Infant Crying: Mothers' Perceptions and Affective Reactions.

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ABSTRACT

Two studies were conducted in order to examine three major issues arising from recent studies of mothers' reactions to their crying infants. These issues, which arise in connection with the Aversive Stimulus Model of crying, relate to (a) the relationships between cry characteristics and mothers' affective reactions to crying, (b) the variability of cry characteristics of individual infants, and (c) the influence of context on mothers' reactions to their infants' crying.

Resting on the premise that the semantic differential is an appropriate technique for addressing these issues, Study A examined the relationships between three sets of semantic differential scales. These were the scales reported by Brennan and Kirkland (1983), which represent three dimensions labelled Affect, Potency, and Evaluation; the scales reported by Zeskind and Lester (1978); and the scales reported by Mehrabian and Russell (1974a), which represent three dimensions of emotion labelled Pleasantness/Unpleasantness, Degree of Arousal, and Dominance/Submissiveness.

A combined factor analysis of cry ratings on these scales uncovered the factor structure of the Brennan and Kirkland scales and of the Mehrabian and Russell scales. The factor representing the Brennan and Kirkland Affect scales also represented both the Zeskind and Lester scales and the Mehrabian and Russell Pleasantness/Unpleasantness scales. The Brennan and Kirkland scales were found to effectively discriminate between perceptually different cry sounds. The Mehrabian and Russell scales, however, were found to be lacking in face validity and therefore unsuitable for use with cry sounds.

Study B examined the perceptions and affective reactions of mothers listening to their own infants' cries, in two situations - in the home as the crying occurred, and in an experimental situation involving tape-recorded cry samples. The results indicate that: (a) mothers affective reactions to cries did not simply depend upon the aversiveness of the cry sounds, (b) mothers' affective reactions to cries were strongly associated with their attributions regarding the causes and consequences of the cries, (c) cries from the same infant and cries from different infants varied considerably with respect to their perceived characteristics and the types of affective reactions they evoked, and (d) ratings of the tape-recorded cry samples tended to over-emphasise the relationships between cry characteristics and mothers' affective reactions, and to under-represent the extent to which negative affective reactions were experienced by the mothers in the home situation.

Several suggestions were made for future studies. These included the adoption of an individualised approach to study: (a) the cry repertoires of individual infants, (b) the types and patterns of affective reactions experienced by individual mothers, (c) mothers' attributions regarding to their own feelings and their infants' behaviors, and (d) the relationships between mothers perceptions, attributions, affective reactions, and actual caregiving behaviors.

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INTRODUCTION AND REVIEW

Recently, a number of studies have examined the effects of infant social behaviours on caregivers, focussing particularly on infant smiles and cries. These studies represent a dramatic shift in emphasis in cry research. Previously, studies have been preoccupied with acoustic analyses of cry sounds from normal infants (e.g., Truby, 1960; Truby & Lind, 1965) and from abnormal infants (e.g., Michelsson, 1971; Wasz-Hockert, Lind, Vuorenkoski, Partanen, & Valanne, 1968), normative studies of crying behavior (e.g., Aldrich, Sung, & Knop, 1945a, 1945b, 1945c; Ringel & Kluppel, 1964), or studies of the social function of crying (e.g., Bell and Ainsworth, 1972; Wolff, 1969). These latter studies have typically focussed on listeners' abilities to identify the cause of cries recorded in different cry-eliciting situations (e.g., Muller, Hollien, & Murry, 1974; Wasz-Hockert et al., 1968), or caregivers' abilities to identify their own infants from their cries (e.g., Formby, 1967; Valanne, Vuorenkoski, Partanen, Lind, & Wasz-Hockert, 1967). In contrast, recent studies have focussed primarily on the affective qualities and emotional consequences of crying, employing physiological and/or subjective measures to examine the reactions of various groups of listeners to the cries of various groups of infants. A common feature of these recent cry studies is their attempt to examine simultaneously the influences of both infant and caregiver characteristics on caregivers' reactions to infant behaviours. However, the variety of methods that have been employed and the underlying theoretical models that have been adopted raise a number of questions regarding the ecological validity of the

resulting generalisations.

One method used to study the effects of crying has been to monitor subjects' reactions to video-recordings of infants in various states. For example, Donovan, Leavitt and Balling (1978) examined mothers' physiological reactions to short silent video segments of an infant either smiling or crying, after they had previously viewed a tape of the infant in a different state (crying or smiling). Both the crying and the smiling elicited increases in skin conductance and cardiac acceleration, characteristic of a defensive reaction. However, the smiling evoked this response only when it preceded the crying, whereas the crying did so regardless of whether it preceded or followed the smiling. Furthermore, mothers who perceived their own infant to be difficult were physiologically less sensitive to changes in infant signals. Donovan et al. suggest that with difficult infants, who are typically irritable and fussing, both mother and infant may fail to benefit from the interchange of positive behaviours during their interactions. These authors raise the possibility that crying may inhibit responses to subsequent signals. They also suggest that the responses to the crying face is consistent with the view that crying is an attachment behaviour whose primary function is to elicit attention when contact with the caregiver has been lost. However, it would seem inappropiate to offer this explanation of the auditory function of crying to account for the reactions evoked by silent visual stimuli.

A major limitation of the Donovan et al. study is the use of short silent stimuli. This prompted Frodi and co-workers to employ two-minute long video recordings of an infant's facial expression, accompanied by audio recordings of the infant's vocalisations. Both

physiological and mood adjective scales were used to examine viewers' reactions to these tapes. In their studies, they have demonstrated that reactions to crying are influenced by caregiving experiences and by the characteristics of subjects' own children. For example, differences in arousal were found between mothers of premature and normal infants (Frodi, Lamb & Wille, 1981), mothers of "difficult" and "easy" infants (Frodi et al., 1981), and abusers and non-abusers (Frodi & Lamb, 1980).

Several of the Frodi et al. studies also compared the physiological reactions evoked by cries from different infant groups. In one study (Frodi, Lamb, Leavitt, Donovan, Neff, & Sherry, 1978b), video segments were made of the smiling and the crying faces of two infants, one full-term and one premature, due for release from hospital within 36 hours. Four stimulus tapes were produced, one of each infant coupled with its own and the other infant's cries. Regardless of appearance, the crying from the premature infant elicited greater arousal. This effect was enhanced when the visual stimulus was also of the premature infant. In another study (Frodi, Lamb, Leavitt, & Donovan, 1978a), differential reactions to crying were evoked in listeners simply by altering the label used to describe the infant on the stimulus tape (normal, difficult, or premature). Labelling the infant as premature elicited greater arousal, and less sympathy was reported when the infant was labelled as premature or difficult. On the basis of these studies, Frodi (1980) concluded that abusers and mothers of atypical infants (premature or temperamentally difficult) find cries more aversive than do other mothers. She also suggested that all cries are aversive to adults, especially those of atypical infants or those

incorrectly labelled as atypical.

A number of criticisms have been leveled at the Frodi et al. studies. As their findings have been widely disseminated and are commonly reported, and as their shortcomings are common to most of the recent cry studies, a examination of these would seem pertinant. One criticism concerns the representativeness of the signals used as stimuli. Typically, only one infant has been selected to represent a particular class of infants (e.g., full-term or premature). Whilst the design adopted by Frodi et al. is appropriate for comparing groups of subjects, it is not appropriate when the objective is to generalise about a class of infants. Commenting specifically on the studies of Frodi et al. (1978b, 1981), which involved one pre-term and one full-term infant, Friedman, Zahn-Waxler and Radke-Yarrow (1982) suggest that pre-term infants are not a homogeneous group, and therefore a single infant does not represent this group. They also suggest that as the pre- and full-term infants used in the Frodi et al. studies were not of the same conceptional age, this may also have influenced their findings.

To investigate these points, Friedman et al. (1982) examined mothers' perceptions of tape-recorded cries from 12 infants; four full-term, four medium-risk pre-term, and four low-risk pre-term. All were the same age from conception. The mothers rated the cries on five semantic differential scales (urgent-not urgent, pleasing-grating, healthy-sick, soothing-arousing, and mature-immature). Whilst the medium-risk infants were consistently rated more negatively, some of the low-risk cries were rated more positively than some of the full-term cries. Furthermore, the ratings indicated considerable within-group variability.

Several points emerge from the Friedman et al. findings. First, it would appear that the nature of an infant's cries may be influenced by the infant's medical history, even if it is "healthy" at the time of recording. This view is consistent with that put forward by Zeskind and Lester (1978), who found significant differences in both acoustic and perceptual characteristics of groups of high- and low-risk infants. Second, the results suggest caution in assuming that infant groups are homogeneous, particularly those defined using developmental criteria. Indeed, had Frodi et al. (1978b, 1981) used certain of the Friedman et al. cries, they may have obtained the opposite results. Yet, to date, all of these studies of the effects of crying have conducted group analyses on the assumption of group homogeneity. Furthermore, none of these recent studies has considered the question of variability within a sample of cries from the same infant. It has simply been assumed that an individual infant's cry characteristics are consistent.

Another criticism of the Frodi et al. studies is that the stimulus tapes were of infants unfamiliar to the subjects whose reactions were being monitored (Wiesenfeld, Malatesta, & DeLoach, 1981). Wiesenfeld et al. argue that this approach ignores those aspects of an infant's signals that may be unique for its own caregiver as a consequence of their extensive interactions. Wiesenfeld and Klorman (1978) compared mothers' reactions to their own and another infant's affective expressions, by measuring physiological reactions to videos of each infant smiling and crying. Markedly different reactions to the two infants were observed. When mothers viewed their own infants, both the smiling and the crying evoked cardiac acceleration and large increases in skin conductance,

characteristic of a defensive reaction. The cry of the unfamiliar infant, however, evoked cardiac deceleration and small changes in skin conductance, characteristic of an orienting response; the smiling evoked non-significant changes. Unfortunately, the videos were short (10 seconds) and silent, thus suffering from the same limitations as those of Donovan et al. (1978).

In a second study, Wiesenfeld et al. (1981) used 15 second audio-recordings to examine mothers' and fathers' reactions to their own and another infant's pain and anger cries. There were clear differences in the mothers' and fathers' reactions to their own infant's cries; mothers responded with cardiac deceleration followed by secondary acceleration, whereas the fathers responded with deceleration. Both sets of parents responded to the unfamiliar cries with cardiac deceleration.

Although Wiesenfeld et al. used different stimuli (visual without sound, and sound without visual) in their two studies, similar results were achieved. That is, the reactions of mothers to the unfamiliar infant were consistent with those found by Donovan et al.(1978), but contrary to those found by Frodi et al. (1978a, 1978b, 1980, 1981), and mothers reacted differently to their own than to an unfamiliar infant. This last point is important, considering that all studies to date, except those of Wiesenfeld et al., have examined subjects' reactions to unfamiliar infants.

These recent studies highlight the uncertainty that exists over the interpretation of physiological responses. Both Donovan et al. and Wiesenfeld et al. used measures of skin conductance and heart rate to distinguish between an Orienting Response (OR) and a Defensive Reaction (DR). For simple stimuli, the OR is characterised

by cardiac deceleration and decreases in skin conductance, whereas the DR is associated with cardiac acceleration and increases in skin conductance. Wiesenfeld and Klorman (1978) predicted that smiles would be perceived as pleasant, and evoke an OR, and that cries would be perceived as unpleasant and evoke a DR. Donovan et al. (1978), however, noted that physiological reactions to complex stimuli are not simply a function of stimulus characteristics, but are affected by experiential and cognitive factors. For this reason, they declined to predict the type of response elicited by crying and smiling, electing instead to focus on the effect of each signal type on reactions to subsequent signals. Frodi et al. also employed measures of skin conductance and heart rate, as well as diastolic blood pressure, making the same predictions as Wiesenfeld et al. (1978) regarding the effects of smiles and cries. However, they selected these measures on the grounds that:

> Diastolic blood pressure is a sensitive index of an aversive state, feelings of anger and a disposition to agress, while SC [skin conductance] is a more general index of autonomic arousal to aggress. (1978a, p.191)

Heart rate was used to distinguish between OR and DR.

Although the findings of Frodi et al. confirm their predictions, several factors mitigate against assuming that cardiac acceleration and increases in skin conductance are necessarily an aversive reaction. Whilst these responses were elicited by infant crying in the Frodi et al. studies, they have also been elicited by smiling (Donovan et al., 1978; Wiesenfeld et al., 1978) which subjects have described as pleasant (Wiesenfeld et al., 1978). Wiesenfeld et al. suggest that acceleratory cardiac responses to smiling may represent what Lipsitt (1976) has called a "hedonic

response". They further suggest that part of the apparent contradiction may be because the relationship between cardiac acceleration and aversion was derived from research that did not consider the effects of pleasant stimuli, but focussed on those that were noxious or fear-inducing.

One possible reason for difficulties experienced in interpreting physiological data is that the measures are of arousal, which is just one aspect of an emotional response. Studies of affect, that is, emotion as expressed in language, provide evidence of multiple dimensions of emotion. For example, semantic differential studies have consistently uncovered three major factors (Evaluation, Activity and Potency) which appear to be affective in nature (Osgood, 1969). These three factors have emerged for 21 different languages, thus appear to be trans-cultural (Osgood, May, & Miron, 1975). Multiple factors have also been uncovered from words expressing emotion. Averill (1975) uncovered three factors (Evaluation, Activity, and Control/Depth of experience) from 558 emotional terms, and Bush (1973) derived three dimensions (Pleasure, Activation, and Aggression) from a similarity analysis of 264 adjectives describing feelings. As well, studies of facial expression have consistently found two dimensions (Pleasure and Activation) (see Russell & Mehrabian, 1977).

Russell (1978) intercorrelated dimensions of affect obtained in previous studies to determine whether these dimensions were actually equivalent. His results strongly supported the convergent validity of two bipolar dimensions (pleasure-displeasure, degree of arousal) but were equivocal on further dimensions. To partial out the effects of the pleasure dimension, separate multidimensional scaling analyses

were carried out on pleasant, intermediate and unpleasant terms. The analyses confirmed the presence of an arousal dimension at each level of pleasure, and uncovered three additional dimensions: control/potency/dominance, depth of experience, and locus of causation. Russell suggests that these additional dimensions do not describe emotion per se, but rather beliefs about the antecedents/consequences of emotion which could best be discussed from a cognitive perspective.

So far, the limitations discussed have related to methodology and measurement. However, questions have also been raised regarding the conceptual frameworks that have been employed in cry research. The cry studies of Frodi et al. begin with the premise that crying is an aversive stimulus. This view stems from the suggestion that crying, along with behaviours such as smiling, clinging, sucking, and eye-contact function as "attachment-behaviours" (Bowlby, 1958; Ainsworth, 1967) that serve to promote contact between and infant and its caregiver, thus enhancing its chances of survival. According to Bell and Ainsworth (1972):

> Unlike smiling, which gratifies a caretaker, crying arouses displeasure or alarm and elicits interventions aimed at terminating it and discouraging its recurrance. Herein lies the power of crying to promote proximity more effectively than other early signalling behaviour. (p.1172)

The Aversive Stimulus Model, as it has been called (Murray, 1979), has certain appeal because it complements the Berkowitz model of Impulsive Aggression (Berkowitz, 1974), thus offering an explanation for apparent links between crying and abuse. Reports indicate that certain infants, such as those with immature or damaged nervous systems, are more likely to be abused (Elmer & Gregg, 1967;

Klein & Stern, 1971). This has led to the suggestion that whereas all crying is aversive to adults, the cries of these infants are particularly aversive, putting them at increased risk. Frodi et al. (1978a) argue that infants who cry excessively or who fail to respond to intervention may themselves become aversive stimuli through a process of conditioning. As arousing and aversive stimuli are more likely to provoke abuse (Berkowitz, 1974), these infants are at risk of becoming the targets of acts of impulsive aggression, even when not crying.

The possibility of links between cry features and abuse has also been suggested by Zeskind and Lester (1978). They note that crying that is high-pitched, grating and excessive is often mentioned in reports of abuse. In their study, they found from group analyses that the pain cries of high-risk infants had a significantly higher threshold, latency, and fundamental frequency than the cries of low-risk infants. The cries of high-risk infants were also perceived by listeners to be more aversive. Whilst they caution against generalising to all of an infant's cries on the basis of its pain-cry characteristics, they suggest that if the basic cry type of these infants has similar perceptual qualities, the cries of medically "at-risk" infants may adversely affect the quality of their interactions with a caregiver. They speculate that:

> In a nonsupportive environment, the behavioral repertoire of the poorly organised infant with a cry that is perceived as grating and aversive may violate the level of caregiver control behavior. (p.587)

One consequence of having adopted the Aversive Stimulus Model is that the results are interpreted <u>as if</u> cries <u>are</u> aversive. This has tempted at least one report to go beyond the data. For example, as

well as physiological indices, Frodi et al. employed 10 mood adjective scales to assess subjects' perceptions of infant signals. Subjects reported feeling more annoyed, more irritated, more distressed, more disturbed, more indifferent, less attentive, and less happy to crying than to smiling (Frodi et al., 1978a); and significantly more irritated, more annoyed , more disturbed and less indifferent when hearing a premature infant than while hearing a normal infant's crying (Frodi et al., 1978b). Yet the mean scale ratings of each of these stimuli (Frodi et al., 1978a, Table 1, p.494; Frodi et al., 1978b, Table 3, p.195) suggests that (except for the scales happy and attentive) none of the stimuli elicited a marked aversive reaction. That is, on a five-point scale (1 = not at all, 5 = very much) the mean ratings were less than 3. It would seem to be stretching a point to conclude from these ratings, as Frodi et al. do, that cries are perceived as "aversive", even although they are more aversive than smiles. Furthermore, Frodi et al. argue that significant correlations between ratings on various scales (e.g., distressed, irritated) and physiological responses supports the notion that feelings of anger or aversion are evident in the pattern of these responses. Due to the apparently narrow range of scale values, these correlations may be spurious, and the reported interpretation questionable. Given the implied links between aversiveness and abuse, it should be noted that no study has actually examined the cry characteristics of abused infants; or examined the behavioral responses of caregivers towards infants whose cries have been identified as particularly "aversive".

The Aversive Stimulus Model is but one of three models that have been proposed to explain the effects of crying on caregivers, the

other two being the Attribution Model (Kirkland, 1979), and the Empathy Model (Murray, 1979). The Attribution Model, based on attribution theory (Weiner, 1972, 1980), considers the causes a caregiver attributes to the crying, and suggests that causes can be categorised as internal/external, stable/unstable, and global/specific (Kirkland, 1979). In this context, "internal" refers to a behaviour that is self initiated, genetically based or "psychological". "External" means a behaviour that is environmentally based, accidental, or a contagious disease. "Stable" means the behaviour is lasting (longer than two days) or does not change quickly, and "unstable" means variable, or changing quickly. "Global" factors are general and universal, whereas "specific" causes are limited to a specific person.

According to the Attribution Model, a caregiver's reactions to an infant's crying will depend upon the cause attributed to it. For example, if the crying is attributed to "wanting attention" (internal, unstable, specific) it is likely to evoke feelings of annoyance. The crying is seen as intentional, and the caregiver attempts to do something <u>to</u> the infant to stop it crying. On the other hand, if the crying is seen as being due to "teething" (internal, stable, global) the response is likely to be one of sympathy. The crying in this case is attributed to developmental rather than "psychological" causes, and the caregiver is prompted to do something <u>for</u> the infant in order to relieve its distress. The model suggests that crying attributed to the "psychological" cell (internal, unstable, specific) is seen as intentional, and more likely to evoke a negative caregiving response.

In contrast to the Aversive Stimulus Model, which focusses

solely on the sound of the cry, the Attribution Model acknowledges the role of cognitive processing in determining a response to crying. That is, the interpretation of the cause of crying is considered to be an important factor in determining a listener's response. Curiously, the most direct evidence of the influence of a listener's beliefs or "cognitive set" on his or her reactions to crying comes from the study of Frodi et al. (1978a), where different reactions were elicited from the same cry/face simply by changing the label of the infant (normal, difficult or premature).

Several studies have attempted to examine listeners' causal attributions to crying. Lounsbury and Bates (1982) examined listeners' perceptions of cries recorded from unfamiliar infants belonging to one of three temperament categories (easy, average or difficult), in order to determine whether the cries of these infants differed acoustically and perceptually, and whether listeners' perceptions were affected by their caregiving experiences or the temperament of their own infant. Forty-five primiparous mothers rated 12 infants on three sets of seven-point Likert-type scales representing "behaviour intervention", "emotional reaction", and "perceived cause of crying". The results indicated that listeners perceived the average and difficult infants as more spoiled than the easy infants, and expressed more anger and irritation towards the average and difficult infants. The differences in responses to the average and difficult cries were not significant. Listeners also attributed different causes to the crying: Hunger and minor physical discomfort (wet, tired, cold) was seen as the cause of the "easy" , "average" and "difficult" cries by 69%, 57% and 54% of the subjects respectively; whereas for the emotional/psychological causes

(wanting attention, fright, frustration) the frequencies were 19% (easy), 28% (average) and 30% (difficult). Attribution of major discomfort (teething, pain, illness) did not discriminate between the three groups. There were no significant effects for the intended interventions (i.e., social stimulation: tickle, play games with; caretaking: give bottle, change nappies; or avoidance: do other chores, leave when possible) although a tendency towards avoidance increased with the difficultness of the infant group. Mothers' perceptions of their own infant's temperament was not predictive of their responses to the cries, the best predictor being prior experience with infants. The most highly experienced mothers tended to rate easy and average cries as less spoiled and difficult cries as more spoiled than did inexperienced mothers, and were also less irritated by the average and difficult cries. The more empathic mothers (assessed using the Empathy Scale from Mehrabian and Epstein, 1972) rated easy and average cries as less spoiled and difficult cries as less irritating.

Lounsbury and Bates (1982) also conducted acoustic analyses of the cries. The major finding was that the more difficult cries tended to have longer pauses within and between cry segments. They suggest that the pauses communicate a sense of urgency, which is interpreted as being more demanding or "spoiled".

Using the same cry stimuli as Lounsbury and Bates (1982), Boukydis and Burgess (1982) examined physiological and subjective responses of non-parent, primiparous and multiparous couples. The physiological index was skin conductance, and the subjective measures were five sets of Likert-type scales relating to (1) reaction to cry, (2) cry characteristics, (3) infant gender, (4) similarity with own

infant, and (5) perceived cause of crying.

The physiological responses indicated that the difficult cries elicited greatest arousal, followed by the average then the easy cries. This pattern was evident for the non-parents and multiparous parents, but not for the primiparous parents, who reacted to the average cries with greater arousal than to the easy or difficult cries. Overall, primiparas showed the highest arousal levels, followed by the non-parents then the multiparas. For the ratings of "reactions to crying" and "perceived cause of crying", the results were consistent with those of Lounsbury and Bates (1982). The difficult cries received high ratings for anger/irritation and spoiled, and lower cared-for ratings, and were rated as being caused by more complex emotional/psychological reasons. In contrast, the average and easy cries were attributed to hunger and physical discomfort. Whereas Lounsbury and Bates (1982) conducted acoustic analyses, Boukydis and Burgess used semantic differential scales to examine the perceived characteristics of the cries. The difficult cries were significantly more "grating", "arousing", "piercing", and "aversive" than the other two cry types.

A study by Zeskind (1980) is also pertinent. Zeskind did not specifically examine listeners' causal attributions to crying, but on their intended interventions. Using the 16 cries of high- and low-risk infants from an earlier study (Zeskind & Lester, 1978), 60 listeners (30 parents and 30 non-parents, half of each sex) rated the cries on a checklist of interventions: feed, cuddle, pick-up, clean, give pacifier, wait and see. They also rated each of these options in terms of their "effectiveness" and degree of "tender and caring". No differences were found in non-parents' responses to the low- or

high-risk infants with respect to either category. In contrast, parents gave more "tender and caring" and "effective" responses to the high-risk than to the low-risk infants. Compared to the non-parents, parents gave less "tender and caring" responses to the low-risk infants, and more "tender and caring", "effective" and immediate responses to the high-risk infants.

Zeskind argues that the parents gave responses that paralleled the semantic structures underlying the cries. That is, gave more effective responses to cries that are more urgent and distressing, and more tender and caring responses to cries that are "sick" (i.e. high-risk). However, these cry descriptions are presumably those obtained previously (Zeskind & Lester, 1978), for Zeskind did not ask the subjects in this study to describe the cries.

The findings that emerge from the studies of Lounsbury and Bates (1982), Boukydis and Burgess (1982), and Zeskind (1980), are that (a) listeners' attributions are affected by the acoustic characteristics of the cry sounds, (b) caregiving experience plays an important role in determining a listener's perceptions of crying, and (c) there is a relationship between infant temperament and cry characteristics. These findings have important implications for cry research. First, they suggest that it may be neccessary to control for infant temperament when selecting cries for analysis. Second, a caregiver's perceptions, reactions, and attributions in respect to crying are likely to affect their interactions with their infant, and these reactions appear to be strongly influenced by experience. A caregiver is an important source of environmental shaping which, along with constitutional factors, may account for the temperament-related differences in cry features.Thus it may be also

necessary to control for caregiver experience when selecting infant cry samples.

The third model of crying, the Empathy Model, was proposed by Murray (1979, in press). Murray has criticised the Aversive Stimulus Model on the grounds that it does not adequately explain the effects of crying on caregivers. For example, the model does not explain why, if cries are simply aversive sounds, listeners react differently to cries than to other sounds with matching acoustic properties (Murray, 1980), or why crying usually elicits attention rather than avoidance. Murray also notes Kryter's (1970) suggestion that it is inappropriate to apply a psychophysical theory of the effects of noise to signals that convey emotion.

The Empathy Model attempts to account for the functional significance of crying as a signal, and adopts an ethological perspective. As in the Aversive Stimulus Model, crying is regarded as a means of promoting contact between an infant and its caregiver, thereby enhancing the infant's chances of survival. The models differ, however, in the way they consider this function to be performed. Rather than considering the cry as a noxious sound, the Empathy Model views the cry as a biologically adapted "emergency signal" whose meaning depends upon both its intensity and the context in which it occurs. That is, emphasis is placed on the compelling nature of the cry rather than on its aversiveness. Furthermore, the experience of the caregiver is considered to be an important factor influencing reactivity to crying.

According to the Empathy Model, the effectiveness of the cry as a signal is due to the emotional reaction it evokes in a listener. Under normal circumstances, the cry arouses a feeling of "sympathetic

distress" (Hoffman, 1975) in the caregiver that triggers an altruistic response directed at relieving the infant's distress (Hoffman, 1975). This tendency to respond altruistically depends on the development of parenting behaviours which, according to Murray (1979) are influenced by experience, situational factors, and hormonal changes during puberty, pregnancy, parturition and lactation. Under certain circumstances, the crying may elicit an egoistic rather than an altruistic response. If a mother's attempts to soothe her infant fail, or if she does not respond because of beliefs about "spoiling" her child, her continued feelings of sympathetic distress may become overwhelming. This may cause a shift from concern for her infant's distress to concern for her own. If this situation persists, the crying may exceed her tolerance limits and put the infant "at-risk" of abuse.

To evaluate the Aversive Stimulus and Empathy Models, Murray (1979) conducted three studies in order to determine (a) whether cries <u>are</u> more than simply noxious sounds, and (b) whether listeners' reactions to cries are influenced by their caregiving experience.

In two studies, Murray used both subjective (semantic differential scales) and physiological measures (finger pulse amplitude and blood volume, and pulse rate) to measure listeners' reactions to 10 sounds matched for annoying physical features (impulsiveness, burst length, pause between bursts, turbulance, and peak fundamental frequency). The sounds were four newborn cries (hunger, pain, birth, and attention); four animal sounds (siamese cat cry, crowing of a raven, chicken fear squawk, and orangutang pip-squeaks); and two mechanical sounds (white noise and a synthesised infant cry, from Simner, 1971). Each listener was played

the sounds on two occasions. On the first occasion physiological responses were recorded, and on the second occasion subjects' rated the sounds on descriptive scales. One of the studies used General and Obstetric nurses; the other study used nulli-, primi-, and multi-parous males and females. The nurses responded with greater decreases in pulse amplitude and blood volume to the cries than to the other sounds, but there was no change in pulse rate across sounds. The listeners in the second study responded with greater decreases in pulse amplitude and blood volume to cries than to other sounds, whereas their pulse rate increased to cries. Murray suggests these reactions are characteristic of an active coping or stress reaction. This demonstration of selective arousal to crying but not to other sounds is consistent with the Empathy Model.

