

Publications

Clarke, S.W., Daleo, L., & Glindeman, K.E. (1989, August). Spectator responses to positive and negative outcomes. Paper presented at the Annual meeting of the American Psychological Association, New Orleans, LA.

Manuscripts in Preparation

Daleo, L. The relation between adolescent childbearing and fetal growth patterns.

Daleo, L., & Zeskind, P.S. A developmental psychobiological perspective of adolescent pregnancy and its outcome.

Heyne, T., & Daleo, L. The impact of parental reinforcement of school-related activities on children's attitude towards school.

Clarke, S.W., & Daleo, L. Impact of spectator responses during game events on athletic performance.

Conference Papers and Presentations

Daleo, L., & Zeskind, P.S. (1988, March). Adolescent Childbearing: A developmental psychobiological perspective of pregnancy performance and fetal growth patterns. Paper presented at the Conference on Human Development, Charleston, SC.

Daleo, L., & Zeskind, P.S. (1987, April). Adolescent Childbearing: A developmental psychobiological perspective of pregnancy performance and neonatal outcome. Paper presented at the Virginia Psychological Association, Charlottesville, VA.

Daleo, L., & Zeskind, P.S. (1986, October). The relation between young adolescent pregnancy and neonatal behavioral state. Paper presented at the Virginia Developmental Forum, Charlottesville, Va.

Other Work-related Experiences

September, 1991 - June, 1996: Sexual abuse, sexual assault, and domestic violence programming. Duties include professional presentations, program development, research, and meetings with student organizations and individual students.

January, 1987 - August, 1988: Community Crisis Center Volunteer, RAFT Community Crisis Center. Duties included handling crisis call-in and walk-in situations, and documentation of crisis interventions.

April, 1981 - May, 1984: Research Assistant, Behavior Genetics Laboratory, Department of Biology, William Paterson College, NJ. Duties included assistant animal caretaker, data collection and organization, spectrographic analysis of ultrasonic vocalizations in mouse pups, supervision of research assistants, and general laboratory organization.

December, 1982 - August, 1983: Foster Single Parent, Division of Youth and Family Services, Butler and Bloomingdale, NJ. Duties included primary caretaker of a 12-year-old young adolescent female.

October, 1980 - November, 1982: Help Guide for ex-institutionalized patients, New Jersey Mental Health Association, Clifton, NJ. Duties included social skills training and preparation and presentation of client progress reports.

September, 1980 - June, 1981: Volunteer Comprehensive Education Teacher at School # 13, Paterson, NJ. Duties included tutoring second and third grade students on an individual basis in arithmetic, reading, and spelling concepts.

Courses Taught

Child Psychology,
 Contemporary Issues in Psychology: High-risk Pregnancy and Parenting and
 Developmental Outcomes,
 Developmental Psychology I: The Child,
 Developmental Psychology II: Adolescence,
 Developmental Psychology III: Adulthood, Aging, and Death,
 Development of the Child and Adolescent,
 General Psychology,
 Human Relations,
 Inquiry: Changing Values in a Changing World,
 Laboratory in the Psychology of Motivation,
 Laboratory in Developmental Research Methods,
 Personality Psychology,
 Research Methods in Psychology,
 Social Psychology.

Additional Teaching Interests

Abnormal Psychology,
Cognitive Development,
Diversity: Behavior in the Social Environment
History and Systems in Psychology,
Physiological Psychology,
The Psychology of Learning,
Women's Studies.

Committee Work

Diversity Awareness Training and Sexual Harassment Workshop, Spring, 1999

Inquiry: Changing Values in a Changing World Planning Committee (Spring-Fall, 1992;
Summer-Fall, 1995; 1996)

Faculty Development Committee (Fall, 1993-1995)

Teacher Education Certification Committee (Fall, 1992-1993)

Facilitator in BaFa'BaFa': A Cross-Cultural Simulation (Fall, 1992)

Curricular Innovations

Developed a course; Contemporary Issues in Psychology: High-risk Pregnancy and Parenting
and Developmental Outcomes (1988)

Case study analyses of individual's in Personality Psychology, including theoretical
interpretation and therapeutic orientation from various perspectives (Fall, 1990-1996)

Implementation and demonstration of cooperative learning techniques and reciprocal teaching
methods in the classroom (1992-1996)

Implementation and demonstration of critical thinking techniques in the classroom (1992-1996)
Critical Analysis of controversial psychological issue assignments in Developmental Psychology
classes (1992-1996)

Cultural and other forms of diversity awareness exercises conducted during classroom periods in
the form of cooperative learning groups; initial and follow-up exercises in all classes taught

Instruction-Related University Activities

Two one-week workshops to staff of Head Start; workshops were applied, hands-on, skill
training emphasized. Taught how to promote social and cognitive readiness skills of different
types, methods to improve family involvement. Also taught skills to emphasize, and methods to

increase family involvement, including application of teaching methods, teaching styles, and behavior modification techniques (Summer, 1995; Winter, 1996)

Awards and Honors

Teaching Scholarship 1984 - 1989, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Tuition waiver September 1984 - June 1985, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Outstanding Companion Award presented at the New Jersey Mental Health.

Dean's List seven semesters, William Paterson College, Wayne, NJ.

Biopsychology Honors Program, Biology Dept., William Paterson College, Wayne, NJ, 1981-1983.

Other Skills

Empathy training skills.

Experience administering and scoring the Bayley Scales of Infant Development, including the Mental and Motor Scales and the Infant Behavioral Record, and various Personality inventories.

Experience writing grants for extramural funding.

Working knowledge of IBMPC's, MACINTOSH PC's, SPSSx and MACINTOSH statistical packages.

Professional Meetings Attended

Adolescent Nutrition Workshop, Spring, 1988; Cooperative Learning: An Active Learning Strategy For the College Classroom: A Workshop, Winter, 1992; Cultural Diversity in the Classroom concerning Native-American students: A Workshop, Spring, 1992; African-American students: A Workshop, Spring, 1992; Inquiry and Critical Thinking: A Workshop, Summer, 1992; Fostering Critical Thinking: A Workshop, Fall, 1992; Multicultural Awareness Workshop, 1994.

Professional Affiliations

American Association of Applied and Preventative Psychology, American Psychological Association, American Psychological Society, International Conference of Infant Studies, Society for Research in Child Development.

References

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