From the listeners' subjective ratings of the sounds, Murray reported that the aversiveness of the cries varied with experience. General nurses (relatively little experience) did not differentiate between the sounds. Obstetric nurses, on the other hand, found cries significantly less aversive than the other sounds. Murray also reported that listeners with no experience and those with only one child rated the cries and the other sounds as equally unpleasant, whereas the multiparous parents rated the cries as more pleasant. Unfortunately, Murray does not indicate how she has defined "aversiveness" in terms of the scales used, which, furthermore, did not include a scale of "unpleasantness". The scales were: kind-cruel, pretty-ugly, good-bad (Evaluation); weak-strong, heavy-light, hard-soft (Potency); and slow-fast, active-passive, sharp-dull (Activity).

In a third study, Murray used only five scales

(pleasant-unpleasant, weak-strong, active-passive, annoying-not annoying, sympathetic-unsympathetic)to examine listeners' reactions to four newborn cries. The listeners comprised of non-parents with or without caregiving (babysitting) experience, and parents. Half in each category were male and half female. Again, experience emerged as an important factor in determining listeners' reactions. The ratings increased in pleasantness and decreased in annoyance with experience, and greater sympathy was expressed by more experienced listeners. The results from the non-experienced listeners were consistent with the Aversive Stimulus Model. That is, these listeners were less sympathetic towards the more urgent cries (pain, hunger, birth) than to the less urgent cry (attention). Sympathy towards the hunger and birth cries increased with experience. For these cries, the parents responded with as much sympathy as to the mild attention cry, although they were still unsympathetic towards the pain cry.

Murray (1980) concludes that:

> with more exposure to infants, there is a shift away from egoism toward a more altruistic tendency to be sympathetic in response to discomforting raucous cries as well as unobtrusive cries. (p.4)

Thus Murray's findings offer support for the Empathy Model and provide further evidence that listeners' reactions to crying differ as a function of experience.

In summary, recent cry studies have adopted a variety of approaches in order to examine the effects of infant crying on listeners. The most consistent finding is that listeners' reactions to crying, whether they be physiological, perceptual or attributional, are strongly influenced by previous caregiving

experience. Many of the studies also report differences in the characteristics (acoustic and/or perceptual) of cries recorded from different infant groups. However, the generalisations that can be made from these studies are severely limited due to the variety of methods employed and the different conceptual models involved.

Most of these recent studies have adopted, explicitly or implicitly, the view that cries are aversive stimuli. However, the question of "aversiveness" has not been adequately examined. Some studies have employed physiological indices, on the assumption that (a) these are measures of aversiveness, and (b) that they indicate a "behavioral propensity to aggress". Yet the significance of particular physiological reactions to crying is far from clear, and interpretation has invariably depended upon listeners' self-reports.

Several studies have employed subjective measures to examine the effects of cries. In some, listeners' have described their own emotional feelings after listening to cries, whereas in others listeners have described qualities of cry sounds. Clearly, both of these aspects are relevant and important. However, the scales used for these purposes have generally differed from study to study, making comparisons of the findings difficult.

Since the use of descriptive scales holds much promise for cry research, it would be useful if a standard set of scales was available. Study A takes one step towards this objective by examining the relationships between scales that are currently in use for describing cry sounds and by examining a set of scales that may have general utility for describing feelings evoked by cries.

Another limiting but common feature of recent cry studies is that all have employed group analyses to examine what is essentially

interpersonal communication between infants and their caregivers. As a result, several unexamined assumptions have been made that have a direct bearing on the external and ecological validity of the findings. One assumption, important when considering the effects of crying, relates to the context within which crying occurs. A second assumption concerns the range of variation of cries from particular individuals and from particular groups of infants. To examine these assumptions, whilst at the same time considering the effects of crying at the interpersonal level, Study B investigates mothers' reactions to their own infant's cries.

Thus, two studies are presented. Study A examines the use of semantic differential scales:

i. To describe cry sounds.

ii. To describe feelings evoked by the cry sounds.

Study B examines the perceptions and affective reactions of mothers:

i. To their own infant's crying in the home environment.

ii. To tape-recordings of their own infant's cries.

STUDY A

Since 1978, a growing number of studies have employed descriptive scales in order to examine listeners' perceptions of and reactions to infant crying. In some of these studies, scales have been used to describe cry sounds (Brennan & Kirkland, 1982, 1983; Boukydis & Burgess, 1982; Friedman et al., 1982; Murray, 1979; Wiesenfeld et al., 1978, 1981; Zeskind & Lester, 1978). In other studies, scales have been used to examine the emotional reactions experienced by listeners exposed to infant cry sounds (Boukydis & Burgess, 1982; Frodi et al., 1978a, 1978b, 1980, 1981; Lounsbury & Bates, 1982; Murray, 1980). The scales employed by these studies are listed in Tables 1 and 2. As yet, however, no study has critically examined the scales used for these purposes, or compared the responses from scales describing cries to those from scales describing reactions to cries.

The first reported use of descriptive scales to examine listeners' perceptions of infant cry sounds was by Zeskind and Lester (1978). Sixty listeners (30 males and 30 females, half of each sex group being caregivers) used eight scales (see Table 1) to describe 16 pain cries. The cries were from two groups of eight clinically normal two-day old infants classified as either high- or low-risk on the basis of their pre- and peri-natal histories. To compare the two groups of cries, ANOVAs were computed separately for each scale. Then to determine whether the two cry groups were perceived along different dimensions, separate factor analyses were conducted on the cry ratings from each group. A single factor was uncovered for the

Table 1

Semantic Differential Scales Used to Describe Cry Sounds.

Zeskind & Lester (1978)	Friedman et al. (1982)	Boukydis & Burgess (1982)	Murray (1979) Study 1,2	Murray (1979) Study 3	Brennan & Kirkland (1982)	Wiesenfeld et al. (1978, 1981)
pleasing-grating	pleasing-grating	pleasing-grating	pretty-ugly	pleasant-unpleasant	pleasant-unpleasant	very pleasant-very unpleasant
not urgent-urgent	not urgent-urgent	not urgent-urgent	good-bad	passive-active	relaxed-tense	extremely ordinary-extremely unusual (1981 only)
healthy-sick	healthy-sick	healthy-sick	kind-cruel	not annoying-annoying	happy-sad	
soothing-arousing	soothing-arousing	soothing-arousing	slow-fast	strong-weak	soothing-arousing	
not piercing-piercing	not piercing-piercing	not piercing-piercing	passive-active		calm-agitated	
not aversive-aversive	mature-immature	not aversive aversive	dull-sharp		deep-shallow	
comforting-discomforting		comforting-discomforting	heavy-light		heavy-light	
not distressing distressing		not distressing distressing	strong-weak		strong-weak	
		not manipulative manipulative	hard-soft		large-small	
			meaningful-meaningless		thick-thin	
					important-unimportant	
					intentional-unintentional	
					colourful-colourless	
					meaningful-meaningless	
					sincere-insincere	

Table 2

Scale Terms used to Describe Feelings Evoked by Cry Sounds.

Murray (1979) (Study 3)	Wiesenfeld et al. (1978, 1981)	Lounsbury & Bates (1982)	Boukydis & Burgess (1982)	Frodi et al. (1978a,b, 1980, 1981)
sympathetic-unsympathetic	extremely relaxed-tense as I've ever been	desire to mother (care for)	care for	sympathetic
		anger	anger/irritation	annoyed
		irritation	sadness	irritated
		speed of response	spoiled	attentive
		sadness		distressed
		spoiled		indifferent
				disturbed
				alert
				frightened
				happy

low-risk group, loading on all eight scales. Two factors were uncovered for the high-risk group: the first factor represented the unpleasant qualities of the cries (discomforting, distressing, piercing), whereas the second factor represented the condition of the infant (sick, urgent).

Two other studies have used scales from Zeskind and Lester (1978). Friedman et al. (1982) used four of the scales (urgent-not urgent, pleasing-grating, sick-healthy, arousing-not arousing) and one additional scale (mature-immature) to examine mothers' perceptions of cries from full- and pre-term infants. No explanation was given as to why these four scales were selected from the original eight. Boukydis and Burgess (1982) used all eight scales (plus manipulative-not manipulative) to examine listeners' perceptions of cries from infants classified according to temperament (easy, average, or difficult). As in the Zeskind and Lester (1978) study, both Friedman et al., (1982) and Boukydis and Burgess (1982) used ANOVAs on each scale to compare cry groups and/or listener groups. No attempt was made, however, to examine the relationships between the scales.

Although their primary measures were physiological, Wiesenfeld and Klorman (1978) used two 10-point scales (very pleasant-very unpleasant, very ordinary-extremely unusual) to obtain descriptions of silent video stimuli, and Wiesenfeld et al. (1981) used one 10-point scale (very pleasant-very unpleasant) to describe cry sounds. Frodi et al. (1980, 1981), in addition to 10 mood adjectives on which people described their own feelings, employed three five-point scales (1 = not at all, 5 = very much). On these respondents rated: (a) how pleasant they found the baby, (b) how

much they wanted to interact with it, and (c) how distressed they thought the baby was. Whilst clearly relevant and of interest, the scales of Wiesenfeld et al. and those of Frodi et al. do not represent a systematic attempt to develop scales for describing cry sounds.

Although Zeskind and Lester (1978) employed factor analysis to see if different perceptual dimensions were being used by listeners, the scales had not been selected a priori to represent different dimensions. Rather, "The eight rating scales were generated from descriptions in the psychological and pediatric literature of cry sounds" (p.584). In contrast, studies by two other researchers have attempted to use scales specifically chosen to represent different perceptual dimensions. Murray (in press, Note 1) used two sets of scales. One set, used for comparing listeners' perceptions of cry sounds with those of animal and mechanical sounds with matching acoustic features, consisted of 10 scales. Nine of the scales were selected from Osgood, Suci and Tannenbaum (1957) to represent the three major factors consistently uncovered in Semantic Differential studies: pretty-ugly, good-bad, kind-cruel (Evaluation), slow-fast, sharp-dull, active-passive (Activity), and heavy-light, soft-hard, weak-strong,(Potency). A tenth scale, meaningful-meaningless, was also used (see Table 1). Murray reports, however, that a number of these scales lacked face validity, and gave results that were difficult to interpret (Murray, Note 1). The second scale set comprised five scales, representing Evaluation (pleasant-unpleasant), Activity (active-passive) and Potency (weak-strong); and two additional scales (annoying-not annoying, sympathetic-unsympathetic). Murray does not indicate why these particular scales were selected,

but her comments do highlight the need to consider the face validity of scales being used.

The most systematic attempt to develop a set of scales for describing infant cry sounds is that of Brennan and Kirkland (1983). In their study, 39 mothers were engaged in two tasks. First, the mothers were asked to identify the cry-type of 24 infant cries (6 each of pain, hunger, birth, and pleasure). The patterns of correct and incorrect judgements were used to identify clusters of perceptually similar cries. In the second task, the same mothers were required to rate the 24 cries on 50 semantic differential scales selected from a variety of sources. A factor analysis of the ratings was conducted, across both mothers and cries, to extract underlying perceptual dimensions. Three main factors were uncovered and were labelled Affect, Strength, and Evaluation. Five factorially pure scales were selected to represent each of these factors, and the cry ratings on the factor-scales were submitted to a cluster analysis. The cry clusters which emerged closely matched those derived from the cry-type identification task, indicating that the scales had effectively discriminated perceptually similar cries (Brennan and Kirkland, 1979, 1982, 1983).

The Brennan and Kirkland scales represent three independent perceptual dimensions and have been used to identify perceptually different cry sounds. Thus there would seem to be a greater advantage in using these scales rather than those of Zeskind and Lester (1978) for the study of listeners' perceptions of cry sounds, especially since the latter scales seem to tap just one of the dimensions (Affect) of the former. One purpose of the present study is to examine the relationship between the these two sets of scales,

and their effectiveness in discriminating between different cry sounds.

Whereas the above studies have used scales that describe listeners' perceptions of cry sounds, several studies have used scales that describe feelings evoked by cries (see Table 2). For example, Murray (1980) used a 5-point scale (sympathetic-unsympathetic) to examine listeners' feelings of sympathy towards cry sounds of varying intensity. Wiesenfeld et al. (1978, 1981) used a 10-point scale (extremely relaxed-tense as I've ever been) to examine tension created by cries. Lounsbury and Bates (1982) used six 7-point emotional reaction scales that related to anger, irritation, desire to mother, speed of response to infant, sadness, and perception of infant as spoiled. And Boukydis and Burgess (1982) adopted four scales from Lounsbury and Bates (1982): anger/irritation, sadness, spoiled, care for. The most comprehensive and extensively used set of scales, however, is that of Frodi et al. In a series of studies (Frodi et al., 1978a, 1978b, 1980, 1981), 10 mood adjectives were employed to measure listeners' reactions to cries. After hearing each cry, listeners indicated on a 5-point Likert-type scale (not at all-very much) the extent to which each of the 10 mood adjectives described their feelings.

Although the scales used by these studies appear to have face validity, each study appears to have chosen scales to suit a particular set of assumptions, although these are not explicitly stated, nor are the selection criteria reported. Whilst it is quite valid to employ terms that intuitively seem appropriate, a possible alternative would be to select scales that have an underlying theoretical structure, preferably based on a theory of emotion.

In this respect, there are two theoretical positions that could be adopted. One position, referred to as the Differential Theory of Emotions by Izard (1977), holds that there are a relatively small number of fundamental or basic emotions. There is, however, some disagreement regarding the exact number of basic emotions. For example, Woodworth (1938) suggested six (love/happiness/mirth, surprise, fear/suffering, anger/determination, disgust, and contempt). Plutchik (1962, 1980) considers there to be eight (joy, acceptance, fear, surprise, sadness, disgust, anger, and anticipation), and Izard (1977) describes 10 (interest, enjoyment, surprise, distress, anger, disgust, contempt, fear, shame/shyness, and guilt). All other emotions are considered to be derived from interactions among the basic set, although opinions differ regarding the nature of these interactions. Plutchik (1962, 1980) likens the basic emotions to primary colours from which all other colours are derived. For example, pride = anger + joy, love = joy + acceptance, hate = anger + surprise, and so on for all possible dyads and triads. However, whereas Plutchik considers the primary emotions to mix to form new emotions, Izard argues that the primary emotions in interacting patterns still retain their qualitative identity (Izard, 1977).

Whereas the theory of Differential Emotions helps explain the relationships between emotions, it is not so helpful for selecting terms in order to examine emotions. One difficulty is caused by the large number of categories generated by interactions. For example, with 10 basic emotions, there are 45 dyads and 120 triads. As well each emotion can vary in intensity. According to Plutchik (1980) anger can range from rage to annoyance, sadness from grief to

pensiveness, and so on. Using only the basic emotions would be too coarse to capture nuances of feeling. Yet the interactions produce a prohibitive number of categories. Thus one is left with the task of choosing particular categories and levels of intensity from the hundreds possible.

An alternative approach is offered by the Dimensional Theory of Emotion. Theorists ascribing to this theory argue that emotions can be explained in terms of basic underlying dimensions. For example, Schlosberg (1941) argues that the eight primary emotions proposed by Woodworth (1938) can be explained in terms of two dimensions: pleasantness-unpleasantness and attention-rejection.

Not all researchers adopting a dimensional approach aggree on the nature or number of basic dimensions, however. Factor analytical studies of self-report data have typically uncovered a large number (around 12) of factors that are monopolar (e.g., Nowlis, 1965). In contrast, studies involving semantic differential ratings of emotional terms (e.g., Averill, 1975; Mehrabian & Russell, 1974a) or of facial expression (e.g., Osgood, 1966; Schlosberg, 1954) have generally uncovered a smaller number (2 - 5) factors that are bipolar. Russell (1978) suggests that the greater number of monopolar dimensions uncovered from the self-report studies can be explained by a response style factor (acquiescence). Russell and Mehrabian (1974, 1977) and Russell (1979) found that the scores on the monopolar dimensions could be adequately predicted from scores on bipolar scales representing three dimensions: pleasure-displeasure, degree of arousal, and dominance-submissiveness. In his review of the affect literature, Russell (1978) concludes:

> In short, while no single line of evidence has yielded noncontroversial conclusions, some evidence from each methodology suggests pleasantness-unpleasantness and degree of arousal as two basic dimensions. Evidence of a third dimension has been less consistent, although some similarity can be seen in the concepts of potency, dominance, control and other labels applied to the third dimension. (p.1153)

Russell and Mehrabian (1977) argue that three independant bipolar dimensions - pleasure-displeasure, degree of arousal, and dominance-submissiveness - are both necessary and sufficient to adequately define emotional states. In this scheme, arousal is conceptualised as a unitary emotional response dimension ranging from sleep to frantic excitement (Mehrabian & Russell, 1974b, p.290), and dominance-submissiveness refers to the extent to which an individual feels unrestricted or free to act in a variety of ways (Mehrabian & Russell, 1974b, p.291). No explanation is needed for the terms pleasure-displeasure.

An attractive feature of the three dimensional model proposed by Mehrabian and Russell is that they have developed a set of bipolar semantic differential scales that represent the three dimensions. Although evidence supporting the convergent validity of dominance-submissiveness as a basic dimension of emotion is equivocal (Russell, 1978), this factor is of considerable interest for cry research because it relates to the notions of control and helplessness. Thus not only do the scales offer a means for examining listeners' emotional reactions, but they do so within a theoretical framework that relates to a general theory of emotion. The second purpose of the present study is to examine the Mehrabian and Russell (1974a) scales as a means of examining listeners' reactions to infant cry sounds.

The objectives of the present study are:

i. To examine the factor structures uncovered from the scales of Brennan and Kirkland (1983), Zeskind and Lester (1978), and Mehrabian and Russell (1974a).

ii. To examine the relationships between the three sets of scales.

iii. To determine whether these three sets of scales discriminate between perceptually different cries.

Method

Subjects

The participants were 26 parents (including 12 couples) recruited via advertisements in a local newspaper and at local pre-schools and kindergartens. Fourteen were mothers (aged between 18 and 33 years) and 12 were fathers (aged between 23 and 46). All had an infant aged between six and 24 weeks. One couple had three children (oldest aged four years), eight couples had two children (oldest between two and six and a half years), and two couples and the two single mothers had just one child.

Cry Signals

The 10 signals, labelled C1 - C10, each consisted of a single expiratory cry. There were two pleasure vocalisations (C2, C8), two hunger cries (C4, C6), and six pain cries. Two of the pain cries (C7, C9) were from clinically normal infants; the other four were from infants with hyperbilirubinaemia (C3), asphyxia and brain damage (C5), asphyxia without brain damage (C10), and meningitis (C1). These cries were taken from a tape kindly supplied by Professor Ole Wasz-Hockert, and are described in detail by Wasz-Hockert et al.

(1968). The six cries from normal infants were selected on the basis of results obtained in a previous study (Brennan & Kirkland, 1983) to give three sets of cries (two cries in each) that were clearly discriminated by a cluster analysis of their mean ratings on the 15 factor-scales (BK15). Although it is infants who are abnormal and not their cries, the present study has adopted the convention of referring to cries from abnormal infants as abnormal cries.

For each cry, a tape (Test Tape) was constructed by repeatedly copying the cry onto a cassette tape for two minutes, with six seconds of silence between each repeat. A familiarisation tape was also constructed. This contained the 10 cries (once only) presented in a random order, with six seconds of silence between each cry.

Apparatus

The Test Tapes were played to listeners via headphones (Gamma HP 510A) on a Nakamichi 350 cassette taperecorder at a pre-set playback level.

Semantic Differential Scales

Two sets of semantic differential (SD) scales were used. Set 1 consisted of 22 scales: the set of 15 factor-scales from Brennan and Kirkland (1983), referred to as BK15 (see Table 3); and the set of eight scales from Zeskind and Lester (1978), referred to as ZL8 (see Table 4). One scale (soothing-arousing) was common to both sets. The BK15 scales represent three independent dimensions, (Affect, Potency, and Evaluation), identified as BK1, BK2, and BK3. Set 2 consisted of the set of 18 factor-scales from Mehrabian and Russell (1974a), referred to as MR18. The MR18 scales represent three independent dimensions (Unpleasantness, Degree of Arousal, and Dominance), referred to as MR1, MR2, and MR3 (see Table 6).

To identify individual scales, the 15 BK15 scales are labelled B1-B15, the ZL8 scales are labelled Z1-Z8, and the MR18 scales are labelled M1-M18.

Within each scale set, two different arrangements (O1 and O2) of the scales were produced. To produce O1, the polarity of half of the scales were reversed (random selection) and the scales were randomly ordered. To produce O2, both the scale polarity and scale order of O1 were reversed.

For both Set 1 and Set 2, two types of booklets were produced. Set 1 booklets were constructed entirely of either O1 or O2 scales. Set 2 consisted of sets of O1 and O2 scales alternated on successive pages, beginning with either O1 or O2. By using identical scale sheets for all cries, it is less likely for errors to occur due to accidental rating of the wrong end of scales. On the other hand, there is a greater likelihood of the responses being influenced by those to previous signals. Since six of the cries used in the present study were selected because they were previously differentiated by the Set 1 scales, possible effects of cry interactions were not expected to present serious problems with regards to the Set 1 ratings. However, the possibility of such interactions were considered to pose a potentially serious threat to the Set 2 ratings. Hence, different arrangements of the scale sheets were used for each set. Separate instruction sheets (IS1, IS2A, IS2B) were provided for Set 1 (IS1) and Set 2 (IS2A, IS2B) that explained how to use the scales. Copies of these instruction sheets and the two forms of Set 1 and Set 2 scales (O1 and O2) are included in Appendix A.

Procedure

The participants were tested individually in their own homes with the investigator present. They were told that the purpose of the study was to obtain parents' descriptions of a variety of infant cries and descriptions of the feelings parents experienced when hearing these cries.

To introduce the procedures for using semantic differential scales, each participant was provided with an instruction sheet (IS2A) and three identical sheets of Set 2 scales. After reading the instruction sheet and checking the scale terms, they were asked to use the scales to describe (on separate sheets): (a) how they were feeling at the moment, (b) how their infant's crying made them feel, and (c) how their infant felt while crying.

The participants next read the instruction sheet for Set 1 (IS1), then examined the Set 1 scales to see if any needed clarification. To familiarise them with the scale terms, they were asked to recall a bout of their own infant's crying, and to describe that on a single sheet of Set 1 scales. After listening to the familiarisation tape, which introduced them to the 10 cries, they were played each Test Tape in turn which they rated, as they listened, using one of the Set 1 booklets (01 or 02). Half of the participants used scale booklet 01, and half used 02. Each participant was permitted to listen to a cry as many times as necessary to complete the ratings. Typically, this task took from 30 - 60 seconds per Test Tape. There was a delay of approximately 30 seconds between tapes while the previous tape was rewound and the next Test Tape loaded. Half of the participants using each type of booklet (01 or 02) heard the cries in the same random order (C1-C10).

The rest heard them in the reverse order.

When all 10 cries had been rated on the Set 1 scales, the participants read the instruction sheet (IS2B) for Set 2 and rated each cry in turn on separate sheets of Set 2 scales. The Test Tapes were presented in the same order and rated using the same procedure as with Set 1. At the end of the task, participants were asked whether they experienced any difficulties in using any of the scales.

Data Analyses

Factor Analysis. All factor analyses were made using the SPSS subprogram FACTOR (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975). The method of factoring employed was principal-factors with iterations (PA2). That is, communality estimates replaced the main diagonal elements in the correlation matrix. Factors with eigenvalues of greater than 1.0 were retained and subjected to orthogonal varimax rotation. The factor matrices reported in the present study show the varimax solutions.

CLUSTER. CLUSTER is a computer program (Bimler, Note 2) that employs a variation of the generalised distance formula to produce a mean cry-pair similarity-score matrix from the cry rating data matrices:

$$D_{ij}^{2} = \sum_{k=1}^{N} (x_{ik} - x_{jk})^{2}$$

where x_{ik} and x_{jk} are the subjects' ratings of items i and j on scale k.

From the similarity matrix, principal components are extracted

and used to cluster the items in either the rows (cries) or columns (scales). Using the first two principal components, a two dimensional plot is produced, along with a "minimum spanning tree" which links each each item to its nearest neighbour. The variance accounted for by each of the first three principal components is printed above the top left-hand corner of the cluster plot. The program also produces a list of the clusters emerging at sucessive similarity levels, along with the modal cluster ratings on each scale, and the mean ratings of each cry on each scale.

To interpret the plots, items are linked in the order shown by the minimum spanning tree and circles are drawn around items that cluster together at various levels of similarity. Similarities may range from 0% (no similarity) to 100% (identical). Choice of similarity levels for defining clusters is arbitrary and generally selected to reflect relatively large changes in similarity values between neighbouring items.

Results

Factor analyses

BK15 scales. The 260 (10 cry x 26 subject) x 15 (scale) cry rating data matrix was submitted to a factor analysis in order to uncover the factor structure underlying the BK15 scales. Three factors emerged (see Table 3) which are like the three factors of Affect, Strength, and Evaluation (BK1, BK2, and BK3) reported by Brennan and Kirkland (1983). Factor 1 corresponds to BK1, Factor 2 corresponds to BK2, and Factor 3 corresponds to BK3.

As found previously (Brennan & Kirkland, 1983) the BK1 and BK2 scales are "factorially pure" (Kerlinger, 1969). That is, the scales load

Table 3

Factor Loadings for the BK15 Scales.

Factor		Scale	FACTOR 1	FACTOR 2	FACTOR 3	COMMUNALITY
	B1	PLEASANT-UNPLEASANT	0.90994	-0.10199	-0.06729	0.84293
	B2	SOOTHING-AROUSING	0.88381	-0.16856	-0.19027	0.84573
BK1	B3	RELAXED-TENSE	0.91539	-0.14199	-0.17035	0.88712
	B4	HAPPY-SAD	0.90924	-0.01955	-0.20000	0.86711
	B5	CALM-AGITATED	0.88360	-0.22710	-0.15938	0.85772
	B6	HEAVY-LIGHT	-0.25658	0.76941	0.29257	0.74342
	B7	DEEP-SHALLOW	-0.08722	0.76794	0.19238	0.63435
BK2	B8	STRONG-WEAK	-0.12202	0.80339	0.34071	0.77641
	B9	LARGE-SMALL	-0.20223	0.86020	0.20203	0.82167
	B10	THICK-THIN	0.01944	0.81762	0.12106	0.68353
	B11	IMPORTANT-UNIMPORTANT	-0.48507	0.24850	0.62349	0.68578
	B12	INTENTIONAL-UNINTENTIONAL	-0.22921	0.32984	0.07516	0.16698
BK3	B13	COLOURFUL-COLOURLESS	0.09636	0.33230	0.46680	0.33761
	B14	MEANINGFUL-MEANINGLESS	-0.32931	0.20631	0.74532	0.70651
	B15	SINCERE-INSINCERE	-0.22752	0.26222	0.68222	0.58594
		EIGENVALUE	6.75589	2.79269	0.88922	
		PCT OF VAR	64.7	26.8	8.5	
		CUM PCT	64.7	91.5	100.0	

appreciably (>| .4 |) on only one factor. However, for the BK3 scales the results are not so clear cut. The loadings of the BK3 scales are comparatively lower than those of BK1 or BK2, scale B11 loads on Factor 1 as well as (primarily) on Factor 3, and scale B12 is scarcely accounted for by any of the factors (h^2= .17). Furthermore, several participants commented at the end of the task that they were uncertain about how to use scale B13 (colourful-colourless) when describing the cries. Thus the face validity of this scale must be considered suspect even though it does load on Factor 3 (see Table 3) as previously (Brennan & Kirkland, 1983). However, given that a different sample of listeners, some different cries, and a different procedure was used, these results do suggest that the factor structure of the scales is robust.

ZL8 scales. Separate factor analyses for the two types of pain cry (normal and abnormal) were not attempted (cf. Zeskind & Lester, 1978) because of the relatively small number of signals used in the present study. However, a combined factor analysis of the 260 (10

cry x 26 subject) x 8 (scale) data matrix uncovered a single factor (see Table 4). For this sample at least, there is no support for a

Table 4

Factor Loadings for the ZL8 Scales.

	Scale	FACTOR 1	COMMUNALITY
Z1	NOT PIERCING-PIERCING	0.86144	0.74208
Z2	PLEASING-GRATING	0.91865	0.84392
Z3	SOOTHING-AROUSING	0.90644	0.82164
Z4	COMFORTING-DISCOMFORTING	0.95187	0.90606
Z5	NON AVERSIVE-AVERSIVE	0.58720	0.34480
Z6	NOT DISTRESSING-DISTRESSING	0.91035	0.82874
Z7	HEALTHY-SICK	0.64139	0.41138
Z8	NOT URGENT-URGENT	0.81988	0.67221
	EIGENVALUE	5.57082	
	PCT OF VAR	100.0	

second factor comprising scale Z7 (sick-healthy) and scale Z8 (urgent-not urgent), as reported by Zeskind and Lester (1978). Thus although a comparatively lower loading for scale Z5 (aversive-not aversive) is apparent, the ZL8 scales appear to represent the same perceptual dimension.

BK15 and ZL8 combined. To examine the relationship between the BK15 and Z18 scales, their combined data matrix was factor analysed (See Table 5). Three factors emerged which are identifiable as the three BK15 factors of Affect, Strength and Evaluation (BK1, BK2, and BK3). As can be observed, all 8 ZL8 scales load heavily on Factor 1, with negligible loadings on Factors 2 or 3, and thus correspond to BK1 (Affect).

MR18 scales. The factor loadings for the ME18 scales are presented in Table 6, where the scales have been arranged into their original factor groupings (MR1, MR2, and MR3). Although three factors were uncovered that correspond to the factors labelled Pleasantness, Arousal and Dominance (MR1, MR2, and MR3) by Mehrabian and Russell (1974a), five scales show either low factor loadings

Table 5

Factor Loadings for the BK15/ZL8 Scales.

Factor		Scale	FACTOR 1	FACTOR 2	FACTOR 3	COMMUNALITY
	B1	PLEASANT-UNPLEASANT	0.91908	-0.13342	-0.03572	0.86379
	B2	SOOTHING-AROUSING (Z3)	0.87676	-0.21054	-0.15624	0.83744
BK1	B3	RELAXED-TENSE	0.90875	-0.17898	-0.15236	0.88108
	B4	HAPPY-SAD	0.89860	-0.05688	-0.18112	0.84352
	B5	CALM-AGITATED	0.87899	-0.26769	-0.12898	0.86091
	B6	HEAVY-LIGHT	-0.24460	0.78209	0.25941	0.73879
	B7	DEEP-SHALLOW	-0.06068	0.78161	0.16763	0.64270
BK2	B8	STRONG-WEAK	-0.10438	0.81929	0.30412	0.77462
	B9	LARGE-SMALL	-0.17881	0.86763	0.17577	0.81564
	B10	THICK-THIN	0.06240	0.82260	0.10699	0.69202
	B11	IMPORTANT-UNIMPORTANT	-0.48860	0.28364	0.60966	0.69087
	B12	INTENTIONAL-UNINTENTIONAL	-0.22998	0.33371	0.05670	0.16747
BK3	B13	COLOURFUL-COLOURLESS	0.10009	0.34530	0.46339	0.34399
	B14	MEANINGFUL-MEANINGLESS	-0.34009	0.23792	0.73364	0.71049
	B15	SINCERE-INSINCERE	-0.23618	0.29319	0.65652	0.57276
	Z1	NOT PIERCING-PIERCING	0.83795	-0.07601	-0.13371	0.72581
	Z2	PLEASING-GRATING	0.91981	-0.09116	-0.05072	0.85693
	Z4	COMFORTING-DISCOMFORTING	0.92204	-0.13721	-0.15922	0.89434
	Z5	NONAVERSIVE-AVERSIVE	0.59514	-0.05188	-0.04602	0.35900
	Z6	NOT DISTRESSING-DISTRESSING	0.85382	-0.18445	-0.26298	0.83218
	Z7	HEALTHY-SICK	0.68614	0.20585	-0.10097	0.52336
	Z8	NOT URGENT-URGENT	0.76529	-0.25244	-0.30293	0.74116
		EIGENVALUE	10.72479	3.72095	0.92312	
		PCT OF VAR	69.8	24.2	6.0	
		CUM PCT	69.8	94.0	100.0	

Table 6

Factor Loadings for the MR18 Scales.

Factor		Scale	FACTOR 1	FACTOR 2	FACTOR 3	COMMUNALITY
	M1	RELAXED-BORED	0.75888	0.04212	0.10980	0.58974
	M2	HAPPY-UNHAPPY	0.80971	-0.47012	0.11433	0.88971
MR1	M3	HOPEFUL-DESPAIRING	0.68905	-0.39861	0.20906	0.67739
	M4	CONTENTED-MELANCHOLIC	0.80949	-0.36255	0.04106	0.78841
	M5	PLEASED-ANNOYED	0.87272	-0.27478	0.11739	0.85092
	M6	SATISFIED-UNSATISFIED	0.82150	-0.31775	0.13152	0.79312
	M7	JITTERY-DULL	-0.24723	0.82198	-0.14860	0.75885
	M8	FRENZIED-SLUGGISH	-0.23291	0.65047	-0.20824	0.52072
MR2	M9	AROUSED-UNAROUSED	-0.38456	0.67598	-0.16333	0.63151
	M10	EXCITED-CALM	-0.55926	0.67819	-0.09878	0.78247
	M11	STIMULATED-RELAXED	-0.75231	0.46825	-0.14328	0.80577
	M12	WIDE AWAKE-SLEEPY	-0.17963	0.71471	-0.06285	0.54703
	M13	AUTONOMOUS-GUIDED	0.13284	-0.12661	0.67142	0.48448
	M14	DOMINANT-SUBMISSIVE	0.04468	-0.12400	0.66062	0.45379
MR3	M15	IN CONTROL-CARED FOR	0.23324	-0.26773	0.25041	0.18879
	M16	IMPORTANT-AWED	0.14211	0.15586	0.23501	0.09972
	M17	INFLUENTIAL-INFLUENCED	0.32073	-0.32675	0.40308	0.37211
	M18	CONTROLLING-CONTROLLED	-0.03404	-0.12885	0.51641	0.28444
		EIGENVALUE	8.01172	1.41919	1.08806	
		PCT OF VAR	76.2	13.5	10.3	
		CUM PCT	76.2	89.7	100.0	

(scales M15, M16), or load appreciably (>|.4|) on more than one factor (scales M2, M10, M11). A further five scales (M3, M4, M6, M9, M17) have loadings of >|.3|. Thus over a third of the scales are not

factorially pure. Since these scales were selected by Mehrabian and Russell (1974a) to provide factorially pure scales representing three independent dimensions, the factor structure of these scales does not appear to be robust.

All Scales (BK15/ZL8/MR18). An important question that has emerged from recent cry studies is whether cries perceived as having particular emotional qualities actually elicit those emotions in listeners. That is, would listeners who describe a cry as annoying or distressing actually describe their feelings on hearing the cry as annoyed or distressed. In the present study, the BK15 and the ZL8 scales describe cry characteristics, whereas the MR18 scales describe listeners' affective reactions. To examine the relationships between these different sets of scales, all 40 scales were submitted to a single factor analysis. The factor matrix is presented in Table 7.

In Table 7, the patterns that have emerged within each scale set are very similar to those that emerged from separate analyses of each set (see Tables 4,5,6). Of particular interest are the patterns of interaction between scale sets, especially between the three sets of factor scales from BK15 (BK1, BK2, BK3) and the three from MR18 (MR1, MR2, MR3). Wheareas the ZL8, BK1 and MR1 scales all load heavily on Factor 1, BK2, BK3, MR2, and MR3 are independent: BK2 = Factor 2, BK3 = Factor 4, MR2 = Factor 3, and MR3 = Factor 5. Interestingly, although scales B2 (soothing-arousing), B3 (relaxed-tense), and B5 (calm-agitated) appear to describe emotions corresponding to those described by scales M9 (unaroused-aroused), M11 (relaxed-stimulated), and M10 (calm-excited), these two sets of scales load on different factors. Whereas these three MR2 scales (M9, M10, and M11) do load on Factor 1 as well as Factor 3 (see Table 7), the corresponding BK1

Table 7

Factor Loadings for the BK15/ZL8/MR18 Scales.

Factor	Scale		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	COMMUNALITY
	B1	PLEASANT-UNPLEASANT	0.90421	-0.10777	-0.14623	-0.02211	0.08255	-0.05189	0.86059
	B2	SOOTHING-AROUSING (Z3)	0.85435	-0.19598	-0.16053	-0.15461	0.05461	-0.13430	0.83901
BK1	B3	RELAXED-TENSE	0.89381	-0.16841	-0.15811	-0.13270	0.07427	-0.09098	0.88366
	B4	HAPPY-SAD	0.88763	-0.04269	-0.17683	-0.18560	-0.04286	-0.05047	0.85981
	B5	CALM-AGITATED	0.87074	-0.25592	-0.15401	-0.10161	0.03399	-0.10124	0.86913
	B6	HEAVY-LIGHT	-0.24774	0.79233	0.14724	0.16368	-0.08491	-0.03452	0.74603
	B7	DEEP-SHALLOW	-0.07123	0.78145	0.07710	0.10930	-0.01642	-0.03455	0.63509
BK2	B8	STRONG-WEAK	-0.11616	0.84250	0.14882	0.19615	-0.02018	-0.05741	0.78764
	B9	LARGE-SMALL	-0.20043	0.87711	0.07546	0.07525	-0.05648	-0.04516	0.82608
	B10	THICK-THIN	0.04910	0.81235	0.05248	0.06434	0.03871	-0.02926	0.67157
	B11	IMPORTANT-UNIMPORTANT	-0.48237	0.32215	0.11698	0.57907	-0.07590	0.01797	0.69155
	B12	INTENTIONAL-UNINTENTIONAL	-0.23033	0.34152	-0.00704	0.06043	0.09669	0.13626	0.20131
BK3	B13	COLOURFUL-COLOURLESS	0.11977	0.38916	0.06034	0.41219	-0.24871	-0.04914	0.40361
	B14	MEANINGFUL-MEANINGLESS	-0.31939	0.27578	0.22366	0.74757	0.04539	-0.00642	0.78905
	B15	SINCERE-INSINCERE	-0.23579	0.34819	0.11850	0.57761	-0.09260	-0.03355	0.53421
	Z1	NOT PIERCING-PIERCING	0.81447	-0.06398	-0.15290	-0.12000	0.13359	-0.05316	0.72591
	Z2	PLEASING-GRATING	0.88877	-0.06202	-0.18923	-0.05070	0.08910	-0.09005	0.84819
	Z4	COMFORTING-DISCOMFORTING	0.89413	-0.12036	-0.18124	-0.16484	0.05694	-0.10424	0.88809
	Z5	NONAVERSIVE-AVERSIVE	0.54503	-0.03848	-0.25747	-0.00227	0.13104	-0.26663	0.45310
	Z6	NOT DISTRESSING-DISTRESS	0.84068	-0.18892	-0.13115	-0.23105	0.11830	-0.09614	0.83626
	Z7	HEALTHY-SICK	0.67269	0.21847	-0.07221	-0.12564	0.10197	0.04007	0.53324
	Z8	NOT URGENT-URGENT	0.75943	-0.25883	-0.10815	-0.27976	0.10741	-0.04965	0.74770
	M1	RELAXED-BORED	0.69102	-0.06487	0.14995	0.08769	0.09345	0.24584	0.58107
	M2	HAPPY-UNHAPPY	0.82720	-0.11758	-0.30572	-0.08783	0.09949	0.28576	0.89082
MR1	M3	HOPEFUL-DESPAIRING	0.71000	-0.13577	-0.26827	-0.00288	0.19449	0.24094	0.69039
	M4	CONTENTED-MELANCHOLIC	0.82590	-0.07531	-0.18048	-0.12521	0.02500	0.24526	0.79683
	M5	PLEASED-ANNOYED	0.85651	-0.13667	-0.16384	0.12834	0.11169	0.22244	0.85756
	M6	SATISFIED-UNSATISFIED	0.81331	-0.13331	-0.15844	-0.01857	0.12621	0.26081	0.78865
	M7	JITTERY-DULL	-0.39178	0.11354	0.77023	0.17479	-0.14261	-0.00619	0.81057
	M8	FRENZIED-SLUGGISH	-0.34592	0.18884	0.60815	0.01133	-0.23832	0.01382	0.58228
MR2	M9	AROUSED-UNAROUSED	-0.45461	0.16005	0.49691	0.37645	-0.15043	-0.18670	0.67841
	M10	EXCITED-CALM	-0.62974	0.15376	0.50120	0.22216	-0.09639	-0.24785	0.79150
	M11	STIMULATED-RELAXED	-0.79985	0.15203	0.26789	0.16372	-0.14527	-0.17607	0.81355
	M12	WIDE AWAKE-SLEEPY	-0.30609	0.16772	0.61318	0.18658	-0.07121	-0.00890	0.53777
	M13	AUTONOMOUS-GUIDED	0.18145	-0.08726	-0.06908	-0.05794	0.66508	-0.08389	0.49804
	M14	DOMINANT-SUBMISSIVE	0.02179	-0.01615	-0.06261	-0.14298	0.69148	0.19969	0.54311
MR3	M15	IN CONTROL-CARED FOR	0.19817	-0.15038	-0.18996	-0.10686	0.24324	0.28860	0.25184
	M16	IMPORTANT-AWED	0.10412	-0.01399	0.13382	0.19009	0.26028	0.00386	0.13284
	M17	INFLUENTIAL-INFLUENCED	0.38442	-0.06918	-0.22259	-0.12303	0.40758	0.03344	0.38448
	M18	CONTROLLING-CONTROLLED	0.01431	0.09130	-0.16217	0.02074	0.49478	-0.02608	0.28075
		EIGENVALUE	17.71139	4.02759	1.87125	1.28310	0.95654	0.69141	
		PCT OF VAR	66.7	15.2	7.1	4.8	3.6	2.6	
		CUM PCT	66.7	81.9	89.0	93.8	97.4	100.0	

scales (B2, B3, and B5) load only on Factor 1. In other words, the listeners' feelings of arousal (MR2 scales) can not be accounted for solely in terms of the unpleasant/arousing (BK1) qualities of the cries. And since the MR2 scales load only slightly on Factors 2 and 4, the evoked feelings described by these MR2 scales cannot be explained in terms of the potency (BK2) or importance (BK3) of the cries either.

Cluster analyses

To determine whether or not the scales discriminate between different cry sounds, the data were submitted to cluster analyses

using CLUSTER. The miminum spanning trees for Figures 1 - 5 are presented in Appendix B.

BK15 cry clusters. The cry clusters resulting from a cluster analysis of the mean BK15 data matrix are presented in Figure 1.

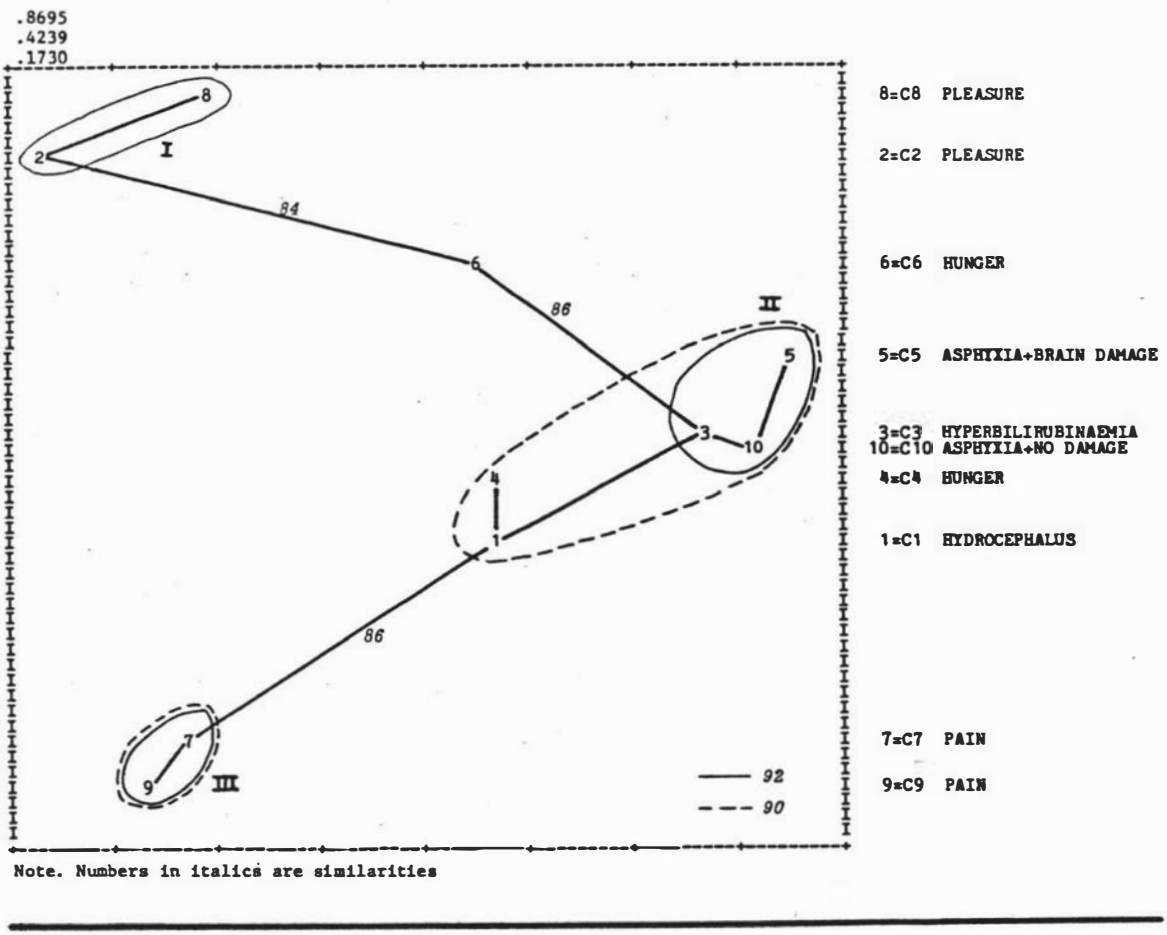

Figure 1. Cry clusters produced from the mean BK15 scale ratings.

Three main clusters emerged. Cluster I corresponds to the pleasure cries, Cluster II to the abnormal pain cries, and one hunger cry (C4), and Cluster III to the normal pain cries. Although the two hunger cries do not cluster together, this is not unexpected as they were chosen to represent different perceptual qualities along a continuum represented by the two normal pain cries at one end and the

two pleasure cries at the other (Brennan & Kirkland, 1983). The important feature is that the hunger cries did not cluster together or with the normal pain or pleasure cries.

Figure 1 demonstrates that the scales have effectively discriminated between the three types of normal cries (pain, hunger, and pleasure). This result is consistent with previous findings (Brennan & Kirkland, 1983) and confirms that the scales effectively discriminate between perceptually distinct signals. It is also of interest that three of the abnormal pain cries (C3, C5, C10) have formed a discrete group, indicating that these cries sound quite different from normal pain cries. The forth abnormal pain cry (C1) apparently sounds quite different to the other three, and has similar characteristics to one of the hunger cries (C4). These differences can be seen from the mean scale ratings shown in Table 8.

In Table 8 the cries have been arranged according to their vertical order in Figure 1. The scales have been arranged into their factor groupings, with the scale terms having the lowest scale value presented first. The similarities in rating of cries within clusters are quite apparent, as are the similarities in ratings of each cry on scales within each factor.

Using Table 8, the differences apparent in Figure 1 between C1/C4 and C3/C5/C10 can be examined. For example, in terms of scales B1, B8, and B11, C1 is more unpleasant, not as weak and more important than the other three abnormal cries; C4 is less unpleasant, stronger and as important as these three abnormal cries; and C1 is more unpleasant, not as strong and more important than C4.

Rather than describing particular cries, the ratings in Table 8 can be used to describe and compare cry clusters. For example, using

Table 8

Mean Cry Ratings and Modal Cluster Ratings on the BK15 Scales.

Factor		Scale	Cry										Cluster		
			C8	C2	C6	C5	C3	C10	C4	C1	C7	C9	I	II	III
BK1	B1	PLEASANT-UNPLEASANT	1.5	1.6	3.9	5.3	5.7	5.5	4.7	5.9	6.0	6.4	1	5	6
	B2	SOOTHING-AROUSING	1.7	2.1	3.9	5.0	5.6	5.2	5.2	5.9	6.3	6.4	2	5	6
	B3	RELAXED-TENSE	1.3	1.5	3.7	5.1	5.5	5.7	4.8	5.6	6.3	6.4	1	5	6
	B4	HAPPY-SAD	1.5	1.5	4.3	5.2	5.5	5.6	5.0	5.8	6.0	5.8	1	5	6
	B5	CALM-AGITATED	1.3	1.5	3.6	4.6	5.1	5.5	5.2	5.8	6.4	6.5	1	5	6
BK2	B6	HEAVY-LIGHT	5.8	5.0	5.0	5.6	5.2	5.1	3.9	4.2	2.5	1.8	5	5	2
	B7	DEEP-SHALLOW	5.0	4.4	4.8	5.6	5.1	5.4	3.9	4.2	3.1	2.0	4	5	3
	B8	STRONG-WEAK	5.0	4.2	5.0	5.5	4.9	5.4	3.8	3.7	2.1	1.4	5	5	2
	B9	LARGE-SMALL	6.0	4.5	4.8	6.0	5.3	5.7	3.8	4.5	2.3	1.7	4	5	2
	B10	THICK-THIN	4.9	3.9	4.2	6.1	5.4	6.0	3.4	5.0	3.0	2.0	4	6	1
BK3	B11	IMPORTANT-UNIMPORTANT	5.0	5.3	4.1	3.7	3.3	3.5	3.5	2.7	2.0	2.2	5	3	2
	B12	INTENTIONAL-UNINTENTIONAL	4.0	3.4	3.3	3.1	3.4	2.7	2.9	3.0	2.3	1.6	4	3	2
	B13	COLOURFUL-COLOURLESS	3.5	2.8	3.8	4.6	3.9	4.0	3.7	3.5	3.0	2.7	3	4	3
	B14	MEANINGFUL-MEANINGLESS	4.5	4.2	4.0	3.6	3.1	3.2	3.3	2.7	2.1	1.8	4	3	2
	B15	SINCERE-INSINCERE	4.0	4.2	4.5	4.0	3.5	3.1	3.0	2.5	1.9	2.3	4	3	2

Note. Cluster I = C2, C8
Cluster II = C3, C5, C10
Cluster III = C7, C9

the modal cluster ratings on scales B1, B8, and B11, Cluster I would be described as pleasant, slightly weak and slightly important; Cluster II is slightly unpleasant, slightly weak and slightly important; and Cluster III is quite unpleasant, quite strong and quite important. More detailed descriptions could be derived by using more or all of the scales. Comparing clusters, it is apparent that Clusters I and II differ mostly on BK1, Clusters I and III differ on all three factors, and Clusters II and III differ mostly on BK2. Thus each factor contributes to the effectiveness of the BK15 scales as a means of discriminating between different cry clusters.

BK15 scale clusters. If the scales are being used consistently, three discrete clusters should emerge from a cluster analysis of the scales and should correspond to the three sets of factor-scales.

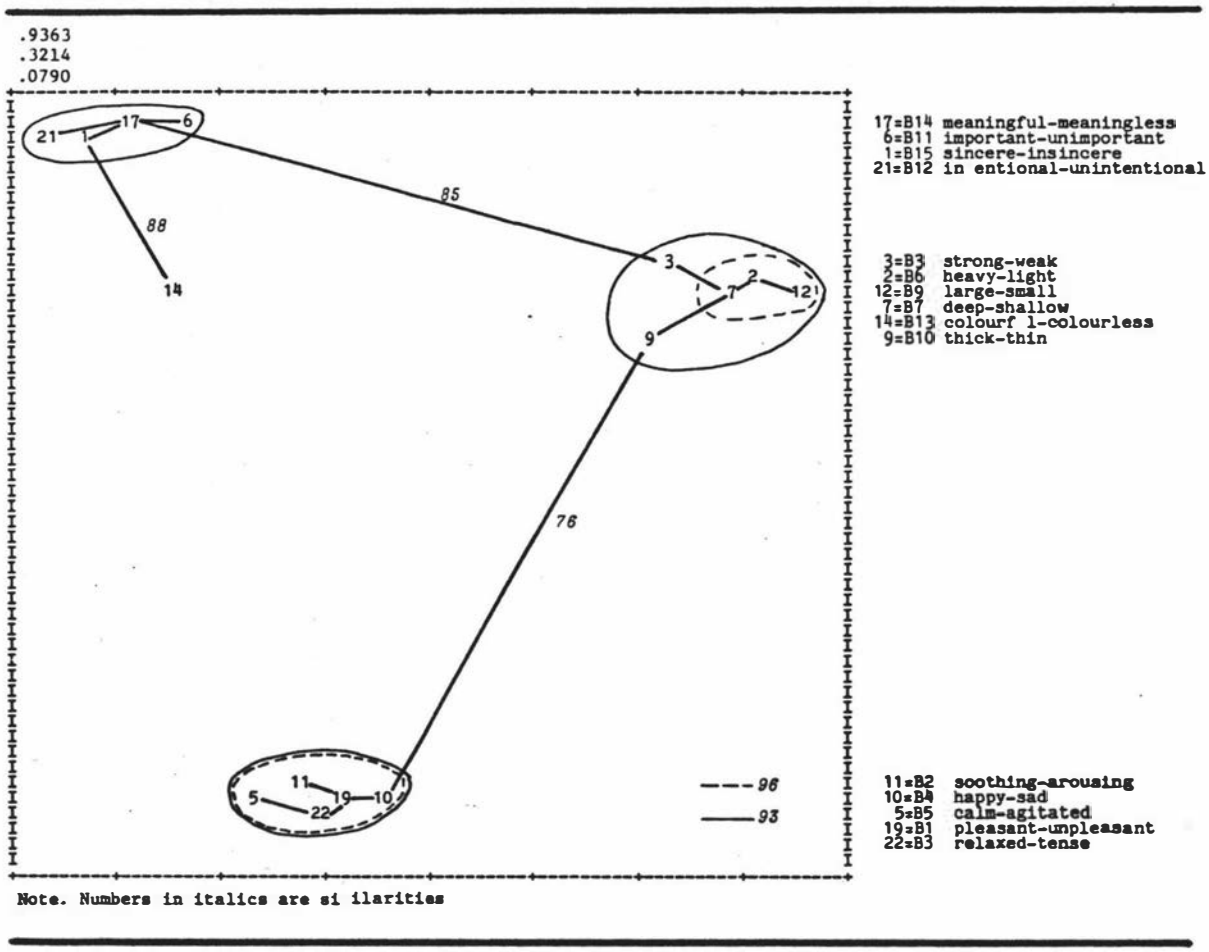

Figure 2. BK15 scale clusters produced from the mean cry ratings.

From the plot in Figure 2 it is apparent that this is the case. Although scale B12 (intentional-unintentional) did not load heavily on BK3 in the factor analysis (see Table 3), it has in fact clustered with the BK3 scales in Figure 2, as would be expected from previous findings (Brennan & Kirkland, 1983). Whereas in terms of central tendency (mean) scale B12 is closer to the other BK3 scales than to those of BK1 and BK2, it would seem from the results of the factor analysis (see Table 3) that it was used in quite different ways from the other BK3 scales. The one scale that did not fall into a cluster in Figure 2 is scale B13 (colourful-colourless). This result may

reflect the effects of the lack of face validity, reported earlier, that this scale had for some listeners.

Comparison of two sets of BK15 cry clusters. To examine the similarity between the cry clusters produced from the BK15 scales in the present study and in the Brennan and Kirkland (1983) study, the two mean data matrices for the six cries in common (C2, C4, C6, C7, C8, C9) were submitted to a single CLUSTER analysis. The output shown in Figure 3, demonstrates remarkable similarity between the mean ratings of the six cries from the two samples of listeners. For both sets of data, the pain cries (C7 and C9) and the pleasure cries (C2 and C8) clustered together, whereas the hunger cries (C1 and C4) formed discrete clusters. However, whereas for the pain and hunger cries identical cries (i.e., 1a/1b, 4a/4b etc.) clustered together in the combined analysis (see Figure 3), this did not occur with the pleasure cries. As C2 and C8 clustered together on each occasion, the relative ratings of these two cries by the two groups of listeners were clearly very similar. The existance of two clusters containing different cries (i.e C2a and C8a, C2b and C8b) rather than identical cries (C2a and C2b; C8a and C8b) suggests that different scale positions were used to rate these cries on each occasion. From Figure 3 it appears that the ratings were more extreme on the second occasion (i.e., in the present study).

It is apparent from Figure 2 that the BK15 scales were used in a consistent manner and represent three independent factors; and from Figures 1 and 3 that these scales have effectively and consistently discriminated between three types of cry (normal pain, hunger, and pleasure) that have been shown previously (Brennan & Kirkland, 1983) to be perceptually discrete. As the scales also discriminated

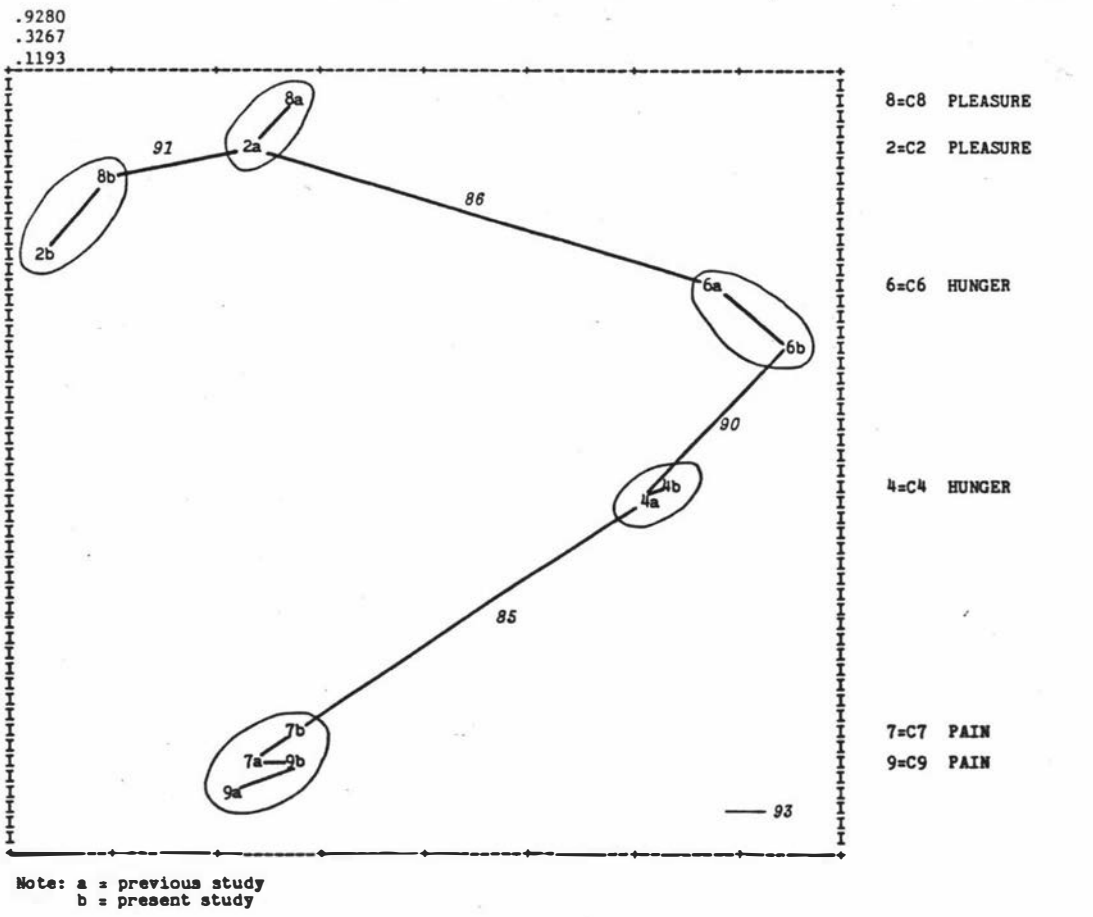

Figure 3. Cry clusters produced from two independent sets of BK15 scale ratings.

between normal and abnormal pain cries (see Figure 1), these two sets of cries must be perceptually distinguishable, thus providing a means of evaluating the usefulness of the ZL8 scales for discriminating between these two cry types.

ZL8 cry clusters. The output from a cluster analysis of the group mean ZL8 scale ratings of the 10 cries resulted in the output shown in Figure 4. At the 94% level of similarity, three clusters have emerged: Cluster I (pleasure cries); Cluster II (abnormal pain cries); and Cluster III (normal pain cries). The two clusters of pain cries are actually very similar and merge at the 92% level of

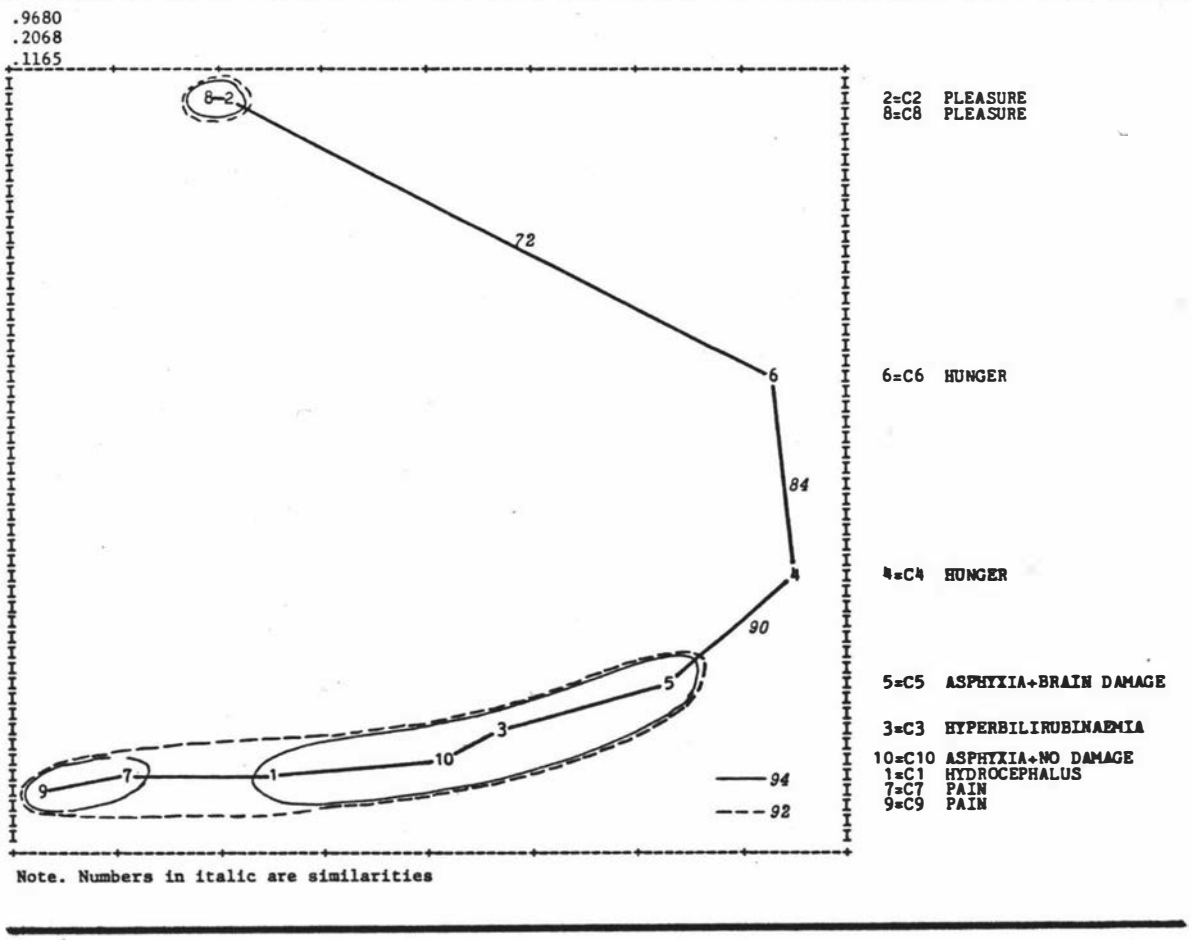

Figure 4. Cry clusters produced from the mean ZL8 scale ratings.

similarity. While the scales do discriminate the pleasure, two hunger, and pain cries, they do not discriminate well between the normal and abnormal pain cries. Compared to Figure 1, the most notable difference in Figure 4 is that of the relative positions of C1 and C4. One reason for these differences between Figures 1 and 4 is that the ZL8 scales are equivalent to the BK15 factor BK1 scales on which there were only marginal differences between the normal and abnormal pain cries. The scales that most effectively discriminated these two cry groups were the BK2 scales (see Table 8), for which there are no equivalent ZL8 scales.

The mean scale ratings and the modal cluster ratings for the ZL8 scales are shown in Table 9. In Table 9, the similarity of the

Table 9

Mean Cry Ratings and Modal Cluster Ratings on the ZL8 Scales.

Scale	Cry										Cluster		
	C2	C8	C6	C4	C5	C3	C10	C1	C7	C9	I	II	III
Z1 NOT-PIERCING-PIERCING	1.3	1.2	2.2	3.4	5.2	5.8	6.1	6.1	5.6	6.3	1	6	6
Z2 PLEASING-GRATING	1.7	1.4	3.7	4.5	5.3	5.6	5.6	6.4	5.8	6.4	1	5	6
Z3 SOOTHING-AROUSING	2.1	1.7	3.9	5.2	5.0	5.6	5.2	5.9	6.3	6.4	1	5	6
Z4 COMFORTING-DISCOMFORTING	1.9	1.9	4.0	5.1	5.1	5.5	5.7	6.0	6.3	6.4	1	5	6
Z5 NON AVERSIVE-AVERSIVE	2.2	2.4	3.3	4.4	4.5	4.5	5.1	5.0	5.1	5.4	2	5	5
Z6 NOT DISTRESSING-DISTRESSING	1.5	1.3	3.0	4.5	4.9	5.2	5.3	5.6	6.2	6.2	1	5	6
Z7 HEALTHY-SICK	1.4	1.6	3.3	3.5	4.8	4.6	4.8	4.4	4.1	3.7	1	4	4
Z8 NOT URGENT-URGENT	1.4	1.5	3.4	4.0	4.5	4.7	5.0	5.0	6.0	6.3	1	4	6

Note. Cluster I = C2, C8
Cluster II = C1, C3, C5, C10
Cluster III = C7, C9

scales is quite apparent from the narrow range of mean ratings on each cry. The similarities between the two sets of pain cries apparent in Figure 4 are also shown by both the mean scale ratings and the modal ratings of Clusters II (abnormal) and III (normal). A notable feature of the pain cry ratings is that the cries lie along a continuum, from C5 at the more positive end to C9 at the more negative end, on all scales except Z7 (sick-healthy). Although the differences in the mean ratings are small, it would seem that the abnormal cries were perceived as sounding slightly more "sick" that the normal pain cries. Indeed, the mean Z7 ratings are the major source of difference between cries C4 and C5.

MR18 cry clusters. The cry clusters produced from the MR18 scales are shown in Figure 5. A feature of Figure 5 is the apparent similarity to Figure 4, although there are differences in

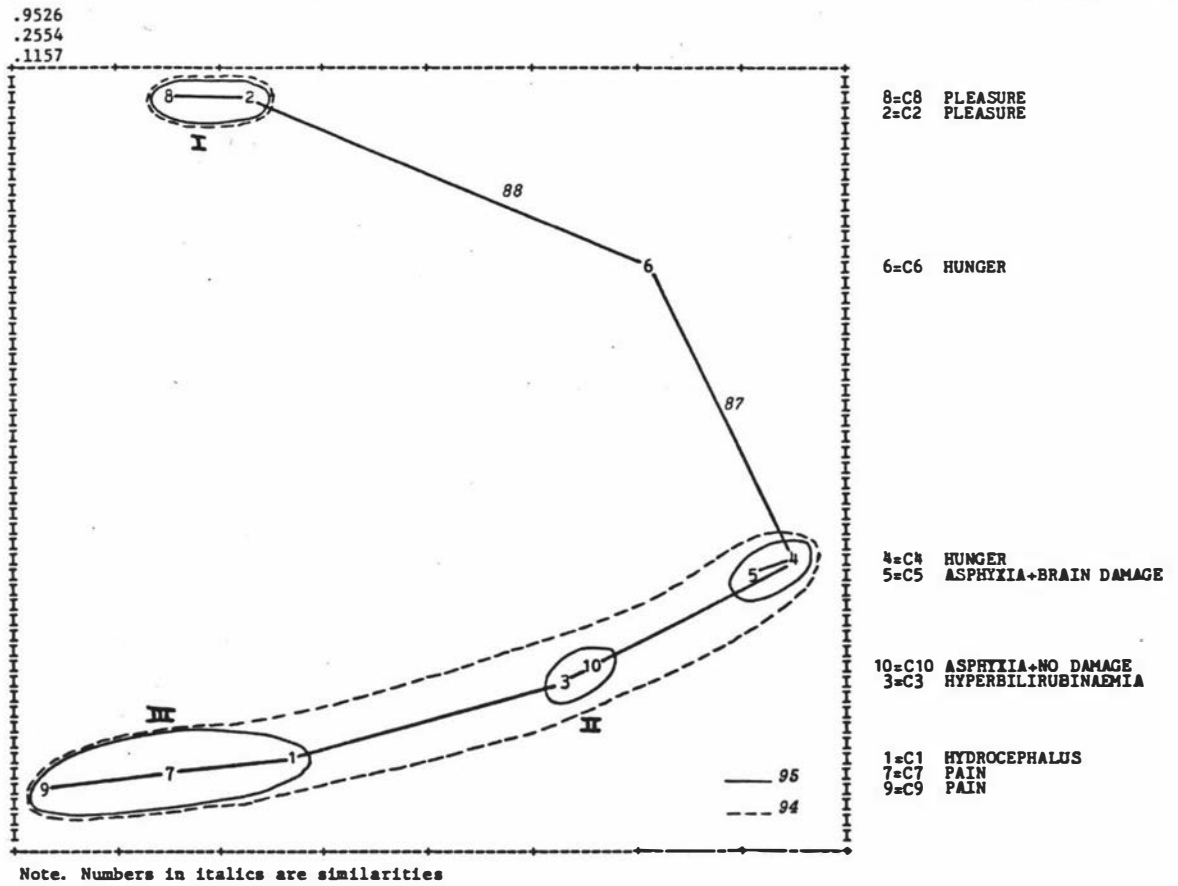

Figure 5. Cry clusters produced from the mean MR18 scale ratings.

similarities between particular cries. In Figure 1, compared to Figure 4, C7 is more similar to C1 than to C9, and C5 is more similar to C4 than to C3. Even so, as in Figure 4, all of the pain cries show a high degree of similarity.

The actual reactions evoked by these cries are indicated by the mean ratings shown in Table 10. The ratings across scales are reasonably consistent within each factor for each cry, but it is notable that there is relatively little variation across cries on any of the MR3 scales. The similarity between the pain cries is evident from both the mean scale ratings and the modal cluster ratings of

Table 10

Mean Cry Ratings and Modal Cluster Ratings on the MR18 Scales.

Factor		Scale	Cry										Cluster		
			C8	C2	C6	C4	C5	C10	C3	C1	C7	C9	I	II	III
MR1	M1	PLEASED-ANNOYED	1.7	1.6	3.5	4.7	4.8	5.2	5.0	5.5	5.7	6.2	1	5	5
	M2	RELAXED-BORED	1.9	1.8	3.3	4.0	3.7	4.4	4.3	4.2	4.1	4.3	1	4	4
	M3	HOPEFUL-DESPAIRING	1.3	2.3	3.3	4.3	4.6	5.0	4.8	5.5	5.2	5.9	2	5	5
	M4	CONTENTED-MELANCHOLIC	1.6	1.5	3.0	4.7	4.5	4.9	5.0	5.1	5.2	5.3	1	5	5
	M5	HAPPY-UNHAPPY	1.5	1.7	3.4	4.8	4.7	5.2	5.3	5.5	5.7	6.1	1	5	5
	M6	SATISFIED-UNSATISFIED	1.8	2.0	3.7	4.9	5.0	5.2	5.3	5.7	5.8	6.1	2	5	5
MR2	M7	AROUSED-UNAROUSED	5.2	4.8	3.9	3.1	3.6	2.7	2.5	2.4	2.1	1.8	5	2	2
	M8	JITTERY-DULL	4.8	4.4	4.5	3.5	3.4	3.1	3.2	2.7	2.5	2.2	4	3	2
	M9	FRENZIED-SLUGGISH	5.0	4.6	4.4	3.8	3.8	3.1	3.5	3.0	2.9	2.6	5	3	3
	M10	EXCITED-CALM	6.4	5.8	5.0	3.9	3.9	3.2	3.3	3.1	2.5	2.2	6	3	3
	M11	STIMULATED-RELAXED	6.2	6.5	4.7	3.3	3.0	2.6	2.5	2.3	2.1	1.7	6	2	2
	M12	WIDE AWAKE-ASLEEP	4.4	3.3	3.3	2.5	3.0	2.5	2.7	2.2	1.7	1.5	4	2	2
MR3	M13	DOMINANT-SUBMISSIVE	3.9	3.9	3.6	3.8	4.0	4.3	4.3	4.4	4.2	4.3	3	4	4
	M14	AUTONOMOUS-GUIDED	3.7	3.4	3.7	3.6	4.0	3.9	4.7	4.7	4.8	4.6	3	4	4
	M15	IN CONTROL-CARED FOR	3.0	3.0	2.8	3.3	3.6	3.7	3.5	3.8	4.2	4.3	3	4	3
	M16	IMPORTANT-AWED	3.6	3.7	3.7	3.8	4.1	3.7	3.9	4.0	4.2	3.8	3	4	3
	M17	INFLUENTIAL-INFLUENCED	3.4	3.2	3.3	4.5	4.7	4.2	4.7	5.7	5.3	5.6	3	4	5
	M18	CONTROLLING-CONTROLLED	4.6	3.8	3.9	4.2	4.7	4.2	4.2	4.7	4.7	4.9	4	4	4

Note. Cluster I = C2, C8
Cluster II = C3, C10
Cluster III = C1, C7

Clusters II and III in Table 10. Cluster I (pleasure cries) differs from Clusters II and III mainly on the MR1 scales, and to a lesser extent, on MR2. This narrow range may possibly be explained in part by two factors. First, a lack of consistency in the use of the scales, as indicated by the low factor loadings (see Table 6), which would result in mean values near the central scale value (4). Second, listeners' were instructed to use the center scale position (4) if unfamiliar with or uneasy about the scale terms. The main point emerging from Figure 5 is that although the two sets of pain cries were perceived as different (see Figure 1), the reactions they evoked in the listeners were very similar.

Discussion

The purposes of this study were threefold: to examine the robustness of the factor structure of three sets of scales (BK15, ZL8, MR18); to examine the relationship between the three sets of scales; and to determine the effectiveness of the scales in discriminating between perceptually distinct groups of cries.

For the BK15 scales, the three expected sets of factorially pure scales were emerged, with one unaccountable exception: scale B12 (intentional-unintentional) did not load appreciably on any of the three factors. However, a cluster analysis of the scales did in fact produce three clusters, with scale B12 located with other BK3 factor scales. These conflicting results suggest that different listeners used scale B12 in quite different ways, these differences obscured by the use of mean ratings in the cluster analysis. Scale B12 may therefore provide a useful means for examining differences between listeners, particularly with respect to the attribution of intent. Scale B13 (colourful-colourless), although loading appropriately on Factor 3 (see Table 3) did not form a tight cluster with the other BK3 scales and would seem to lack face validity for some listeners. A cluster analysis of the cry ratings on the BK15 scales effectively uncovered different cry groups, the clusters corresponding closely to those uncovered previously (cf. Brennan, 1979; Brennan & Kirkland, 1983). Thus it would appear that the factor structure of the BK15 scales is robust, and that the scales provide an effective and consistent means of identifying perceptually similar cry sounds.

For the ZL8 scales, one factor emerged that corresponded to the BK15 factor, BK1. There was no evidence of a second factor comprised of the two scales sick-healthy and urgent-not urgent (cf. Zeskind &

Lester ,1978). One reason for this may be that a range of cry types was used in the present study, whereas Zeskind and Lester (1978) used only pain cries. For example, it is apparent from Figure 1 that cry C4 (hunger) was perceived as having quite similar characteristics to cry C1 (pain: hydrocephalus). Unfortunately, there were too few pain cries in the present study to attempt an analysis of just pain cries. It would appear from the mean ratings shown in Table 9, however, that the scale sick-healthy did discriminate between the normal and abnormal pain cries to a limited extent. Although the ZL8 scales do not add a new dimension for looking at cry sounds, they do offer additional scales that could be used to describe affective characteristics of infant cries.

One of the ZL8 scales (aversive-non aversive) caused some difficulties. On first reading the scales, several participants expressed uncertainty over its meaning, which had to be explained. And during debriefing, several participants also commented that they felt hesitant about using a term that seemed to imply avoidance. This possible interaction between the scales and the participants' child-rearing beliefs may account for the lower factor loading of this scale.

For the MR18 scales, three factors were uncovered that corresponded to those reported by Mehrabian and Russell (1974a). However, six of the scales (one from Factor 1, two from Factor 2, and three from Factor 3) had either low factor loadings or were not factorially pure. There are several possible explanations for this outcome. First, the scales have been used to examine a specific type of stimulus (cry sounds) in a particular context. This may effect the way certain scales such as "in control/cared for" are used. A

second possibility has to do with the scale terms. Terms such as melancholic and autonomous are not commonly used, and even terms like awed, jittery and frenzied are unusual. Uncertainty over the precise meanings of these terms became apparent from the need to provide definitions of these terms during the familiarisation phase. It is also quite possible that some people would hesitate to admit their lack of comprehension. A third possibility relates to the nature of the scales. Several participants indicated during debriefing that they were perturbed by the scale "relaxed/bored", which they did not consider to represent opposite ends of a continuum. Thus, whilst the scales may have construct validity (see Mehrabian & Russell, 1974a), the present study raises questions about their face validity. Given the occurances of uncommon or unusual terms, the contrived nature of the scales, and the low or non-specific factor loadings of several of the scales, the usefulness of these scales for examining the effects of cry signals is open to further research.

In Figures 1, 4, and 5, the order of the cries along the vertical axis is almost identical. It is along the horizontal axis that the plots differ. In part, these differences reflect the structure of the dimensions represented by the scales. For example, a cluster analysis of data with only a single underlying dimension will produce a U shaped curve (on its side). Data representing two independent dimensions of equal weight will produce a circle (Bimler, Note 3). The U shaped curve is apparent in all three figures, but especially in Figures 4 and 5. That Figure 1 is basically U shaped rather than circular can be explained in terms of the mean scale ratings in Table 8. Although three factors emerged from a factor analysis of the raw data (see Table 3), the distribution of the mean

ratings shown in Table 8 suggest moderately negative correlations between BK1 and BK2, and moderately positive correlations between MR1 and MR3. Thus in terms of the mean ratings, all 15 scales tend to co-vary. The deviations from the U shape in Figure 1 (see C3, C5, C10) are most likely due to the inexact nature of the co-variation.

In contrast to the BK15 scales, the ZL8 scales do represent a single dimension, hence the smooth U shaped curve in Figure 4. And for the MR18 scales, the MR1 and MR2 mean ratings (see Table 10) co-vary and the MR3 scales do little to discriminate between the cries. Thus although the abnormal cries were perceived as being slightly less unpleasant (BK1) and much less potent (BK2) although slightly more important (BK3) (see Table 8), the slight differences in reaction to these two sets of cries (see Table 10) were of degree rather than type. That is, there is something about the abnormal cries that compensates for their lack of potency (i.e., strength, etc.), so that they evoked reactions that were almost as strong as to the normal pain cries. The pattern of the ZL8 mean ratings (see Table 9) suggests that this something may be the "sickness" of the cry sound. The point is, the results indicate that it is not sufficient to simply consider the affective (unpleasantness/arousing) qualities of cries, or their potency (strength). The attributes assigned to the cries (sick, important) also need to be taken into account.

In conclusion, it would appear from the factor analyses that the factor structure of the BK15 scales is robust, that of the MR18 scales is not, and the ZL8 scales correspond to the BK15 Factor 1. Furthermore, a cluster analysis of the BK15 scale ratings effectively differentiated perceptually distinct groups of cries and it is

apparent that all three of the BK15 factors contributed to the effectiveness of the discrimination. Thus although the ZL8 scales provide additional terms for describing the affective qualities of cry sounds, the BK15 scales provide a more effective means of identifying perceptually different cries. As they stand, the MR18 scales are not adequate for the task of studying the effects of infant cry sounds, mainly because the scales are comprised of uncommon terms and lack face validity. Whereas the dimensions of Unpleasantness and Arousal seem to be important, further dimensions relating to attributions ascribed to cries would seem desirable.

STUDY B

The great variety of methods reported in recent cry studies makes comparisons of findings difficult. One source of variation, associated with the measures used to examine listeners' responses to cries, has been examined in Study A. A second source relates to the ages of infants from whom cry samples were obtained. As can be seen in Table 11, the ages range from a few days to six months. Clearly, infants within this range may be at quite different developmental stages, and therefore display differences, not only in cry features, but in their social behaviours. For example, during the first month or so much of an infant's interaction with a caregiver will be elicited by and associated with fussing and crying whereas by the third month the infant is typically exhibiting social smiling, babbling, and eye-gazing, and spends far more time awake and in a quiet alert state (Bell, 1980).

A third source of variation arises from differences in ages between infants from whom cry samples were obtained and infants belonging to participants in the studies. Whilst the ages of these two sets of infants were matched in some studies, they were not in others (see Table 11). This raises the possibility of listeners using inappropriate criteria when judging infants at a different developmental stage to their own.

Yet another source of variation lies with the nature of the signal samples used. Quite apart from the fact that some studies used silent videos, some audio tapes, and others audio plus video, there has been little consistency regarding the length or type of

Table 11

Characteristics of Cry Samples Used in Previous Cry Studies.

Researcher	N	Condition of infant	Age of infant	Age of listeners' infant	Form of signal	Length of signal	Type of cry
Donovan et al. (1978)	2	n.s.	3 mths	3 mths	video-no sound	10 secs	n.s.
Frodi et al. (1978a)	1	n.s.	5 mths	9 mths	video with sound	2 mins	"
(1978b)	1 1	term prem	newborn several weeks	5 mths	"	"	"
(1980)	1	n.s.	5 mths	20 mths-11 years	"	"	"
(1981)	1 1	term prem	newborn several weeks	7 mths	"	"	heel snap
Zeskind & Lester (1978)	8 8	high risk low risk (term)	2 days	n.s.	tape-recording	10 secs	pain
Wiesenfeld & Klorman (1978)	17	healthy	5 mths	5 mths	video-no sound	10 secs	spontaneous
Wiesenfeld et al. (1981)	16	healthy	5 mths	5 mths	tape-recording	15 secs	anger, pain
Murray (1979) Study 1,2,3	4	n.s.	newborn	n.s.	"	10 secs	attention birth, pain, hunger
Friedman et al. (1982)	4 4 4	low risk prem medium risk prem full term	38-42 wks from conception	n.s.	"	30 secs	during neurological exam
Lounsbury & Bates (1982)	4 4 4	easy average difficult (all term)	4-6 mths	4-6 mths	"	30 secs	spontaneous prefeed
Boukydis & Burgess (1982)	"	"	"	2-6 mths	"	"	"

Note. N = number of cries
n.s. = not specified

signal used (see Table 11). Cry samples range from 10 seconds to 2 minutes; some cries are of pain, some are of hunger, and others are unspecified.

Perhaps of greater importance than the issues relating to comparability of studies are the unexamined assumptions upon which some of the studies were based, for these have a direct bearing on the external validity of the findings.

One assumption is that listeners respond to an unfamiliar infant's cry in the same way that they would if that infant was their own. As a result, studies have generally examined the effects of an infant's crying on strangers, not the infant's own caregivers. This procedure ignores the influence of affectional ties and knowledge of the infant's characteristic behaviours, and essentially disregards attachment theory. Furthermore, analyses typically involve comparisons of different groups of listeners and/or infants, although the studies are ostensibly attempting to examine what is essentially inter-personal communication. Although the impetus for several of these studies came from suggestions of links between infant crying and abuse, this approach overlooks the fact that infants who are abused are abused by their own caregivers: it is the caregivers' reactions to their own infant's crying that are important.

A second assumption is that it is primarily (even exclusively) the sound of the cry that determines a caregiver's reaction. Thus attention has focussed on cry sounds without regard to the context in which these were emitted. From an ethological perspective, context provides important clues which may assist the caregiver in interpreting the signal (Murray, 1979). For example, it has been noted that mothers responding to cries do not simply rely on the

sound of a cry, but depend upon knowledge of time since last feeding and size of feed (Bernal, 1972). The possibility that mothers' reactions may depend upon the congruence (or incongruence) between what they know and what they hear is suggested by Frodi's findings. Different reactions were induced in listeners simply by changing the description of the infant (Frodi et al., 1978a). As the interpretation of a cry is likely to affect any response to it (and future signals), an examination of effects of cries out of context may be quite misleading. Yet the use of tape-recorded cries in laboratory settings does just this and has not been questioned, except by Brennan (1982b).

Third, there is an implicit assumption that different groups of infants, defined in terms of developmental or medical criteria, are homogeneous with respect to cry characteristics, and that cries from a particular individual will show relatively little variation. Although Zeskind and Lester (1978) found significant differences between groups of high- and low-risk infants on a number of cry (acoustic) characteristics, the reported data indicates considerable overlap between groups. Studies have typically selected a single segment of crying (10-120 secs) from each of a small number (1-8) of infants of a particular type (full-term/premature, high/low risk, easy/difficult) without considering the range of within-group and individual variation in cry sounds. Although most of the studies have adopted designs appropriate for comparing groups of listeners, few are adequate to enable generalisations about particular groups of infants.

A fourth implicit assumption is that cry segments selected using criteria designed to give equivalent samples in terms of cry

eliciting conditions and auditory characteristics provide a valid sample of an infant's crying. When attempts are made to select cries using "standard" stimuli or criteria there is no way of knowing whether the samples are typical of the infant's cry repertoire. For example, if an infant is usually attended to immediately and does not usually cry vigorously, it would be misleading to examine the infant's vigorous crying, caused by delayed intervention, to the exclusion of its crying on other occasions. Furthermore, different types of cry (pain, hunger, unspecified) have been used (see Table 11), presumably on the assumption that acoustic characteristics (particularly those associated with "aversiveness") do not change across cry types.

And lastly, several studies have employed physiological measures on the assumption that they provide an indication of a propensity to aggress. However, the meaning of physiological responses are far from certain (see Izard, 1977, pp.114-116) and researchers have tended to rely on self reports to interpret these results in any case. And whereas the use of descriptive scales has proven to be a useful means of examining perceived characteristics and effects of cries, an implicit assumption is that cries described as "aversive" will evoke negative emotional reactions in the listener as well.

In light of these criticisms, the purpose of the present study is to examine mothers' descriptions of their own infant's cries and of the feelings evoked by the cries. To accomplish this, two sets of scales were used: one set for describing cry sounds (Set A); the other for describing feelings evoked by the cries (Set B). Both sets of scales were used by the mothers on two occasions. First, to describe each bout of their infant's crying as and when it occurred

in the home over a 48 hour period (Home Phase). And second, to describe tape-recorded samples of the cries rated during that 48 hour period (Experimental Phase). In order to record the cries in the home with a minimum of disruption to normal procedures, automatic time-referenced recordings were made by employing a tape-recorder with a sound activated switch, coupled to an audio clock (Brennan, 1982a). In this way, a comparison can be made of a mother's ratings of her infant's cries both in context (i.e., as they occurred) and out of context (i.e., tape-recorded cries). Also, an examination can be made of the variation in cry characteristics and evoked emotional reactions from both the group and individual mothers.

Thus, using each mother's semantic differential ratings of her own infant's cry characteristics and of the feelings evoked by the cries, the objectives of the present study are:

i. To compare the range of cry characteristics and feelings reported by different mothers.

ii. To examine the range of cry characteristics and evoked feelings reported by each mother.

iii. To examine the relationship between cry characteristics and reported feelings.

iv. To examine the effects of using tape-recorded cry samples on reported cry characteristics and feelings.

Method

Subjects

Twelve mothers were recruited from a maternity ward in a local hospital when their infants were two to three days old. These mothers were part of a larger group from whom signed consent had been obtained (a) to permit recording of their infants' cries during the routine PKU test, and (b) to obtain medical information. Mothers who lived locally, were married, white, and whose infants were full-term and clinically normal were invited to participate in the present study and were provided with an information sheet. The mothers, six primiparous and six multiparous, were aged between 25 and 32 years (M = 27.8, SD = 2.5). Of the twelve infants, six were male and six were female. The mothers are labelled M1 through M12 and their infants correspondingly labelled I1 through I12.

A copy of the consent form, the preliminary medical information form, and the information sheet, are presented in Appendices C, D, and E respectively.

Apparatus

Taperecorders. Two tape-recorders were employed in the present study. A Nakamichi 350 cassette recorder was used for the home recordings, coupled to one of three microphones; the standard Nakamichi microphone (Infants I1 & I2), an ECM 1015 (Infant I3), or an ECM 2001 (Infants I4-I12). Microphone changes were necessitated by competing demands for equipment. A Sony TC 124 cassette recorder was used to play back cries during rating tasks, via headphones (Gamma HP 510-A).

The Nakamichi 350 was modified to operate from a sound activated switch (VOX). The VOX serves to release the machine from "pause"

mode so that recording begins when the sound level exceeds a pre-set threshold intensity. The machine returns to "pause" if the sound level drops below this threshold for at least 10 seconds. The use of the VOX freed mothers from the task of manually switching the machine on/off each time crying occurred, and allowed all of each infant's crying during a 48-hour period to be automatically recorded.

Audio-Clock. The audio-clock is a microcomputer that outputs time signals (hours, minutes, seconds) in the form of audio-tones. These tones are recorded on one channel of a tape-recorder whenever VOX controlled recordings are being made on the other channel. On replay, the tones are converted back to a visual display to provide a time reference for the recordings.

Two models of the Audio-Clock were used. Model A, a prototype, was used for infants I1, I2, I3 and I4. A more sophisticated model, Model B, was used for the rest of the infants. Whereas both models can output and read time, Model B can also output and read a six-digit number specifying the date and subject code number, and can be interfaced with a computer to enable analysis of on-off times and to produce graphic output.

Diary Form

A Diary Form (see Appendix F) is a grid consisting of seven rows (one for each day of the week) and 96 columns (representing quarter hours), on which various activities and infant states could be recorded by means of symbols (e.g., feeding = f; cry rating = 1; sleeping = --; crying = X; awake = <blank>). The mothers used the Diary Forms to indicate what had happened in each 15 minute interval over the recording period.

The purpose of the Diary Form was to provide an overview of each

infant's activity over the 48 hour period and an independent record of each infant's crying during this time. This served as a check that the recording equipment was in fact operating during each of the infants' cry bouts.

Cry Signals

Thirteen unique sets of cries were used in the present study: one set of Familiarisation Cries and twelve sets (one per infant) of Test Cries.

Familiarisation Cries. These were six cries from Study A, labelled Cry 1 to Cry 6. The correspondence between the cries in the present study and Study A is: Cry 1 = C7, Cry 2 = C4, Cry 3 = C2, Cry 4 = C6, Cry 5 = C9, and Cry 6 = C10. Each cry consisted of a single expiratory vocalisation, lasting between 1.1 and 2.4 seconds. Five of the cries were from clinically normal infants and represented two pain cries (Cry 1 and Cry 5), two hunger cries (Cry 2 and Cry 4), and one "pleasure" cry (Cry 3). The remaining cry (Cry 6) was a pain cry from an infant with asphyxia without brain damage. The Familiarisation Cries were copied repeatedly for five minutes onto cassette tapes with a seven second pause between each repeat. A separate tape was used for each of the six cries. A further tape was produced that contained the six Familiarisation Cries (familiarisation tape), with a seven second pause between each cry.

Test Cries. Prior to the Home Phase, it was not possible to determine the number of cries to be included in the analysis. This number depended upon: (a) the number of cries emitted by each infant, (b) the number of cries rated by each mother, and (c) the number of rated cries successfully recorded.

In order to examine these factors, the occurrences of each

infant's crying over the recording period were plotted, using both the times recorded on tape from the audio-clock and the mothers' diary form records. These plots, attached in Appendix G, serve several purposes. First, they confirm that the automatic recording equipment operated satisfactorily. And most importantly, the plots indicate that the periods during which cries were rated by the mothers are reasonably representative of the total number of cry periods of their infant, although none of the mothers rated cries during all of these periods.

The plots show considerable differences between infants with respect to the amount, duration and occurrences of crying behaviour. The plots also show differences between mothers with respect to the number of cry bouts rated (7-15). An examination of these differences, however, is beyond the scope of the present study.

To facilitate comparisons of the 12 mothers, approximately the same number of cries (7-9) was selected from each, providing a total sample of 98 cries. These were the first seven to nine cries rated by each mother for which a recorded signal was available for use in the Experimental Phase. Within each infant's set of Test Cries, the cries were labelled 1-n, where n is the number of cries in a set (7, 8, or 9). By using the times reported on the cry rating sheets by each mother and the times recorded on the tapes from the audio-clock, corresponding cry segments were located and edited onto master tapes. Segments of approximately 20 seconds duration were selected from as near as possible to the times reported by the mother. The cutoff for each segment was made during a pause following an inspiration or expiration and attempts were made to select segments with minimal background noise and without breaks caused by the VOX switching off.

For each infant, the recorded segments of their own cries were copied twice onto a single cassette tape in a random order (e.g., 6, 6, 3, 3, 9, 9, 1, 1...), with a 15 second pause between each. Each segment was preceded by an announcement in the form "Cry One, first time", or "Cry One, second time". This procedure was adopted because the length and number of cry segments and the number of infants prohibited the use of repeated presentations of each cry on separate cassette tapes. Thus it was necessary to be able to clearly identify each cry on a tape.

Semantic Differential Scales

The present study employed three sheets of Semantic Differential scales: Sheet A, Sheet B, and Sheet C.

Sheet A. This sheet contained two sets of scales, Set A and Set B. Set A was used to describe characteristics of cry sounds, and consisted of 12 scales, four selected from each of the three sets of BK15 factor-scales employed in Study A. These scales represent three independent factors, labelled Affect, Potency, and Evaluation, In the present study these factors are referred to as F1, F2, and F3, rather than BK1, BK2 and BK3 as in Study A, since different numbers of scales are involved. Three scales from the original set of 15 (i.e., BK15) were considered inappropriate for the present study and deleted; happy-sad (from BK1), deep-shallow (from BK2), and colourful-colourless (from BK3). The removal of one scale from each factor had the advantage of reducing the size of the scale set, thereby reducing the time requirement of the mothers' rating tasks without altering the relative weightings of the factors or appreciably reducing the usefulness of the scale set. The BK1 scale (happy-sad) was deleted because the present study did not examine

vocalisations associated with pleasure/happiness but only cries associated with some degree of distress. The BK2 scale (deep-shallow) was deleted because it appears to relate more to breathing than to cry sounds. The BK3 scale (colourful-colourless) was deleted because of its lack of face-validity in Study A. And although it showed low factor loadings in Study A, scale B12 (intentional-unintentional) was retained (now labelled A10) because the attribution of intent is of theoretical significance.

Set B consisted of 10 mood adjectives that describe mothers' emotional reactions to their infant's crying and mothers' feelings toward their infants. The MR18 scales from Study A were not used because of serious difficulties with face validity. The Set B scales scales were selected in part from those reported by Frodi et al. (1978a, 1978b), with additional scales added that seemed pertinent to the Empathy, Aversive Stimulus and Attributional Models of crying. Bipolar scales rather than Likert-type scales (cf. Frodi et al. 1978a, 1978b) were used to be consistent with the Set A format.

Individual scales within a scale set are labelled as follows: Set A = A1-A4 (F1), A5-A8 (F2), A9-A12 (F3); Set B = B1-B10. The scales comprising Set A and Set B are shown in Table 12.

Sheet B. This sheet also contained a set of Set A and Set B scales, as on Sheet A, along with two questions and spaces for recording the date and times of rating. The two questions were placed at the bottom of the sheet. They were: "What is it about the crying that makes you feel this way?"; and "Why do you think your infant is crying?".

Sheet C. This sheet contained three sets of scales: Set C, Set D, and Set E. Set C was simply Set B arranged in a different random

order. The mothers used Set C to describe the feelings that resulted from their infant's responses to their interventions. Set D consisted of five scales for describing the infants' responses to interventions. Set E consisted of five scales on which the mothers described how they felt prior to the cry bout. The mothers were also asked to indicate what they were doing when the crying began. The information on Sheet C is not considered in the present analysis.

Response booklets, consisting of multiple copies of Sheet A plus an instruction sheet (IA), were used in the Familiarisation Phase for rating the Familiarisation Cries, and in the Experimental Phase for rating the Test Cries. In the Home Phase, the mothers were provided with a booklet consisting of twenty alternating copies of Sheets B and C, with an instruction sheet (IB) on the front cover. Instruction sheet IA and Sheet A are included in Appendix H; Instruction sheet IB, Sheet B, and Sheet C are included in Appendix I.

Procedure

The present study was conducted in three phases, referred to as the Familiarisation Phase, the Home Phase, and the Experimental Phase.

Familiarisation Phase. The mothers' task in the this phase was to rate the six Familiarisation Cries, the objectives being (a) to familiarise the mothers with the scales and rating procedures, and (b) to enable the mothers to become proficient in using the scales. The cry rating data was not intended for analysis. The purpose was to prepare the mothers for the Home Phase, where they were required to rate their own infant's crying prior to intervention. Thus they needed to be able to use the scales quickly and without confusion.

For this reason identical sheets (Sheet A) of scales were used for all cries. The possibility of the mothers developing a response set was considered preferable to the increased chance of unintentionally checking the wrong end of a scale if the scales were re-ordered and the polarities reversed in a random fashion.

Each mother was contacted by telephone when her infant was approximately 10 days old, in order to explain the nature of the task and arrange a suitable time to visit. When each mother was visited in her own home by the author, the task was explained in detail. After hearing the familiarisation tape, the first Familiarisation Cry was rated for practice. Any questions were answered and the remaining Familiarisation Cries were rated in turn. Each cry was played repeatedly until the rating was completed, with a 30 second pause between cries while the cassette was being rewound and the next tape loaded. All mothers were played the cries in the same order (1-6).

At the completion of the task the nature of the Home Phase was outlined and arrangements were made to make contact again by telephone when the infant was approximately one month old.

Home Phase. In this part of the study, each mother was involved in several tasks.

One task was to rate their own infant's crying as it occurred on various occasions over a 48 hour period. On each occasion, the mothers first rated the crying (on Sheet B) prior to intervention, then again (on Sheet C) after they had finished attending to their infant. An important part of this task was to record the exact time the cries were rated so that the recorded time-tones from the audio-clock could be used to locate the corresponding cry recordings.

For this reason, the mothers were provided with a pocket calculator (Casio AQ-2200) with a clock display (hours, minutes, seconds) that had been synchronised with the Audio-Clock.

The second task was to complete a Diary Form, recording the infant's state (awake, asleep, crying) during each 15 minute period, feeding times, times at which the crying was rated, and any periods of absence from the home.

The third task concerned the recording of the infant's crying. The mothers' responsibilities were: (a) to ensure that the power was not disconnected from the recording equipment, (b) to ensure that the microphone was kept near the infant at all times, (c) to check that the VOX was working, and (d) to change the cassettes as necessary. No other involvement with the equipment was required.

Each mother was contacted by telephone to arrange a convenient time to begin the recording/rating tasks. Typically, a study began on a Monday or Thursday morning at approximately 9.00 am, and finished on the following Wednesday or Saturday at approximately 10.00 am. On arrival, the equipment was set up by the author, and operating instructions given. This involved a demonstration of how to change cassettes (one side only was used) and where to position the microphone. The microphone was mounted on a lightweight adjustable stand and had a 12 metre extension lead enabling it to reach any room in the house without moving the tape-recorder.

The mother was given a clipboard and pen, a rating booklet sufficient for 20 cry bouts, an instruction sheet, a diary sheet, the calculator/clock, a summary sheet of the tasks, and the author's contact telephone number.

A brief pre-arranged visit was made by the author in the early

afternoon of the first day of recording to check the equipment and to ensure there were no problems. At the end of the 48 hour period the exercise was discussed with the mother and the third phase of the study outlined.

Experimental Phase. In this phase, the task for each mother was to rate tape-recorded cries (Test Cries) from her own infant. After arranging a suitable time by telephone, each mother was visited by the author approximately one week after the 48 hour recording. After the nature of the task was explained, the mother rated each Test Cry in turn using Sheet A. Each cry was played twice, the first time for rating on the Set A scales, and the second time for rating on the Set B scales. Rating started as soon as a cry began. When the cry ended, the tape-recorder was stopped until all of the Set A scales were completed, then the second occurrence of the cry was played while it was rated on the Set B scales.

Results

HOME PHASE

Relationships between scales. To examine the relationships between the various scales in Set A and Set B, the ratings on all 22 scales of the 98 cries were subjected to a factor analysis (SPSS). As in Study A, the method used was principal factoring with iteractions (PA2), with orthogonal varimax rotation. The resulting rotated factor matrix is shown in Table 12.

In marked contrast to previous analyses involving Set A scales (e.g., Brennan & Kirkland, 1982, 1983; Study A), F1 has not emerged

Table 12

Factor Loadings for the SetA and SetB Scales: Home Phase.

		SetA	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	COMMUNALITY
	A1	PLEASANT-UNPLEASANT	0.48745	0.36947	0.24790	0.12047	0.32387	0.55497
F1	A2	SOOTHING-AROUSING	0.11711	0.36436	0.57509	0.11556	0.31336	0.58875
	A3	RELAXED-TENSE	0.30510	0.63104	0.12683	-0.03749	0.16067	0.53460
	A4	CALM-AGITATED	0.10404	0.59749	0.29629	0.07222	0.24465	0.52068
	A5	WEAK-STRONG	0.21915	0.69850	0.24668	0.00031	0.00720	0.59683
F2	A6	LIGHT-HEAVY	0.19222	0.76980	0.14968	0.07554	0.08163	0.66432
	A7	SMALL-LARGE	0.24777	0.86689	0.17468	-0.00980	-0.18157	0.87647
	A8	THIN-THICK	0.12470	0.68341	0.02006	-0.12798	-0.06180	0.50319
	A9	UNIMPORTANT-IMPORTANT	-0.06069	0.02859	0.70201	0.02046	0.09990	0.50772
F3	A10	UNINTENTIONAL-INTENTIONAL	-0.04101	-0.22410	0.11405	0.00175	-0.04499	0.06694
	A11	MEANINGLESS-MEANINGFUL	-0.06711	0.20984	0.81745	-0.09529	-0.10531	0.73693
	A12	INSINCERE-SINCERE	-0.00220	0.09285	0.78061	-0.12242	-0.04426	0.63492
		SetB						
	B1	SYMPATHETIC-UNSYMPATHETIC	0.12260	0.10700	-0.61648	0.71568	0.04271	0.92056
	B2	NOT DISTRESSED-DISTRESSED	0.57004	0.32006	-0.02656	-0.09810	0.25174	0.50109
	B3	NOT ANXIOUS-ANXIOUS	0.62393	0.39713	0.02293	-0.34450	0.23679	0.72227
	B4	CALM-AGITATED	0.74286	0.31679	-0.05489	-0.12295	0.26734	0.74180
	B5	IN CONTROL-CONTROLLED	0.62214	0.02398	0.02711	-0.15141	0.15905	0.43659
	B6	NOT GUILTY-GUILTY	0.56558	0.27530	-0.04541	-0.41915	-0.01945	0.57380
	B7	NOT RESENTFUL-RESENTFUL	0.85761	0.20297	-0.04360	0.07724	-0.10169	0.79490
	B8	NOT ANNOYED-ANNOYED	0.85567	0.07386	-0.14900	0.08383	-0.05295	0.76966
	B9	NOT ANGRY-ANGRY	0.81843	0.20891	-0.12374	0.20812	-0.01726	0.77240
	B10	ACCEPTED-REJECTED	0.64953	0.13785	0.14896	0.07819	-0.14080	0.48902
		EIGENVALUE	7.24473	3.38920	1.55353	0.82164	0.49929	
		PCT OF VAR	53.6	25.1	11.5	6.1	3.7	
		CUM PCT	53.6	78.7	90.2	96.3	100.0	

as an independent factor. Two of the F1 scales (A3, A4) load on Factor 2 which primarily represents F2, and, although scales A1 and A2 also load moderately on Factor 2, A1 loads mainly on Factor 1, which represents the Set B scales; and A2 loads mainly on Factor 3, which represents F3. As in Study A, A10 (intentional-unintentional) does not load on any of the factors.

From Table 12 it would seem that Factor 1 represents the mothers' affective reactions to the cries (Set B) and the unpleasantness of the cry sounds (A1). Factor 2 represents the affective and physical characteristics of the cry sounds (A1, A2; F2 [A5-A8]), the state of the infant (A3, A4), and feelings of anxiety (B3). Factor 3 represents mothers' evaluations of the cries (F3 [A9-A12]) and sympathy (B1). And Factor 4 represents feelings (or a lack) of sympathy (B1) and guilt (B6). For Factor 5, however, none

of the scales have appreciable loadings, the highest being on scales A1 and A2.

The splitting of the F1 scales across three factors suggests that the mothers have made a distinction between pleasantness, arousal, and the state of the infant (tense, agitated). Furthermore, except for B3 (anxious), which loads moderately on Factor 2, and B1 (unsympathetic), which loads on Factor 3, the Set B scales are quite independent of the Set A scales except for A1 (unpleasant). That is, the negative feelings described by Set B appear to correspond to the unpleasantness (A1) of the cries but not to the arousing qualities (A2), the state of the infant (A3, A4), the physical qualities (F2), or the mothers' evaluations of the cries (F3).

Dichotomous rating categories. Given current interest in the "aversiveness" of crying, it would seem pertinent to examine those cries perceived as having negative affective characteristics (i.e., high F1 ratings) and/or that evoked negative affective reactions from the mothers (i.e., high Set B ratings). In order to do this, each 7-point scale on Set A and Set B has been collapsed into two categories by recoding 1, 2, 3, and 4 as 1, and 5, 6, and 7 as 2. Originally, the Set A scales were bipolar with categories 1, 2, and 3 described by the left-hand label, 4 being neutral, and categories 5, 6, and 7 described by the right-hand label. After recoding, the scales have become essentially unipolar, and only the right-hand scale labels apply. Thus pleasant-unpleasant becomes not unpleasant-unpleasant, soothing-arousing becomes not arousing-arousing, and so on. This interpretation of the dichotomous categories (henceforth referred to as DC) has also been adopted for

the Set B scales even though six of the scales (B2, B3, B6, B7, B8, B9) are unipolar. Whilst this means that the number of negative responses on the six unipolar scales errs on the conservative side, this approach avoids a possible source of error. Namely, as the bipolar and unipolar scales were intermixed in the same scale set, it is possible that with the unipolar scales the mothers may have used a 4 rather than a 1 for "neutral" and a 5 rather than a 2 for "slightly negative" as they would for bipolar scales. If this was the case, more negative responses are reported than actually occurred. This possibility is suggested by the bimodal distributions of the 7-point Set B ratings shown in Table 13 where, in contrast to the Set A scales, the Set B scales have one mode of 1 and a second mode of 4 or 5.

The proportion of cries in each of the DC categories are also shown in Table 13 for the Set A and Set B scales. For the Set A scales, the proportion of cries in each DC category differs considerably between the three sets of factor scales (F1, F2, and F3), and between A1 and the other three F1 scales (A2, A3, and A4). While many of the cries (63-80) received DC ratings of 2 on scales A2, A3, and A4 (F1) and on scales A9-A12 (F3), only approximately half of the cries (38-56) received such ratings on scale A1 or scales A5-A8 (F2). Thus, far more cries were perceived as arousing (A2) than unpleasant (A1) or potent (F2).

For the Set B scales, the number of cries with DC ratings of 2 was generally much lower than for the scales in Set A. The feelings most frequently reported by the mothers (the actual number shown in parentheses) were: anxious (37), agitated (36), distressed (32), annoyed (25), controlled (24), and resentful (19). Relatively few

Table 13

Frequency Distributions across the Seven-point and Dichotomous (DC) Categories of the Set A and Set B Scales: Home Phase.

			Seven-point Categories							DC Categories	
		Set A	1	2	3	4	5	6	7	1	2
F1	A1	PLEASANT-UNPLEASANT	4	6	10	28	24	15	11	48	50
	A2	SOOTHING-AROUSING	0	2	7	12	32	24	21	21	77
	A3	RELAXED-TENSE	3	1	13	18	41	16	6	35	63
	A4	CALM-AGITATED	2	1	8	15	33	24	15	26	72
F2	A5	WEAK-STRONG	6	4	18	18	30	19	7	42	56
	A6	LIGHT-HEAVY	8	15	20	17	22	10	6	60	38
	A7	SMALL-LARGE	5	12	21	15	29	9	7	53	45
	A8	THIN-THICK	4	9	12	25	30	14	4	50	48
F3	A9	UNIMPORTANT-IMPORTANT	6	9	7	10	22	25	19	32	66
	A10	UNINTENTIONAL-INTENTIONAL	6	3	6	10	41	14	18	25	73
	A11	MEANINGLESS-MEANINGFUL	0	2	4	12	29	21	30	18	80
	A12	INSINCERE-SINCERE	1	2	7	16	33	22	17	26	72
		Set B									
	B1	SYMPATHETIC-UNSYMPATHETIC	21	21	27	16	6	5	2	85	13
	B2	NOT DISTRESSED-DISTRESSED	26	3	15	22	22	9	1	66	32
	B3	NOT ANXIOUS-ANXIOUS	20	15	4	14	25	8	4	61	37
	B4	CALM-AGITATED	24	16	11	11	21	12	3	62	36
	B5	IN CONTROL-CONTROLLED	30	12	11	21	7	10	7	74	24
	B6	NOT GUILTY-GUILTY	35	14	11	27	6	3	2	87	11
	B7	NOT RESENTFUL-RESENTFUL	30	15	8	26	15	3	1	79	19
	B8	NOT ANNOYED-ANNOYED	29	19	7	18	15	6	4	73	25
	B9	NOT ANGRY-ANGRY	33	13	13	25	7	5	2	84	14
	B10	ACCEPTED-REJECTED	18	8	12	51	5	3	1	89	9

Note. N = 98

cries made mothers feel angry (14), unsympathetic (13), guilty (11) or rejected (9). Clearly, most of the cries did not evoke negative affective reactions in mothers, even though, on the basis of the DC ratings shown in Table 13, a substantial proportion of these same cries were considered unpleasant, arousing, strong, and important.

Cross-tabulations of Set A and Set B responses (DC = 2). The relationships between the Set A and Set B scales for cries with high DC ratings (DC = 2) are shown in Table 14.

For many of the scale interactions the proportion of cries with high DC ratings on both scales is generally in the order of 70%-100%, with most above 60%. There are, however, some cases where the proportion of cries in common is less than 60%, suggesting that certain reactions are more likely to be associated with particular

Table 14

Proportion of Cries with High DC Ratings (DC = 2) on both SetA and SetB Scales: Home Phase.

	SetA												
SetB	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	NC
B1	7	9	7	11	7	5	5	4	5	8	6	5	13
%NC	54	69	54	85	54	39	39	31	39	62	46	39	
B2	27	30	29	30	28	22	24	22	28	24	29	26	32
%NC	84	94	91	94	88	67	75	69	88	75	91	81	
B3	26	33	30	34	30	24	27	24	27	26	33	30	37
%NC	70	89	81	92	81	65	73	65	73	70	89	81	
B4	30	32	30	31	30	23	27	23	25	25	32	31	36
%NC	83	89	83	86	83	64	75	64	69	69	89	86	
B5	15	22	18	20	18	12	13	14	17	17	19	17	24
%NC	63	92	75	83	75	50	54	58	71	71	79	71	
B6	11	10	8	9	9	7	8	8	7	8	9	9	11
%NC	100	91	73	82	82	64	73	73	64	73	82	82	
B7	15	18	17	15	14	10	12	14	12	15	16	16	19
%NC	79	95	90	79	74	53	63	74	63	79	84	84	
B8	18	21	19	18	17	11	14	16	13	20	20	18	25
%NC	72	84	76	72	68	44	56	64	52	80	80	72	
B9	12	13	11	12	12	7	10	8	6	8	10	9	14
%NC	86	93	79	86	86	50	71	57	43	57	71	64	
B10	8	9	8	9	9	6	8	7	8	8	9	9	9
%NC	89	100	89	100	100	67	89	78	89	89	100	100	
Total	50	77	63	72	56	38	45	48	66	73	80	72	

Note. NC = Number of cries with a high DC rating on that SetB scale.

cry characteristics.

Three subsets of Set B scales are discernible in Table 14. The first subset is comprised of scale B1 (unsympathetic), which was typically associated with cries lacking the characteristics represented by high DC ratings on the Set A scales. For example, with the exception of A2 (arousing), A4 (agitated), and A10 (intentional), less than 55% of cries that evoked an unsympathetic reaction had high DC ratings on the remaining Set A scales.

The second subgroup is comprised of B2 (distressed), B3 (anxious), B4 (agitated), B6 (guilty) and B10 (rejected). In contrast to B1, all of these reactions were typically associated with cries having the characteristics represented by high DC ratings on

all of the Set A scales.

The third subgroup is comprised of B5 (controlled), B7 (resentful), B8 (annoyed) and B9 (angry). These scales all have a relatively low proportion of cries with high ratings on certain scales. Specifically, B5 is low on A6 (heavy), A7 (large), and A8 (thick), and also comparatively low on A1 (unpleasant) compared with the rest of the Set B scales, except B1. B7 is low on A6 (heavy). B8 is low on A6 (heavy), A7 (large) and also A9 (important). And B9 is low on A6 (heavy), A8 (thick) and also A9 (important) and A10 (intentional). These results suggest that the reactions associated with various degrees of annoyance/anger were commonly associated with "quieter" or less "potent" crying (not heavy, large, or thick) that were considered not important, as well as with cries that were "potent" and considered important.

ADC cry categories. The cross-tabulations do not show the interactions between the scales within scale Set A. To obtain a more detailed description of the cry characteristics associated with the Set B reactions, each cry has been classified into one of 16 categories on the basis of their DC ratings on four Set A scales (henceforth referred to as the ADC scales): A1 (not unpleasant-unpleasant), A2 (not arousing-arousing), A5 (not strong-strong) and A9 (not important-important). Two of these scales (A1 and A2) were selected from F1 (Affect) because both pleasure and arousal have consistently emerged as two independent dimensions of affect (Russell, 1978), and also appear from the factor analysis to represent different factors (see Table 12). The remaining two scales (A5, A9) were selected on the basis of face validity to represent F2

(Potency) and F3 (Evaluation) respectively.

The relationships between the four ADC scales is shown by the breakdown at the top of Table 15, where each cry category is labelled with a letter preceded by a number referring to the level of the breakdown. The sign (+ or -) indicates whether the DC rating was 1 (+) or 2 (-), and identifies the appropriate ADC scale label. The number under the sign specifies the number of cries in the category. For example, level 1 shows the breakdown of scale A1 into two categories (1a and 1b), level 2 shows the cross-tabulation of scales A1 and A2, producing four categories (2a, 2b, 2c, 2d), and so on.

Table 15

Frequency of SetB Ratings (DC = 2) in each ADC Category: Home Phase.

Scale		ADC Category																Total	
A1	NOT UNPLEASANT(+) UNPLEASANT(-)					1a + 48										1b - 50		+ 48	- 50
A2	NOT AROUSING(+) AROUSING(-)			2a + 19				2b - 29				2c + 2				2d - 48		21	77
A5	NOT STRONG(+) STRONG(-)	3a + 17		3b - 2		3c + 16		3d - 13		3e + 2		3f - 0		3g + 7		3h - 41		42	56
A9	NOT IMPORTANT(+) IMPORTANT(-)	4a + 13	4b - 4	4c + 1	4d - 1	4e + 5	4f - 11	4g + 2	4h - 11	4i + 1	4j - 1	4k + 0	4l - 0	4m + 1	4n - 6	4o + 9	4p - 32	32	66
B1	UNSYMPATHETIC column %	4 31				1 20			1 9						1 17	3 33	3 9	85	13
B2	DISTRESSED column %	1 8	1 25						3 27						2 33	3 33	22 69	66	32
B3	ANXIOUS column %	3 23	1 25				2 18	1 50	4 36					1 100		5 56	20 63	61	37
B4	AGITATED column %	3 23							3 27	1 100				1 100	1 17	6 67	21 66	62	36
B5	CONTROLLED column %	1 8	1 25			1 20	1 9		5 45					1 100	1 17	4 44	9 28	74	24
B6	GUILTY column %										1 100			1 100		3 33	6 19	87	11
B7	RESENTFUL column %					1 20	1 9		2 18	1 100				1 100	1 17	4 44	8 25	79	19
B8	ANNOYED column %	3 23				2 40			2 18	1 100				1 100	1 17	5 56	10 31	73	25
B9	ANGRY column %	1 8							1 9					1 100		6 67	5 16	84	14
B10	REJECTED column %								1 9							1 11	7 22	89	9

Category 1a contains 48 cries that have DC ratings of 1 on scale A1; that is, they are not unpleasant (+). Category 1b contains 50 cries with DC ratings of 2 on scale A1; that is, they are unpleasant (-).

The total number of cries with DC ratings of 1 (+) or 2 (-) are shown for both the ADC and SetB scales in the right-most columns labelled "Total". The totals for the ADC scales show that whereas 77 of the cries were perceived as arousing and 66 were important, just 56 were strong and only 50 were unpleasant. The cross-tabulations of scales A1 and A2 suggest the cries tend to be arousing whether they are unpleasant (2d) or not (2b), whereas unpleasant cries are mostly arousing (2d). Few cries that are neither unpleasant nor arousing (2a) are strong (3b), and few cries that are unpleasant and arousing (2d) are not strong (3g). However, cries that are not unpleasant may be arousing regardless of whether they are strong (3d) or not (3c).

At level 3, most of the cries are accounted for by only four of the 8 categories (i.e., 3a, 3c, 3d, and 3h), and, except in 3a, most of the cries in these categories are "important". By level 4, only eight of the possible 16 categories contain more than one to two cries. A comparison of 3a with 3c, which differ only in arousal, 3c with 3d, which differ only in strength, and 3d with 3h, which differ only in unpleasantness, suggests that the importance of a cry is dependent more upon its arousing qualities than its strength or unpleasantness. Whereas unpleasant, arousing, strong cries (3h) tend to be considered important (4p), it is notable that nine of the 41 cries with these characteristics are not rated as important (4o).

The relationships between the cry characteristics and the mothers' affective reactions are shown in the lower portion of Table 15 which reports, for each Set B scale, the number of cries in each

ADC category with DC ratings of 2. These numbers are also reported as a percentage (col. %) of the total number of cries in that ADC category (4a-4p).

Two points emerge regarding the relationship between the ADC categories and the Set B responses. First, none of the 10 affective reactions are restricted to a particular ADC category. Even scales B6, B9, and B10, which have the most restricted range, describe cries in four, five, and three categories respectively. The remaining Set B scales describe cries in six categories or more. Second, most of the affective reactions are evoked by cries in just four categories: 4a, 4h, 4o, and 4p. The categories with the greatest proportion of cries on each scale are those where the cries are unpleasant, arousing, and strong, regardless of whether they are considered important (4p) or not (4o). However, cries need not necessarily be unpleasant to evoke negative reactions (see 4h) and negative reactions were even evoked by cries having the least negative or compelling characteristics (4a). Furthermore, even in category 4p, which accounted for a substantial proportion of the negative reactions on most of the Set B scales, less than 70% (9%-69%) of the cries (i.e., those that were unpleasant/arousing/strong/important) actually evoked a negative response on a particular scale. And the proportion of negative Set B reactions evoked by cries that were unpleasant/arousing/strong/not important (4o) was less that 68% (11%-67%).

ADC patterns for individual mothers. Differences in the proportions of cries in the cry categories 4a, 4h, 4o, and 4p on some of the Set B scales may be a reflection of differences between

mothers rather than an indication that certain cry characteristics are generally associated with particular affective reactions. This is demonstrated in Table 16, which shows the number of cries rated by each mother in each of the 16 cry categories. Differences between

Table 16

Cries Rated by each Mother in each ADC Category: Home Phase.

	ADC Category																
Mother	4a	4b	4c	4d	4e	4f	4g	4h	4i	4j	4k	4l	4m	4n	4o	4p	Total
M1								1								6	7
(P)								1								9	10
M2	4	1			1			1							2		9
(P)	4	1			1			1							2		10
M3						2		1						1	1	4	9
(P)						2		1						1	1	4	10
M4				1				4								2	7
(P)				1				6								3	10
M5					1	6								1			8
(P)					1	8								1			10
M6	2				1											6	9
(P)	2				1											7	10
M7	2	1			1									1		2	7
(P)	3	1			1									1		3	10
M8		1	1		1			2							2		7
(P)		1	1		1			3							3		10
M9	5						1								2	1	9
(P)	6						1								2	1	10
M10		1							1				1	1	2	3	9
(P)		1							1				1	1	2	3	10
M11						2	1	2		1						3	9
(P)						2	1	2		1						3	10
M12						1								2		5	8
(P)						1								3		6	10
NC	13	4	1	1	5	11	2	11	1	1	0	0	1	6	9	32	
NM	4	4	1	1	5	4	2	6	1	1	0	0	1	5	5	8	

Note. (P) = Proportion of cries out of 10 in each category.
NC = Number of cries in category.
NM = Number of mothers using category.

the mothers have emerged in three respects: (a) in the particular cry categories that describe their infant's cries, (b) in the number of cry categories that describe their infant's cries, and (c) in the number of cries from each infant in a particular cry category. Whilst only category 4p contains cries rated by more than half of the mothers, for all of the mothers, except M5, there are at least two

cries in category 3h (i.e., 4o/4p); that is, cries that are unpleasant, arousing, and strong.

It would seem from Table 16 that the pattern of distributions evident in Tables 12 and 13 do not represent the responses of a homogeneous group of mothers, but reflect the peculiarities of 12 individuals. This matter is followed up below.

Scale set responses of individual mothers. In order to examine the variation in responses from each mother and the variation of responses across all 12 mothers, mean (7-point) ratings were computed for each cry on each scale set. The use of mean factor-scale ratings is common in semantic differential studies (see Osgood et al., 1957). And although the four F1 scales (A1-A4) did not load on the same factor (see Table 12) the various possible combinations of the ratings on these scales do provide a continuum that ranges from positive to negative with respect to affective cry characterisitcs, thus justifying the use of mean F1 ratings. It is also acknowledged that the Set B scales, although loading on a single factor (see Table 12), do represent a variety of reactions. Thus, identical mean ratings for the Set B scales may represent quite different combinations of reactions. The means do, however, provide an indication of the degree to which positive or negative feelings were evoked by the cries, even if the exact nature of these reactions is obscured. The original data from which the means were computed are reported in Appendix J.

The distribution of the cries in terms of their mean ratings are shown in Figures 6-9 for scale sets F1, F2, F3, and Set B respectively. The labels of the scales comprising these scale sets

are shown in Table 12.

In Figures 6-9, a separate column is used for each mother, whose infant's cries are identified by numerals. Solid vertical lines indicate the range of mean scale ratings from each mother. The descriptions of the highest ratings (7.0) in each figure are provided by the right-most terms of the bipolar scales in Table 12.

A comparison of mothers' mean ratings in Figures 6-9 shows their infants' cries to differ considerably with respect to their highest, lowest, and range of mean ratings on each of the sets of scales, yet there is considerable overlap in ranges across most mothers. Although a few mothers have a rather limited range of mean ratings on some of the scale sets (e.g., F1: M1, M4, M5, M12; F2: M5; F3: M3, M4, M12; Set B: M4, M5) only three of the mothers (M4, M5, M12) show restricted ranges on more than one scale set. The wide range of mean ratings for the remaining nine mothers is of particular interest, for this demonstrates considerable variability in their infants' cries, and highlights one of the difficulties associated with the selection of a cry or cries typical or representative of a particular infant. Different random samples of single cries from each of these nine infants would lead to quite different conclusions regarding the nature and effects of the cries. Clearly, it would be inappropriate to simply use mean ratings of a random selection of cries from a particular infant to represent that infant's cries, or to simply select a single cry sample on the assumption that one cry is representative of an infant's cry repertoire.

DC response patterns of individual mothers. To examine the individual response patterns more closely, the frequencies of

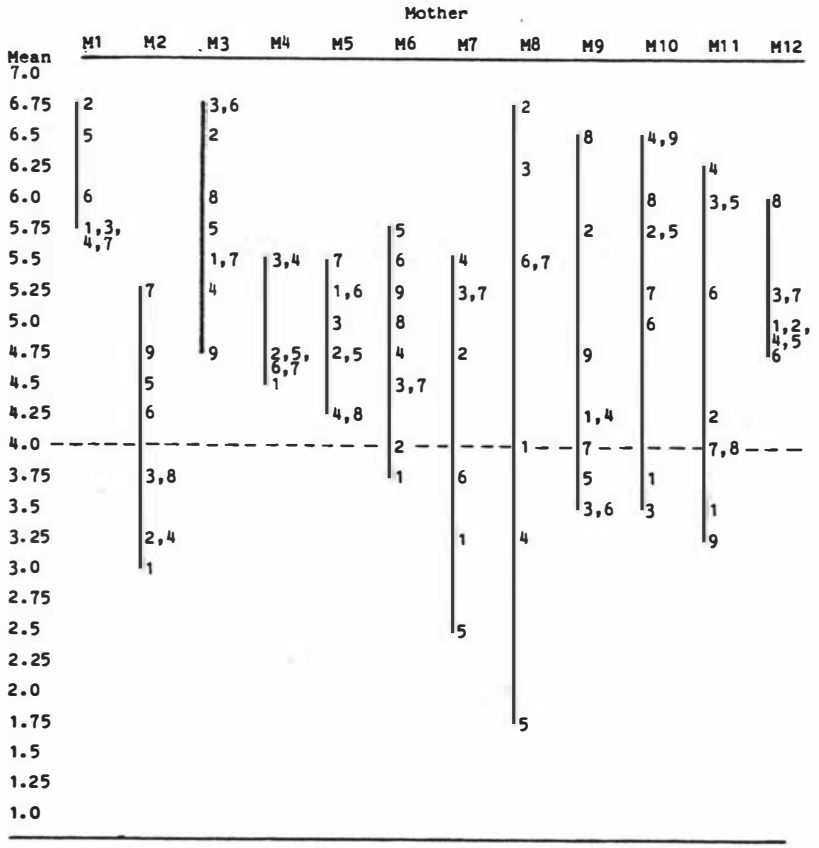

Figure 6. Mean F1 ratings for the cries rated by each mother: Home Phase.

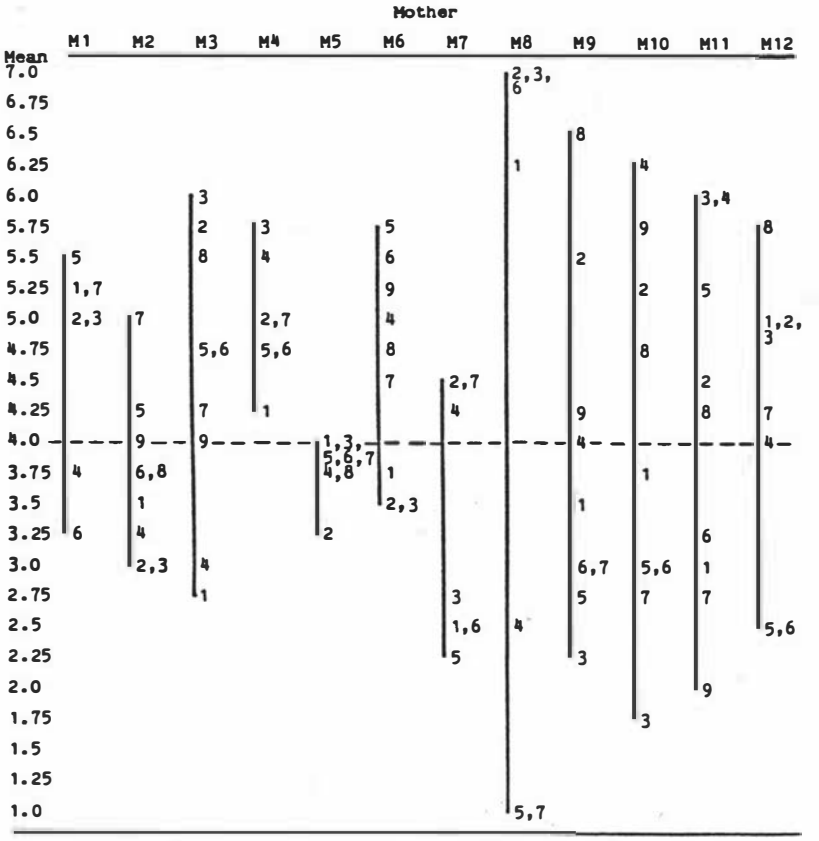

Figure 7. Mean F2 ratings for the cries rated by each mother: Home Phase.

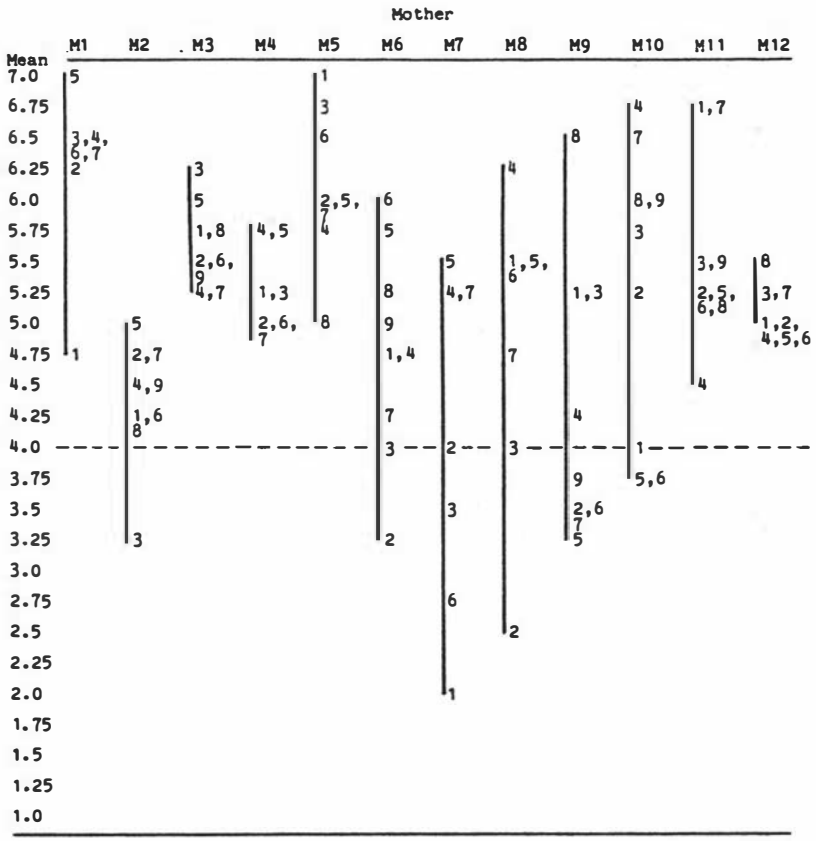

Figure 8. Mean F3 ratings for the cries rated by each mother: Home Phase.

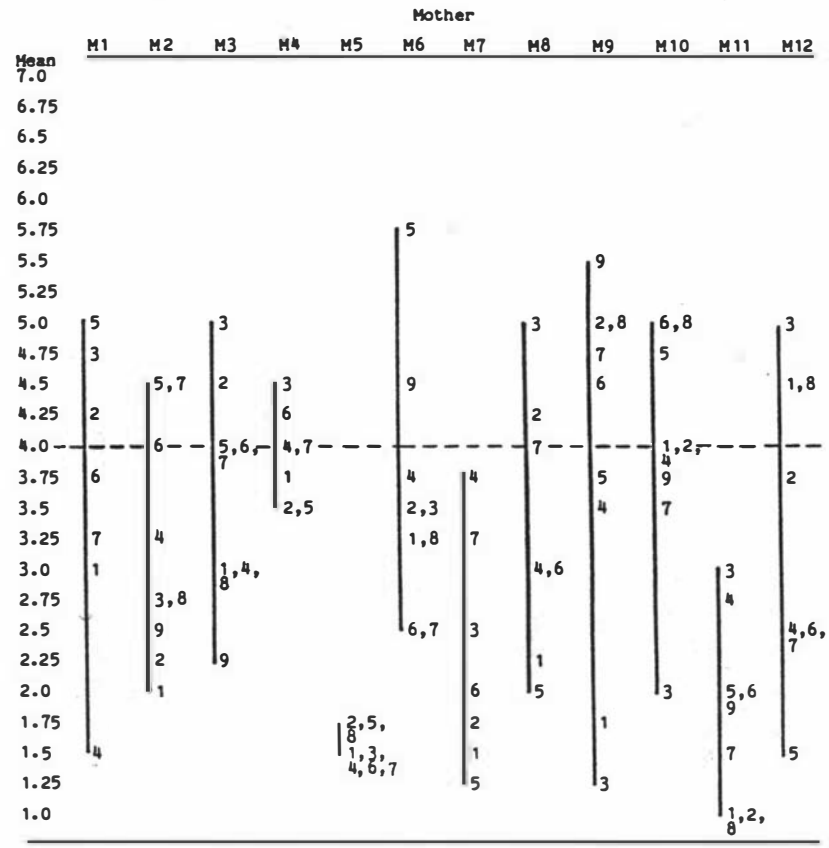

Figure 9. Mean SetB ratings for the cries rated by each mother: Home Phase.

responses by each mother on the Set A and Set B scales are shown in Table 17. Only the number of cries with DC ratings of 2 are reported, and, since the primary focus is on mothers' affective reactions to crying, the Set B scales are presented first.

With respect to the Set B scales (see Table 17), the mothers differ widely in their reactions to cries in terms of: (a) the total number of negative reactions reported, (b) the types of reactions reported, (c) the range of reactions reported, and (d) the frequency with which particular reactions are reported.

To facilitate comparisons of the 12 mothers, the data in Table 17 has been arranged according to the rank of each mother's total number of negative responses on the Set B scales. At one end of the continuum there is M5, who reported no negative reactions of any kind. At the other end there is M9, who experienced each type of reaction at least once, and for whom 40% of all reactions were negative. Three groups of mothers are discernible. The first group contains M5 and M11, who typically show few or no negative reactions (< 10%). The second group of six mothers (M8, M6, M7, M2, M4, M3) reported a greater range of reactions and tend to have experienced particular types of reactions to the cries. That is, these mothers experienced one or more particular types of reaction to over half of their infant's cries. For example, M8 frequently felt controlled, M7 typically felt unsympathetic, M4 frequently felt anxious and agitated, and M3 often felt anxious. The exceptions in this group are M2 and M6 who did not have a predominant type of reaction. M2 experienced each type except for feeling anxious and guilty, and M6 experienced each type except for feeling unsympathetic. The third group (M12, M1, M10, M9) is characterised by the relatively greater

Table 17

Frequency of each Mother's SetA and SetB Ratings (DC = 2): Home Phase.

			Mother													
		Scale	M5	M11	M8	M6	M7	M2	M4	M3	M12	M1	M10	M9	NC	NM	GH
		SetB															
	B1	UNSYMPATHETIC	0	0	1	0	6	1	0	0	0	0	1	4	13	5	1
	B2	DISTRESSED	0	1	0	3	2	2	2	4	6	6	2	4	32	10	2
	B3	ANXIOUS	0	3	0	2	0	0	5	6	4	4	6	7	37	8	6
	B4	AGITATED	0	1	1	2	2	2	4	4	3	5	7	5	36	11	4
	B5	CONTROLLED	0	0	4	1	0	3	1	3	2	5	3	2	24	9	2
	B6	GUILTY	0	1	0	1	0	0	1	1	2	0	2	3	11	7	0
	B7	RESENTFUL	0	0	0	2	0	3	1	1	3	2	5	2	19	8	1
	B8	ANNOYED	0	0	2	2	1	4	0	0	3	2	6	5	25	8	2
	B9	ANGRY	0	0	2	1	1	1	0	0	1	2	3	3	14	8	0
	B10	REJECTED	0	0	0	1	1	2	1	1	2	0	0	1	9	7	0
		Total	0	6	10	15	13	18	15	20	26	26	35	36			
		%	0.0	6.7	14.3	16.7	18.6	20.0	21.4	22.2	32.5	37.1	36.9	40.0			
		Rank	1	2	3	4	5	6	7	8	9	10	11	12			
		SetA															
	A1	UNPLEASANT	1	4	2	6	3	2	2	6	7	6	8	3	50	12	5
F1	A2	AROUSING	8	8	5	7	4	4	6	9	8	7	7	4	77	12	10
	A3	TENSE	4	5	2	7	3	5	7	6	7	7	8	2	63	12	9
	A4	AGITATED	6	5	4	3	5	5	7	9	8	7	5	8	72	12	11
		Total	19	22	13	23	15	16	22	30	30	27	28	17			
		%	59.4	61.1	46.4	63.9	53.6	44.4	78.6	83.3	93.8	96.4	87.5	47.2			
		Rank	5	6	2	7	4	1	8	9	11	12	10	3			
	A5	STRONG	0	6	5	6	2	3	7	6	5	7	5	4	56	11	8
F2	A6	HEAVY	0	3	4	4	2	0	4	6	6	4	3	2	38	10	5
	A7	LARGE	0	4	4	6	2	1	6	6	5	4	4	3	45	11	6
	A8	THICK	0	5	3	5	1	6	7	4	5	5	5	2	48	11	7
		Total	0	18	16	21	7	10	24	22	21	20	17	11			
		%	0.0	50.0	57.1	58.3	25.0	27.8	85.7	61.1	65.6	71.4	53.1	30.6			
		Rank	1	5	7	8	2	3	12	9	10	11	6	4			
	A9	IMPORTANT	7	8	3	6	4	2	7	8	8	7	5	1	66	12	9
F3	A10	INTENTIONAL	8	5	4	6	6	7	7	1	8	7	8	6	73	12	11
	A11	MEANINGFUL	8	9	4	6	3	7	7	9	8	6	7	6	80	12	11
	A12	SINCERE	8	8	0	5	4	6	7	9	8	6	8	3	72	11	10
		Total	31	30	11	23	17	22	28	27	32	26	28	16			
		%	96.9	83.3	39.3	63.9	60.7	61.1	100.0	75.0	100.0	92.9	87.5	44.4			
		Rank	10	7	1	5	3	4	12	6	12	9	8	2			
		NCR	8	9	7	9	7	9	7	9	8	7	9	9			

Note. NC = Total number of cries with DC ratings of 2 on the scale.
NM = Number of mothers who gave DC ratings of 2 on the scale.
GH = Number of mothers who gave DC ratings of 2 on the scale to 50% of cries.
NCR = Number of cries rated.

number of negative responses and a greater range of frequent reactions. Whilst all four of these mothers often felt anxious, two (M1, M12) were typically distressed, three (M1, M9, M10) were frequently agitated, one (M1) frequently felt controlled, two (M9, M10) were frequently annoyed, and one (M10) was occasionally resentful.

As well as demonstrating considerable differences between

mothers, Table 17 also reveals differences between the Set B scales, that is, in the types of reactions experienced by the mothers. Not only does the number of mothers reporting negative responses vary on each scale (see column NM), but for many of the scales a high proportion of the negative responses are made by a subset of mothers (see column GH). For example, the most frequent reaction reported was of feeling anxious (37 cries). However, only eight of the 12 mothers reported this feeling, and most of the responses (86.5%) came from just six mothers (M1, M3, M4, M9, M10, M12). The second most frequent reaction was of feeling agitated (36 cries), which was reported by 11 of the 12 mothers, with most of the responses (69.4%) coming from only five mothers (M1, M3, M4, M9, M10). And whilst 10 mothers reported feeling distressed, a high proportion (62.5%) of these responses were from four mothers (M1, M3, M9, M12). Similarly, a few mothers account for most responses on scales B1 (unsympathetic), B5 (controlled) and B8 (annoyed), and to a lesser extent, B7 (resentful). In contrast, the reactions described by scales B6 (guilty), B9 (angry) and B10 (rejected), reported by seven to eight mothers, are not typical or common for any of the mothers. Notably, an unsympathetic reaction (B1) was reported by only five mothers, and most of these responses (77%) were from just two mothers (M7, M9).

Table 17 also shows considerable differences between mothers in terms of their perceptions of their own infant's cry features as described on the Set A scales. Most of the mothers reported at least one cry with characteristics described by each of the 12 scales, with three exceptions: none of the cries rated by M5 had DC ratings of 2 on any of the F2 scales (A5-A8), no cries were considered sincere

(A12) by M8, and no cries were perceived as heavy (A6) by M2.

Considering the four classification scales (A1, A2, A5, A9), only five of the 12 mothers frequently perceived cries as unpleasant. Indeed, less than three cries were considered unpleasant by M2, M4, M5, and M8. In contrast, most of the mothers found more than half of their infant's cries to be arousing (except M2 and M9), strong (except M2, M5, M7 and M9), and important (except M2, M8 and M9).

When the the responses on Set A and Set B are compared (see Table 17), it would seem that the affective reactions evoked by the cries are independent of the perceived cry characteristics. The Spearman Rank Order Correlations between the ranks on Set B and those on F1, F2, and F3 are all non-significant. For Set B/F1, r_s = .441 (t = 1.55, df = 10, $p > .05$); for Set B/F2, r_s = .385 (t = 1.32, df = 10, $p > .05$); and for Set B/F3, r_s = .093 (t = .295, df = 10, $p > .05$). Indeed, most of the mothers (M9 excepted) reported cries with compelling or negative Set A characteristics that did not evoke negative reactions.

DC responses to individual cries. Table 17 only shows the number of responses on each scale by each mother. To examine the interactions between scales, the DC responses to all scales are shown for each mother and each cry in Table 18.

In Table 18, the mothers are ordered, as in Table 17, on the basis of the total number of negative reactions reported on the Set B scales. Four features of the Set B scale responses invite comment. First, for some of the mothers, certain columns are predominantly negative (i.e., DC = 2). As discussed in relation to Table 17, these would seem to indicate those mothers' characteristic reactions

Table 18

Mothers' Ratings (DC) of their Infants' Cries: Home Phase.

		SetA			SetB			SetA			SetB
	Cry	F1 A1-4	F2 A5-8	F3 A9-12	B1-10		Cry	F1 A1-4	F2 A5-8	F3 A9-12	B1-10
	1	1212	1111	2222	1111111111		1	1122	2112	2222	1111111111
	2	1212	1111	1222	1111111111		2	1222	2222	2222	1121211111
M5	3	1222	1111	2222	1111111111	M4	3	2222	2222	2222	1222121112
	4	1211	1111	2222	1111111111		4	2222	2222	2222	1122112111
	5	1222	1111	2222	1111111111		5	1222	2122	2222	1111111111
	6	1222	1111	2222	1111111111		6	1222	2122	2222	1222111111
	7	2222	1111	2222	1111111111		7	1222	2222	2222	1122111111
	8	1211	1111	2222	1111111111						
							1	2212	1111	2122	1111111111
	1	1211	2111	2222	1111111111		2	2222	2222	2122	1222211111
	2	1212	2112	2122	1111111111	M3	3	2222	2222	2122	1222121111
M11	3	2222	2222	2122	1122111111		4	1222	1111	2122	1111111111
	4	2222	2222	2121	1211111111		5	2212	2221	2122	1122111112
	5	2222	2222	2122	1121111111		6	2222	2221	2122	1222211111
	6	1222	1112	2222	1121111111		7	1222	1221	2122	1121212111
	7	1211	1111	2222	1111111111		8	2222	2222	1222	1221111111
	8	1221	2121	1222	1111111111		9	1212	2112	2122	1111111111
	9	2111	1111	2222	1111121111						
							1	2222	2222	2222	1222112211
	1	1112	2221	1221	1111111111		2	2222	2222	2222	1221121111
	2	2222	2222	1111	2111111121	M12	3	2222	2222	2222	1222222222
M8	3	2221	2222	1121	1112111221		4	2222	2121	2222	1211111111
	4	1211	2111	2221	1111211111		5	1222	1111	2222	1111111111
	5	1111	1111	2211	1111211111		6	2212	1211	2222	1111111111
	6	1212	2222	2121	1111211111		7	2222	1212	2222	1211111111
	7	1212	1111	1211	1111211211		8	2222	2222	2222	1222212212
	1	1111	1111	1222	1111111111		1	2222	2222	2211	1111111111
	2	1121	1111	1111	1111111111		2	2222	2212	2222	1222211111
M6	3	1221	1111	1111	1111111111	M1	3	1222	2122	2222	1222212221
	4	2221	2222	2221	1211111111		4	2222	2112	2222	1211111111
	5	2222	2222	2222	1222222222		5	2222	2222	2222	1212212221
	6	2222	2222	2222	1111111111		6	2222	2111	2222	1222211111
	7	2211	2121	2111	1111111111		7	2222	2221	2222	1222211111
	8	2221	2122	2222	1111111111						
	9	2222	2222	2222	1222112211		1	2121	1112	1212	1112112211
							2	2222	2122	1222	1122121111
	1	1111	1111	1111	2111111111	M10	3	1121	1111	2221	1121111111
	2	2212	2212	2211	2111111111		4	2222	2222	2222	1222111211
M7	3	1222	1111	1212	2111111111		5	2222	2111	1122	1122212221
	4	2222	2121	2222	2212111222		6	2211	1111	1212	1122222221
	5	1111	1111	2222	1111111111		7	2221	1112	2222	1111212211
	6	1112	1111	1211	2111111111		8	2222	2221	2222	2212112221
	7	2222	1221	2222	2212111111		9	2222	2222	2222	1122111111
	1	1111	1111	1122	1112111111		1	1112	1111	1222	1111111111
	2	1122	1112	1222	1111111111		2	2222	2222	1121	2222222221
M2	3	1122	1112	1211	1111211111	M9	3	1112	1111	1222	1111111111
	4	1111	1111	1222	1111111211		4	1212	2121	1221	1121111111
	5	1222	2112	2222	2211212212		5	1112	1111	1211	1121111111
	6	1221	1112	1221	1111112211		6	1111	1111	1221	2122111211
	7	2222	2122	1222	1112212222		7	1112	1111	1111	2222111221
	8	1111	1111	2111	1211111111		8	2222	2222	2222	1222121212
	9	2212	2112	1222	1111111111		9	2212	2111	1111	2222222221

towards their infant's cries. Second, certain of the rows are predominantly negative, suggesting that these cries are particularly aversive. Third, there is considerable variation between mothers in the distribution of negative responses across the cries. For example, although the total number of negative responses was relatively low for mothers M8 and M11, these were spread over five of nine cries for M11 and six of seven cries for M8. In contrast, M6 reported a greater number of negative reactions than either M8 or

M11, but these reactions were evoked by only three of nine cries. At the other end of the scale, even M9, who had the greatest number of negative Set B ratings, reported only one negative Set B response for two cries, and none for two other cries. Indeed, only M10 did not have at least one cry that did not elicit a negative Set B reaction. And fourth, none of the mothers showed consistent patterns of reacting. That is, the combinations of reactions vary considerably from cry to cry.

No pattern clearly emerges from a comparison of the Set A and Set B responses in Table 18. Even cries with identical Set B reactions from a particular mother have totally different Set A descriptions, for example (cry labels in parentheses): M1 (2, 6, 7), M7 (1, 2, 3, 9), M8 (4, 5, 6), M9 (2, 9), M11 (5, 6), M12 (4, 7). And cries with identical descriptions on Set A evoked different Set B reactions, for example: M4 (3, 4), M4 (5, 6), M6 (5, 6, 9), M10 (4, 9), M12 (1, 2, 3, 8). It may be that the Set A scales are simply inadequate for describing the essential auditory features of the cries. An alternative explanation is that mothers' responses to cries may be influenced by their interpretations (attributions) and by the context of the crying regardless of how the cries sound.

To identify factors that may have influenced the mothers' Set B responses, each mother had been asked to answer two questions whenever she completed Set B ratings: (a) "Why do you think your infant is crying"?, and (b) "What is it about the crying that makes you feel this way"? The responses to each of these questions regarding causes and reasons are considered in turn.

Causes of crying. The perceived causes of the cries are shown in Table 19, where individual cries are identified by a numeral between 1 and 9. Spaces between numerals have been omitted for cries reported by the same mothers. In those cases where several possible causes were reported, the alternatives are indicated by placing the cries in parentheses. For example, M11 considered Cries 5, 7 and 8 to be due to hunger. Cries 1 and 2 were attributed to wet nappies or, possibly, hunger. Cries 3, 4, and 9 were attributed to wind pains, and Cry 6 occurred as the infant was being put down for a nap.

Although some of the causal categories in Table 19 are very similar (e.g., categories 7 and 8; 9, 10, and 11), and some are general rather than specific (e.g., categories 3, 12, and 13), all have been reported precisely because they do demonstrate a range of specificity.

The total number of cries in each causal category in Table 19 is shown in the column labelled NC. The most frequent cause of crying was hunger (42 cries), followed by wind (10 cries), being put down (9 cries), and wet (8 cries). For a number of mothers, several possible causes were reported for some cries, suggesting that the task of identifying the cause of the crying prior to intervention was to some extent guesswork.

The column labelled NM in Table 19 shows the number of mothers who reported a particular cause as the primary cause for one or more of their infant's cries. Most of the causes were reported by only one to three of the mothers, with hunger being the only cause reported by all 12 mothers. The second most common cause was "being put down" (eight mothers), followed by "wind" (five mothers). If second choices are also considered, "wet" (eight mothers) was also a common cause of crying.

Table 19

Perceived Cause of Crying of each Infant's Cries.

Cause	Mother												NC	NM
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12		
A. Hunger														
1. Hungry	467	148	134 78	134 57 (6)	134 567 8	1	5(7)	145 67	13	347 8 (25)	578 (12)	457	42	12
B. Minor Discomfort														
2. Wet	1	235 69	(6)	(45) (6)						(47)	12	(4)	8	3
3. Uncomfortable						(1)				29		3	3	2
4. Hot/Cold						2							1	1
5. Tired			9	6			123						5	3
C. Major Discomfort														
6. Wind (pain)	(3)		256			(5)	7		8		349	28	10	5
D. Emotional/Psychological														
7. Wants to be Held	2					5(2)				(6)		(2)	2	2
8. Wants to be suckled	3(2)												1	1
9. Wants company					2	9							2	2
10. Wants attention						4						6	2	2
11. Bored	5								5	56			4	3
12. Upset				2					4				2	2
13. Naughty							4						1	1
14. Being undressed						6							1	1
15. Being put-down		7				7	6	2	26	1	6	1	9	8
Don't Know						3			79				3	2
Not specified						8		3					2	2
Number of cries	7	9	9	7	8	9	7	7	9	9	9	8	98	12

Note. NC = Number of cries in category.
NM = Number of mothers using category.

In order to examine more closely the relationships between the causes, effects, and cry characteristics, the causes listed in Table 19 have been assigned to one the four causal categories reported by Lounsbury and Bates (1982). The correspondence between the Lounsbury and Bates (1982) causal categories and the 15 causes identified in the present study (shown in parentheses) are: Hunger (cause 1), Minor Physical Discomfort (causes 2-5), Major Physical Discomfort

(cause 6), and Emotional/psychological (causes 7-15). For the present study, a further two categories, Don't Know and Not Specified, have been added.

An alternative classification scheme that could have been used, and which is of theoretical significance to the present study, is that proposed by Kirkland (1979). In that scheme, the cries could be classified in terms of three attributional dimensions: internal/external, stable/unstable, and global/specific. Although these three dimensions give rise to eight possible categories, only two are required to account for the 15 causes reported in Table 19: internal/unstable/global (causes 1-6), and internal/unstable/specific (causes 7-15). However, the Lounsbury and Bates (1982) categories were selected for the present study because they offer the advantage of retaining more information while allowing the possibility of collapsing categories to achieve the attributional classifications mentioned by Kirkland (1979).

In fact the terms used by the mothers to describe the causes suggest a third set of categories, based on their referents: the condition of the infant (causes 1-6, 11, 12); demands upon the mother (causes 7-10, 13); and the situation (causes 14, 15).

Relationships between ratings and causes. Considering only cries with DC ratings of 2, the relationships between the causes of the crying, the cry characteristics (ADC scales) and the effects of the cries (Set B scales) are shown in Table 20. Differences in the effects of the cries in the four causal categories on both the ADC and the Set B scales are shown by the percentages of cries that evoked a response (% NC).

Table 20

Frequency of Responses (DC = 2) on the ADC and SetB Scales in each Causal Category.

Cause		Scale A1	A2	A5	A9	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	NC	NM
A. Hunger																	
1. Hungry	Total	15	32	18	33	1	11	11	9	8	1	4	5	1	1	42	12
	% NC	36	76	43	79	2	26	26	21	19	26	10	12	2	2		
B. Minor discomfort																	
2. Wet		2	6	5	4	1	1			2		2	2		1	8	6
3. Uncomfortable		3	3	3	2		1	3	3	1	2	1	1	1	1	3	2
4. Hot/cold																1	1
5. Tired		1	4	3	3	3	1	1	1							5	3
	Total	6	13	11	9	4	3	4	4	3	4	1	2	1	2	17	
	% NC	35	77	65	53	24	18	24	24	18	24	6	12	6	12		
C. Major discomfort																	
6. Wind (pain)	Total	10	9	8	10	1	7	7	7	3	4	1	2		3	10	5
	% NC	100	90	80	100	10	70	70	70	30	40	10	20		30		
D. Emotional/Psychological																	
7. Wants to be held		2	1	2	2		2	2	2	2	1	1	1	1	1	2	2
8. Wants to suckle			1	1	1		1	1	1	1		1	1	1		1	1
9. Wants company		1	2	1	1		1	1	1			1	1			2	2
10. Wants attention		2	2	1	2		1									2	2
11. Bored		3	3	2	1		1	3	3	3	1	3	3	3		4	3
12. Upset			2	2	1			2		1						2	2
13. Naughty		1	1	1	1	1	1		1				1	1	1	1	1
14. Being Undressed		1	1	1	1	1						1					
15. Being put down		6	6	5	3	4	2	4	5	2	1	4	5	3	1	9	8
	Total	16	19	16	13	5	9	13	13	9	3	10	12	9	3	24	
	% NC	67	79	67	54	21	38	54	54	38	13	42	50	38	13		
Don't know		1	2	1		2	2	2	2	1	1	1	2	2		3	2
Not specified		2	2	2	1				1				1	1		2	2
Overall total		50	77	56	66	13	32	37	36	24	11	19	25	14	9	98	12

Note. NC = Number of cries in category.
NM = Number of mothers using category.

The distributions on the ADC scales indicate that the Hunger cries tended to be arousing and important, but not necessarily unpleasant or strong. The cries caused by Minor Discomfort were generally arousing and strong but frequently not unpleasant or important. The Major Discomfort cries were typically unpleasant, arousing, strong, and important. And the Emotional/psychological cries, whilst generally unpleasant, arousing, and strong, were not necessarily important.

For the Set B scales, the proportion of cries perceived negatively was relatively low (< 26%) for both the Hunger and Minor Discomfort categories, relatively high (70%) on specific scales (B2, B3, B4) for the Major Discomfort catgory, and moderately high (38%-54%) on most of the scales (B2, B3, B4, B5, B7, B8, B9) for the Emotional/psychological category. In the Hunger category, the most common feelings (26%) were distressed, anxious, and guilty (B2, B3, B6). In the Minor Discomfort category the main responses (24%) were unsympathetic, anxious, agitated, and guilty (B1, B3, B4, B6). And in the Major Discomfort category, a relatively high proportion of cries (70%) caused mothers to feel distressed, anxious and agitated (B2, B3, B4), and a moderate proportion made mothers feel controlled, guilty, and rejected (B5, B6, B10). Cries in the Emotional/psychological category caused a moderately high proportion of the mothers (38%-54%) to feel distressed, anxious, agitated, and controlled (B2, B3, B4, B5), but in contrast to the other three categories, also caused a similar proportion of mothers to feel resentful, annoyed, and angry (B7, B8, B9).

A high proportion of the cries for which causes were not known or not specified were described as unpleasant, arousing, and strong, but not important (A1, A2, A5, A9), and these cries caused mothers to feel distressed, anxious, agitated (B2, B3, B4), and also unsympathetic, annoyed, and angry (B1, B8, B9). Since there are only five cries in this category, these results may be misleading. However they raise the possibility that not knowing the cause of crying may have important consequences regarding the effects on a mother.

Reasons for responses. The reasons given by the mothers for their Set B responses are shown in Table 21. In Table 21, the reasons given appear to have three major referents: the nature of the crying, the cause of the crying, and the mother. Within these broad and rather loose categories, the following more specific categories have been derived from the terms used by the mothers (enclosed in parentheses):

A. The Crying:

1. High intensity (sharp, strong, loud, intense, piercing, high-pitched, insistent),
2. Low intensity (not strong, quiet crying, mild, small, not agitated, not loud),
3. Persistent (persistent, keeps on crying, continual),
4. Important (important, must be answered, more frantic),
5. Not Important (not important, not serious, not distressed),

B. The Cause:

6. Hunger (hunger, wants a feed),
7. Minor Discomfort (over-tired, uncomfortable, warm, upset, needs rocking),
8. Major Discomfort (pain, wind),
9. Emotional (wants attention, grizzly),
10. Caregiver (not winded properly),

C. The Mother:

11. Knowing the cause (normal cry, familiar cry, recognise cry, not worried, knowing the cause, not distressed, not important, was expecting the cry, know the problem, know what's wrong, know the reason),
12. Not knowing the cause (not knowing, not sure,

couldn't understand why),

13. Rested (had a reasonable night's sleep),
14. Ineffective (continues to cry after I've done my best...),
15. Disrupted (was busy, woke me up, just put down/fed/changed, not expected to wake, not settling, its late, time of day, not due for feed),
16. Recurrent Difficulties (same problem every night, been feeding her constantly).

Several of these categories (2, 5, 11, 13) appear to provide reasons for the absence of negative Set B reponses to a number of the cries.

A point that must be made is that the assignment of the various reasons to categories was not as clear-cut as it may appear, for the referents are sometimes implied rather than explicit. For example, it is not certain whether terms like "upset" refer to physical or emotional factors. Nor is it clear whether, in statements like "I know it is a hunger cry", it is the knowing, the cause, the expected outcome, or some other characteristic that is actually important: all may be important. However, the use of the categories does serve to demonstrate that a wide range of factors influenced the mothers' responses. Indeed, only 13 of the 98 cries had Set B responses attributed to the cause of the crying (reasons 6-10). In comparison, 30 sets of responses were attributed to the nature of the crying (reasons 1-5); and 44 sets of responses were attributed to factors associated with the mothers (reasons 11-16). These findings strongly suggest that it would be inappropriate to focus only one a single factor such the cause or the sound of a cry when investigating the effects of crying on mothers; the context and consequences of the

Table 21

Mothers' Reasons for the SetB Responses to each of their Infant's Cries.

Reason	Mother												NC	NM
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12		
A. The Crying														
1. High intensity	23		23	134 56				(3)		(4) 9			10	4
2. Low intensity		123 89							3	6		5	8	4
3. Persistent				7			4	25	(9)	24	4		7	5
4. Important	5		6										2	2
5. Not important			9							1(8)		6	3	3
B. The Cause														
6. Hunger	467		(14) (8)					6			8	4	6	4
7. Minor Discomfort			(9)			36	3		8				4	3
8. Major Discomfort			(5)										(1)	0
9. Emotional/Psychol.										35			2	1
10. Caregiver											9		1	1
C. The Mother														
11. Knowing the cause			145 8	2	1-8	2	1	1	1(3)		12 (6)7		20	8
12. Not knowing the cause								3	5		35	8	5	4
13. Rested								4					1	1
14. Ineffective						(5)			9				1	1
15. Disrupted		57	7			7(5)	67	7	267	78	6	13	15	9
16. Recurrent difficulties						59							2	1
D. Not specified	1	46				148	25		4			27	11	6

Note. NC = Number of cries in category.
NM = Number of mothers using category.

crying in terms of the disruption it causes are also important considerations.

Relationships between ratings and reasons. The relationships between the ADC and Set B scales and the reasons for the Set B responses are shown in Table 22. Most noticeable is the finding that whereas 42 cries were attributed to hunger (see Table 19), hunger was cited only six times as the reason for the Set B responses. Specific causes such as hunger, minor discomfort, major discomfort, and so on

(reasons 6-10), mainly evoked feelings of being distressed, anxious, agitated, and controlled (B2, B3, B4, B5). The greatest range and number of Set B responses, however, were evoked by cries that were intense, persistent, or disruptive (reasons 1, 3, and 15). Intense cries mainly evoked feelings of being distressed, anxious, and agitated (B2, B3, B4), and to a lesser extent, controlled, guilty and resentful (B5, B6, B7). Feelings of being distressed, anxious, and agitated (B2, B3, B4) were also elicited by cries that were persistent or disruptive. Disruptive cries also accounted for a substantial proportion of the reports of feeling unsympathetic, controlled, resentful, annoyed, and angry (B1, B5, B7, B8, B9). Both the persistent and the disruptive cries were considered unpleasant and arousing; persistent cries were generally strong and important, whereas this was not necessarily the case for disruptive cries.

The most frequent (20 cries) and common (eight mothers) reason for the Set B responses was "knowing the cause". In contrast to the previous categories (i.e., Hunger, High Intensity, Persistent, and Disrupted), this category actually accounts for the absence of reaction to many of the cries, illustrating that not all cries evoked negative affective reactions.

The findings illustrated in Table 22 are summarised in Table 23, where the 16 Reason categories have been collapsed into six major categories on the basis of face validity. These categories have been labelled as follows: High intensity crying (high intensity, persistent, important), Low intensity crying (low intensity, not important), Specific cause (Hunger, Minor Discomfort, Major Discomfort, Emotional, Caregiver), Knowing the cause, Disrupted, and Ineffective (Not knowing the cause, Ineffective, Recurrent

Table 22

Frequency of ADC and SetB Ratings (DC = 2) in each Reason Category.

	Scale															
Reason	A1	A2	A5	A9	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	NC	NM
A. The Crying																
1. High intensity	6	9	10	10		6	8	8	3	2	2	1	1	1	10	4
2. Low intensity	2	3	1	2		1	1	2	2	1	1	1	1		8	4
3. Persistent	5	6	6	5	2	3	3	4	1	1		2	2	1	7	5
4. Important	2	2	2	2		2	1	2	2		1	1	1		2	2
5. Not important	2	2	1	2				1			1	1			3	3
B. The Cause																
6. Hunger	4	6	6	5		4	2	2	3						6	4
7. Minor Discomfort	2	4	2	2	1	1	1	1		1		1		1	4	3
8. Major Discomfort															(1)	
9. Emotional	1	1	1	1			2	1	1		1	1	1		2	1
10. Caregiver	1			1						1					1	1
C. The Mother																
11. Knowing the cause	4	16	6	14	1	1	3	1	1					1	20	8
12. Not knowing cause	4	4	4	3		1	4	3	1		1	2	1	1	5	4
13. Rested		1	1	1					1						1	1
14. Ineffective	1	1	1		1	1	1	1	1	1	1	1	1		1	1
15. Disrupted	8	12	7	9	7	7	7	8	7	2	8	10	5	3	15	9
16. Recurrent diff.	2	2	2	2		2	2	2	1	1	2	2	1	1	2	1
Not specified	6	8	6	7	1	3	2			1	1	2			11	6
Total	50	77	56	66	13	32	37	36	24	11	19	25	14	9	98	12

Note. NC = Number of cries in category.
NM = Number of mothers using category.

Table 23

Proportion of Cries in each Reason Category with High DC Ratings (DC = 2) on Particular SetB Scales.

	Scale										
Reason Category	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	NC
High Intensity	2	11	12	14	6	3	3	4	4	2	19
%NC	11	58	63	74	32	16	16	21	21	11	
Low intensity		1	1	3	2	1	2	2	1		11
%NC		9	9	27	18	9	18	18	9		
Specific Cause	1	5	5	4	4	2	1	2	1	1	13
%NC	8	39	39	31	31	15	8	15	8	8	
Knowing Cause	1	1	3	1	1					1	20
%NC	5	5	15	5	5					5	
Disrupted	7	7	7	8	7	2	8	10	5	3	15
%NC	47	47	47	53	47	13	53	67	33	21	
Ineffective	1	4	7	6	4	2	4	5	3	2	9
%NC	11	44	78	67	44	22	44	56	33	22	
Not specified	1	3	2			1	1	2			11
%NC	9	27	18			9	9	18			
Total	13	32	37	36	24	11	19	25	14	9	98

Note. NC = Number of cries in category.

difficulty). A seventh category, Not Specified, accounts for the remaining few (unspecified) cries.

Relationships between causes and reasons. The purpose of forming the major reason categories shown in Table 23 was to facilitate comparisons of the relationships between the causes of the cries, the effects of the cries, and the reasons given for the effects. Considering only those cries that evoked a negative Set B response, these relationships are shown in Table 24.

An important point illustrated by Table 24 is that within each of the four causal categories, few cries elicited responses attributed specifically to those causes (Specific Cause): only 7 of 42 in Hunger, 1 of 17 in Minor Discomfort, 2 of 10 in Major Discomfort, and 2 of 24 in Emotion.

Also important are the reaction patterns evident for the various categories in Table 24. For example, cries that were of high intensity and caused by hunger, minor discomfort, or major discomfort, or due to hunger and attributed to a specific cause, tended to make mothers feel distressed, anxious, and agitated (B2, B3, B4), but neither unsympathetic, resentful, annoyed, nor angry (B1, B7, B8, B9). In contrast, cries with these same causes but which disrupted the mother evoked all of these responses, as did cries with emotional/psychological causes, regardless of the reason (except "know the cause"). Put another way, feelings of being unsympathetic, resentful, annoyed, and angry (B1, B7, B8, B9) were generally associated with feelings of being distressed, anxious, and agitated (B2, B3, B4), and also of feeling controlled, guilty, and anxious (B5, B6, B10). Such reactions (i.e. unsympathetic,

Table 24

Relationships between Causes of Crying, SetB responses, and Reasons.

	Scale										
Cause / Reason	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	NC
A. Hunger											
High intensity		3	5	5	1	2	1	1		1	8
Low intensity		1		1							4
Specific Cause		4	3	2	3						7
Knowing the cause		1	1								13
Disrupted	1	1	1	1	4		3	3	1		4
Ineffective			1		1						2
Not Specified		1						1			4
B. Minor Discomfort											
High intensity		1	3	3		1					3
Low intensity					1						4
Specific Cause	1										1
Knowing the Cause	1										4
Disrupted	1	2	1	1	1	1	2	2	1	2	2
Ineffective											0
Not Specified	1						1	1			3
C. Major Discomfort											
High intensity		3	2	2	2						3
Low Intensity											
Specific Cause		1	1	1		2		1		1	2
Knowing the Cause			1	1						1	1
Disrupted	1	1		1							1
Ineffective		1	2	2	1		1	1		1	2
Not Specified		1	1			1					1
D. Emotional/Psychological											
High intensity	2	4	2	4	3		2	3	4	1	5
Low intensity			1	2	1	1	2	2	1		3
Specific Cause			1	1	1		1	1	1		2
Knowing the Cause			1		1						2
Disrupted	3	2	4	4	2	1	3	4	2	1	7
Ineffective		2	3	2	1	1	2	2	1	1	3
Not Specified		1	1								2
E. Not Specified											
Specific Cause											1
Not specified											1
Disrupted		1	1	1	1			1	1		2
Ineffective	1	1	1	2	1	1	1	2	2		2
Total	13	32	37	36	24	11	19	25	14	9	98

Note. NC = Number of cries in category.

resentful, annoyed, angry) were generally not evoked to any extent by cries in any of the reason categories except "Disrupted", unless the cause was emotional/psychological. Clearly, both cause and consequence have an important effect on mothers responses to crying.

EXPERIMENTAL PHASE

Relationships between scales. To examine the relationships between the Set A and Set B scales, the ratings on all 22 scales were submitted to a factor analysis using the same procedures as for the data from the Home Phase. The resulting rotated factor matrix is shown in Table 25.

Three factors emerged from the analysis. These factors will be referred to as Fac 1, Fac 2 and Fac 3, to distinguish them from the

Table 25

Factor Loadings for the SetA and SetB Scales: Experimental Phase.

		SetA	FAC 1	FAC 2	FAC 3	COMMUNALITY
	A1	PLEASANT-UNPLEASANT	0.54433	0.42022	0.35098	0.59606
F1	A2	SOOTHING-AROUSING	0.50286	0.20347	0.65477	0.72299
	A3	RELAXED-TENSE	0.66220	0.33870	0.46491	0.76937
	A4	CALM-AGITATED	0.61049	0.31993	0.21610	0.52175
	A5	WEAK-STRONG	0.85422	0.23418	0.25462	0.84936
F2	A6	LIGHT-HEAVY	0.87782	0.20771	0.13153	0.83102
	A7	SMALL-LARGE	0.87190	0.19780	0.12312	0.81449
	A8	THIN-THICK	0.77920	0.08725	0.12100	0.62940
	A9	UNIMPORTANT-IMPORTANT	0.67814	0.11010	0.48787	0.71002
F3	A10	UNINTENTIONAL-INTENTIONAL	0.40928	0.16796	0.22810	0.24775
	A11	MEANINGLESS-MEANINGFUL	0.52863	0.13820	0.66015	0.73435
	A12	INSINCERE-SINCERE	0.33364	0.16765	0.75186	0.70471
		SetB				
	B1	SYMPATHETIC -UNSYMPATHETIC	-0.13538	0.03927	-0.76087	0.59880
	B2	NOT DISTRESSED-DISTRESSED	0.35894	0.74765	0.24412	0.74742
	B3	NOT ANXIOUS-ANXIOUS	0.22043	0.74294	0.25187	0.66398
	B4	CALM-AGITATED	0.30533	0.71123	0.23109	0.65247
	B5	IN CONTROL-CONTROLLED	0.10530	0.66847	0.36084	0.58814
	B6	NOT GUILTY-GUILTY	0.09039	0.52573	0.40022	0.44474
	B7	NOT RESENTFUL-RESENTFUL	0.14231	0.79244	-0.04524	0.65026
	B8	NOT ANNOYED-ANNOYED	0.07079	0.79531	-0.08297	0.64442
	B9	NOT ANGRY-ANGRY	0.15230	0.80710	-0.06511	0.67885
	B10	ACCEPTED-REJECTED	0.26273	0.65792	0.07982	0.50825
		EIGENVALUE	10.05709	2.92361	1.32789	
		PCT OF VAR	70.3	20.4	9.3	
		CUM PCT	70.3	90.7	100.0	

factors reported in Table 12. Fac 1 represents all of the Set A scales except A12, Fac 2 represents A1 and all of the Set B scales except B1, and Fac 3 represents A2 and A3 (F1), A9, A11 and A12 (F3), and B1 and B6 (Set B). Thus Fac 1 describes the cries in terms of their Set A characteristics, Fac 2 relates to the unpleasantness of the cries and to the negative affective reactions evoked by the cries, and Fac 3 relates certain cry qualities (arousing, tense, important, meaningful and sincere) to feelings of sympathy and guilt.

The factor analysis failed to uncover the three independent sets of Set A factor scales (F1, F2, F3) found previously (Brennan & Kirkland, 1982), but there is a resemblance between the factor structures in Table 12 and Table 25; Fac 1 corresponds to Factor 2, Fac 2 corresponds to Factor 1, and Fac 3 corresponds to Factor 3. As in Table 12, it would appear that the mothers' Set B responses are generally independent of the Set A responses, except for A1 (unpleasant). The one exception is B1 (sympathy), which in both Table 12 (see Factors 3 and 4) and Table 25 (see Fac 3) appears to be associated with feelings of guilt (B5) and cry characteristics that are arousing (A2), tense (A3), important (A9), meaningful (A11) and sincere (A12). A10, which did not load substantially on any of the five factors in Table 12, does load on Fac 2 in Table 25. The major difference between Table 12 and Table 25 then, is the presence in Table 25 of only three rather than five factors, which would seem to indicate that there is less variability in the relationships between scales than in Table 12.

Dichotomous rating categories. To examine cries which were perceived as having negative affective characteristics and which evoked negative affective reactions, the 7-point scales have been collapsed into two categories using the same criteria as for the Home Phase data (i.e., 1, 2, 3, 4 = 1; 5, 6, 7 = 2). The frequency distributions on the 7-point scales and the proportions in the dichotomous categories are shown in Table 26.

Table 26

Frequency Distributions across the Seven-point and Dichotomous (DC) Categories of the Set A and Set B Scales: Experimental Phase.

			Seven-point Categories							DC Categories		
			1	2	3	4	5	6	7	1	2	S
		SetA										
F1	A1	PLEASANT-UNPLEASANT	4	6	11	20	28	17	12	41	57	+ 7
	A2	SOOTHING-AROUSING	2	6	8	14	31	15	22	30	68	- 9
	A3	RELAXED-TENSE	4	3	13	20	30	15	13	40	58	- 5
	A4	CALM-AGITATED	2	6	15	14	35	12	14	37	61	-11
F2	A5	WEAK-STRONG	6	12	22	14	21	12	11	54	44	-12
	A6	LIGHT-HEAVY	10	12	26	12	21	8	9	60	38	0
	A7	SMALL-LARGE	10	19	16	13	22	7	11	58	40	- 5
	A8	THIN-THICK	7	14	22	17	22	10	6	60	38	-10
F3	A9	UNIMPORTANT-IMPORTANT	8	10	11	6	30	16	17	35	63	- 3
	A10	UNINTENTIONAL-INTENTIONAL	10	11	4	9	37	15	12	34	64	- 9
	A11	MEANINGLESS-MEANINGFUL	3	8	7	6	35	17	22	24	74	- 6
	A12	INSINCERE-SINCERE	2	7	10	20	34	12	13	39	59	-13
		SetB										
	B1	SYMPATHETIC-UNSYMPATHETIC	22	16	33	13	7	5	2	84	14	+ 1
	B2	NOT DISTRESSED-DISTRESSED	32	14	9	14	17	7	5	69	29	- 3
	B3	NOT ANXIOUS-ANXIOUS	33	9	9	11	23	7	6	62	36	- 1
	B4	CALM-AGITATED	20	18	20	16	13	4	7	74	24	-12
	B5	IN CONTROL-CONTROLLED	23	19	17	17	9	9	4	76	22	- 2
	B6	NOT GUILTY-GUILTY	37	15	15	19	9	1	2	86	12	+ 1
	B7	NOT RESENTFUL-RESENTFUL	39	10	19	21	7	1	1	89	9	-10
	B8	NOT ANNOYED-ANNOYED	38	23	15	12	8	1	1	88	10	-15
	B9	NOT ANGRY-ANGRY	43	14	13	18	9	0	1	88	10	- 4
	B10	ACCEPTED-REJECTED	14	10	11	47	12	4	0	82	16	+ 7

Note: S = change from Home Phase in the number of cries in DC category 2.
N = 98

A feature of the distributions on the 7-point scales (see Table 26) is that the bimodal distributions of the Set B scales evident in Table 13 have diminished considerably. And compared to Table 13, the distributions in Table 26 are more negatively skewed for both Set A and Set B.

The effects of the negative skew are reflected in the changes in

the proportion of cries in the DC rating of 2 in Table 26 (see column S). Compared with Table 13, the proportion of cries with DC ratings of 2 is lower for most of the scales, being higher for only four (A1, B1, B6, B10). And for several of these scales (e.g., A2, A4, A5, A8, A10, A12, B4, B7, B8) the change was in the order of 9-15 cries. Thus in the Experimental Phase, considerably fewer cries were arousing, agitated, strong, thick, intentional or sincere; or made the mothers feel agitated, resentful or annoyed. It remains to be seen whether these differences reflect a general shift in the ratings across mothers, or a marked shift by a few mothers.

In spite of the shift in the distributions, the relative proportions of cries with DC ratings of 2 are similar in Table 13 and Table 26 for most scales, the exceptions being B7, B8 and B10. In both tables, more cries are arousing than are important or unpleasant, and even fewer are strong. The most frequently reported reactions are anxious, distressed, agitated and controlled, with relatively few reports of guilt or anger.

Cross-tabulations of Set A and Set B responses (DC = 2). The relationships between the Set A and Set B scales for cries with high DC ratings (DC = 2) are shown in Table 27.

Two features stand out. First, there is a strong similarity to Table 14 with respect to the subgroups of Set B scales characterised by the relatively low proportions of cries (< 60%) on particular Set A scales. Again, one subgroup is comprised of B1 (unsympathetic). Typically, a low proportion of cries that elicited this reaction have high DC ratings on any of the Set A scales. Indeed, there has been a marked drop in these proportions on all of the Set A scales (0%-29%

Table 27

Proportion of Cries with High DC Ratings (DC = 2) on both SetA and SetB Scales: Experimental Phase.

	SetA												
SetB	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	NC
B1	4	1		4		1	1			3	2	1	14
%NC	29		7	29		7	7			21	14	7	
B2	28	29	28	26	21	20	18	18	25	24	28	24	29
%NC	97	100	97	90	72	69	62	62	86	83	97	83	
B3	32	33	32	31	26	23	22	21	31	28	35	27	36
%NC	89	92	89	86	72	64	61	58	86	78	47	75	
B4	24	23	23	23	18	15	15	15	20	20	24	20	24
%NC	100	96	96	96	75	63	63	63	83	83	100	83	
B5	19	20	19	18	15	12	10	10	18	18	20	17	22
%NC	86	91	86	82	68	55	46	46	82	82	91	77	
B6	12	11	11	11	11	10	11	10	11	10	12	12	12
%NC	100	92	92	92	92	83	92	83	92	83	100	100	
B7	9	9	8	8	5	5	4	5	8	9	9	6	9
%NC	100	100	89	89	56	56	44	56	89	100	100	67	
B8	10	10	9	9	6	4	6	6	8	9	10	6	10
%NC	100	100	90	90	60	40	60	60	80	90	100	60	
B9	10	10	10	10	6	5	5	5	8	9	10	8	10
%NC	100	100	100	100	60	50	50	50	80	90	100	80	
B10	16	16	16	16	11	7	8	11	15	16	16	14	16
%NC	100	100	100	100	69	56	50	69	94	100	100	88	
Total	57	68	58	61	44	38	40	38	63	64	74	59	

Note. NC = Number of cries with a high DC rating on that SetB scale.

in the Experimental Phase compared to 31%-85% in the Home Phase).

A second subgroup is comprised of scales B2 (distressed), B4 (agitated), and B6 (guilty). Cries that evoked these reactions typically had high Set A ratings, although the proportion of cries with high ratings on F2 (A5-A8) is rather lower than in the Home Phase, and two scales (B3, B10) that previously belonged to this subgroup now have different Set A characteristics. For example, a much lower proportion of cries that made mothers feel anxious (B3) are thick (A8) or meaningful (A11). And of the cries that caused mothers to feel rejected (B10), a lower proportion are heavy (A6) or large (A7). In contrast, a very high proportion of the cries that evoked feelings of guilt (B6) have high DC ratings on all Set A scales.

The third subgroup is comprised of B5 (controlled), B7 (resentful), B8 (annoyed) and B9 (angry). Again, cries evoking these reactions are characterised by relatively low F2 (A5-A8) characteristics. However, whereas in the Home Phase a relatively low proportion of cries that caused mothers to feel annoyed or angry were important (A9), this is not the case here.

ADC cry categories. To examine the relationships between Set A and Set B scales for cries with negative characteristics (i.e., high F1 or Set B ratings) the cries have been classified into one of the 16 categories derived from the four ADC scales (A1, A2, A5, A9), as in the Home Phase (cf. Table 15). The distribution of the cries across these categories is shown in Table 28.

Due to the changes in the proportion of cries in each of the ADC categories, the numbers of cries in each of the four levels in Table 28 differ from those in Table 15. This has led to an increase in the number of cries in 4a, 4b, 4i, 4l, 4n, and 4p, and particularly 4m, and a decrease in the number in 4c, 4d, 4g, 4h, and particularly 4f and 4o. However, as in Table 15, it is clear that most unpleasant cries are arousing (2d), whereas arousing cries are not necessarily unpleasant (2b). And, although cries that are strong are typically important, cries do not necessarily need to be strong to be important (see 4b, 4f, 4n), or to be unpleasant and/or arousing (see 3g, 3c). Cries that are unpleasant, arousing, and strong are typically considered important (4p).

Changes have also occurred in the distributions of Set B responses across categories. There is a marked drop in the number of

Table 28

Frequency of SetB Ratings (DC = 2) in each ADC Category: Experimental Phase.

	Scale	ADC Category																Total	
		1a										1b						+	-
A1	NOT UNPLEASANT(+) UNPLEASANT(-)	+ 41										- 57						41	57
		2a				2b				2c				2d					
A2	NOT AROUSING(+) AROUSING(-)	+ 23				- 18				+ 7				- 50				30	68
		3a		3b		3c		3d		3e		3f		3g		3h			
A5	NOT STRONG(+) STRONG(-)	+ 23		- 0		+ 10		- 8		+ 6		- 1		+ 15		- 35		54	44
		4a	4b	4c	4d	4e	4f	4g	4h	4i	4j	4k	4l	4m	4n	4o	4p		
A9	NOT IMPORTANT(+) IMPORTANT(-)	+ 17	- 6	+ 0	- 0	+ 5	- 5	+ 1	- 7	+ 5	- 1	+ 0	- 1	+ 6	- 9	+ 1	- 34	35	63
B1	UNSYMPATHETIC	9				1				4								84	14
	column %	53				20				80									
B2	DISTRESSED								1					3	5	1	19	69	29
	column %								14					50	56	100	56		
B3	ANXIOUS		1			1			2	1			1	2	5	1	22	62	36
	column %		17			20			29	20			100	33	56	100	65		
B4	AGITATED									1				2	3	1	17	74	24
	column %									20				33	33	100	50		
B5	CONTROLLED	1	1						1					2	3	1	13	76	22
	column %	6	17						14					33	33	100	38		
B6	GUILTY												1	1			10	86	12
	column %												100	17			29		
B7	RESENTFUL													1	3		5	89	9
	column %													17	33		15		
B8	ANNOYED													2	2		6	88	10
	column %													33	22		18		
B9	ANGRY													1	3	1	5	88	10
	column %													56	100	100	15		
B10	REJECTED														5	1	10	82	16
	column %														56	100	29		

Set B responses in 4a (except on B1) and 4h, and an increase in the number in 4m and 4n. Furthermore, a higher proportion of the Set B responses occur in categories 4m, 4n, 4o, and 4p. Thus in the Experimental Phase, a substantial proportion of the Set B responses were evoked by cries that were unpleasant and arousing but not necessarily strong or important. Indeed, just three scales (B1, B3, and B5) account for all but three of the 26 responses (88.5%) outside 4m, 4n, 4o, or 4p.

In Table 28 it would seem that unsympathetic (B1) responses are asociated with cries that are not arousing, not strong, not

important, and generally not unpleasant. For all of the other types of reaction (B2-B10), most are elicited by cries that are unpleasant and arousing, although not necessarily strong or important. It should be noted, however, that only a proportion of the cries in any category evoked a Set B response. For example, whereas most of the unsympathetic responses were evoked by cries in 4a, only 53% of the cries in this category evoked this reaction. And in 4p, which contains cries with the most compelling ("aversive") characteristics (i.e., unpleasant, arousing, strong, important) only 15% of these cries evoked feelings of anger or resentment. For the remaining scales in 4p, the proportion ranges from 18%-65%. However, only three scales show responses from over 50% of the cries: agitated (50%), distressed (56%), and anxious (65%). Thus, even on these scales between a third to a half of the cries did not elicit a reaction. Unfortunately, the small numbers in many of the other categories render the percentages unsuitable for making comparisons. However, for those categories with a relatively high proportion of cries, cries with the same characteristics (in terms of A1, A2, A5, and A9) do not necessarily evoke the same types of reaction. Since Table 28 does not show the relationships between the Set B scales, it is not possible at this point to say whether any of the cries in categories 4i, 4m, 4n, 4o, or 4p evoke no reaction at all. But this is certainly the case for the remaining categories (except 4l) since the total number of cries across all of the Set B scales in each of these categories is less than the total number of cries in those categories.

In both the Home Phase and the Experimental Phase, most of the negative Set B responses (except B1) were from cries that were both

unpleasant and arousing. To facilitate comparisons of the responses in the two Phases, a summary derived from Tables 15 and 28 is provided in Table 29. Two categories are used: one category represents cries from categories 2a, 2b and 2c combined, and the second category represents 2d.

Table 29 shows that in both phases, mothers tended to associate the various types of negative Set B reactions with cries that were both unpleasant and arousing (2d). Although this proportion (%T) was higher in the Experimental Phase than in the Home Phase (except on B1), the actual proportion of unpleasant/arousing cries (%N) that evoked negative reactions was lower in the Experimental Phase for half of the scales (particularly B1, B4, B7, B8, and B9), with increases (of > 1%) for three scales (B3, B5, B10).

These results suggest that the use of tape-recorded sounds changes the relationships between scales, and could give rise to the misleading impression, consistent with the Aversive Stimulus Model, that negative affective reactions to cries are typically associated with "aversive" (unpleasant/arousing) cry characteristics. Clearly, it is important to consider the proportion of cries having particular characteristics that actually evoke negative responses, in addition to comparisons of the proportions of negative responses evoked by cries with different characteristics.

ADC patterns for individual mothers. The differences between Tables 15 and 28 may be due to a shift in responses by a few mothers to most of their infant's cries, or by most mothers to only a few cries. To examine these possibilities, the contribution of each mother to the various cry categories in Table 28 is shown in Table

Table 29

Proportion of Cries on each SetB Scale with High DC Ratings (DC = 2) in the Home Phase and Experimental Phase.

		Category						
		2abc			2d			
	Scale	NC	%T	%N	NC	%T	%N	T
Home Phase								
		(N = 50)			(N = 48)			
B1	UNSYMPATHETIC	6	46	12	7	54	15	13
B2	DISTRESSED	5	16	10	27	84	56	32
B3	ANXIOUS	11	30	22	26	70	54	37
B4	AGITATED	7	19	14	29	81	60	36
B5	CONTROLLED	9	38	18	15	63	31	24
B6	GUILTY	1	9	2	10	91	21	11
B7	RESENTFUL	5	26	10	14	74	29	19
B8	ANNOYED	8	32	16	17	68	35	25
B9	ANGRY	2	14	4	12	86	25	14
B10	REJECTED	1	11	2	8	89	17	9
Experimental Phase								
		(N = 48)			(N = 50)			
B1	UNSYMPATHETIC	14	100	29	0	0	0	14
B2	DISTRESSED	1	3	2	28	97	56	29
B3	ANXIOUS	6	17	13	30	83	60	36
B4	AGITATED	1	4	2	23	96	46	24
B5	CONTROLLED	3	14	6	19	86	38	22
B6	GUILTY	1	8	2	11	92	22	12
B7	RESENTFUL	0	0	0	9	100	18	9
B8	ANNOYED	0	0	0	10	100	20	10
B9	ANGRY	0	0	0	10	100	20	10
B10	REJECTED	0	0	0	16	100	32	16

Note. NC = Number of cries with DC ratings of 2.
T = Total number of cries with DC ratings of 2.
N = Number of cries in category.

30. The mothers are arranged in the same order as in Table 16 to facilitate comparisons.

A comparison of Tables 16 and 30 shows that considerable changes have occurred in (a) the categories used by particular mothers, (b) the number of cries from particular infants in a category, and (c) the number of mothers using a particular category.

Table 30

Cries Rated by each Mother in each ADC Category: Experimental Phase.

	ADC Category																
Mother	4a	4b	4c	4d	4e	4f	4g	4h	4i	4j	4k	4l	4m	4n	4o	4p	Total
M1													1	1	1	4	7
(P)													1	1	1	6	10
M2	6							1						1		1	9
(P)	7							1						1		1	10
M3									1							8	9
(P)									1							9	10
M4		1						2				1		1		2	7
(P)		1						3				1		1		3	10
M5	1	2			2									1		2	8
(P)	1	3			3									1		3	10
M6	1	2								1						5	9
(P)	1	2								1						6	10
M7	2						1		2							2	7
(P)	3						1		3							3	10
M8	3							2								2	7
(P)	4							3								3	10
M9	3	1							2							3	9
(P)	3	1							2							3	10
M10	1				2								4			2	9
(P)	1				2								4			2	10
M11						4		2					1	1		1	9
(P)						5		2					1	1		1	10
M12					1	1								4		2	8
(P)					1	1								5		3	10
NC	17	6	0	0	5	5	1	7	5	1	0	1	6	9	1	34	
NM	7	4	0	0	3	2	1	4	3	1	0	1	3	6	1	12	

Note. (P) = Proportion of cries out of 10 in each category.
NC = Number of cries in category.
NM = Number of mothers using a category.

In Table 16, six mothers predominantly reported cries in a particular ADC category (shown in parentheses): M9 (4a), M5 (4f), M4 (4h), and M12, M6, and M1 (4p). In Table 30, there are also six mothers who predominantly used a particular ADC category: M2 (4a), M11 (4f), M12 (4n), and M3, M6, and M1 (4p). However, only two of these mothers (M1, M6) used predominantly the same category on both occasions. There would appear, then, to be little similarity between the ratings on the two occasions for many of the mothers.

Mean scale set responses of individual mothers. In order to examine the range of responses from each mother and across all mothers on the F1, F2, F3 and Set B scale sets, mean scale set ratings have been employed, as in the Home Phase. The distributions of the cries using the mean scale ratings are shown in Figures 10-13.

As in the Home Phase (see Figures 6-9), there is considerable variation both within and across mothers with respect to the highest, lowest, and range of mean ratings. Thus the comments made previously regarding the selection of representative cry samples also apply here.

A comparison of the ratings of individual cries in Figures 6-9 with the corresponding ratings in Figures 10-13 reveals some striking changes in mean ratings for many of the cries. Furthermore, the direction of change for cries rated by individual mothers on particular scale sets generally varies from cry to cry. Thus it would seem that the use of tape-recorded cry samples has not had a systematic effect on the cry ratings.

A possible explanation for the non-systematic shift in ratings is that they were caused by regression towards the mean. If this were the case one might expect greater shifts for cries with more extreme ratings. However, such an effect is not suggested by the data.

An alternative possibility is that the mothers' perceptions of the cries have changed because of the changes in the context of the crying. It was noted earlier that the mothers' Set B responses to the cries in the Home Phase seemed to depend on the reasons for the crying, rather than on the cry characteristics. In this (Experimental) Phase, the use of tape-recorded signals effectively places the cries out of context and forces the mothers to attend more

rigorously to the cry characteristics. Even so, the emergence of separate factors for the Set A and Set B scales (see Table 25) suggests that the mothers have not simply reacted to the cry sound even the absence of other information. Unfortunately, the mothers were not asked on this occasion to give the reasons for their Set B responses, so it not possible to determine whether the shifts in the mean scale set ratings reflects changes in the mothers' attributions.

Changes in mean scale set responses. Not only does the rank order change for cries rated by the same mothers (see Figures 6-13), but so too does the absolute values of the ratings. A summary of the magnitude and direction of changes in the mean ratings for each mother on the four scale sets is provided in Table 31. Since scale sets F1, F2, and F3 are comprised of four scales each, a shift from one category to the next in Table 31 represents the equivalent of a change in one scale position on each of the four scales comprising the set. On Set B, such a shift is equivalent to a change of one scale position on all 10 scales. A shift in the positive (+) direction indicates that the cry received a lower mean rating in the Experimental Phase. Conversly, a shift in the negative direction (-) indicates a higher mean rating in the Experimental Phase. Thus a mean change of greater than 1 (and certainly of > 2) suggests that a cry was percieved quite differently on the two occasions. Table 31 shows this to have been the case on each scale set for most of the mothers.

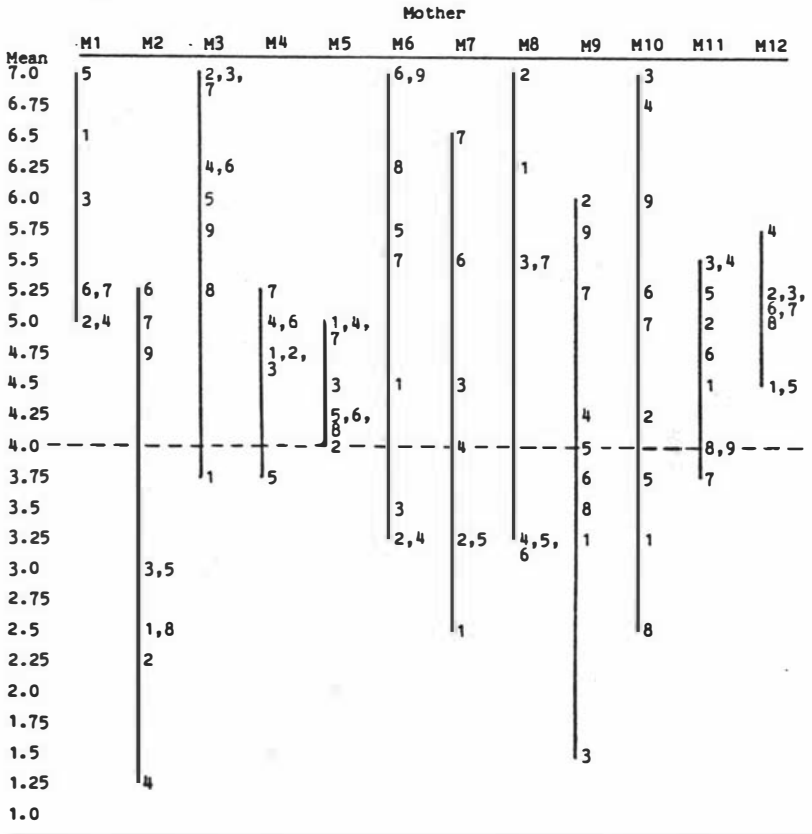

Figure 10. Mean F1 ratings for the cries rated by each mother: Experimental Phase.

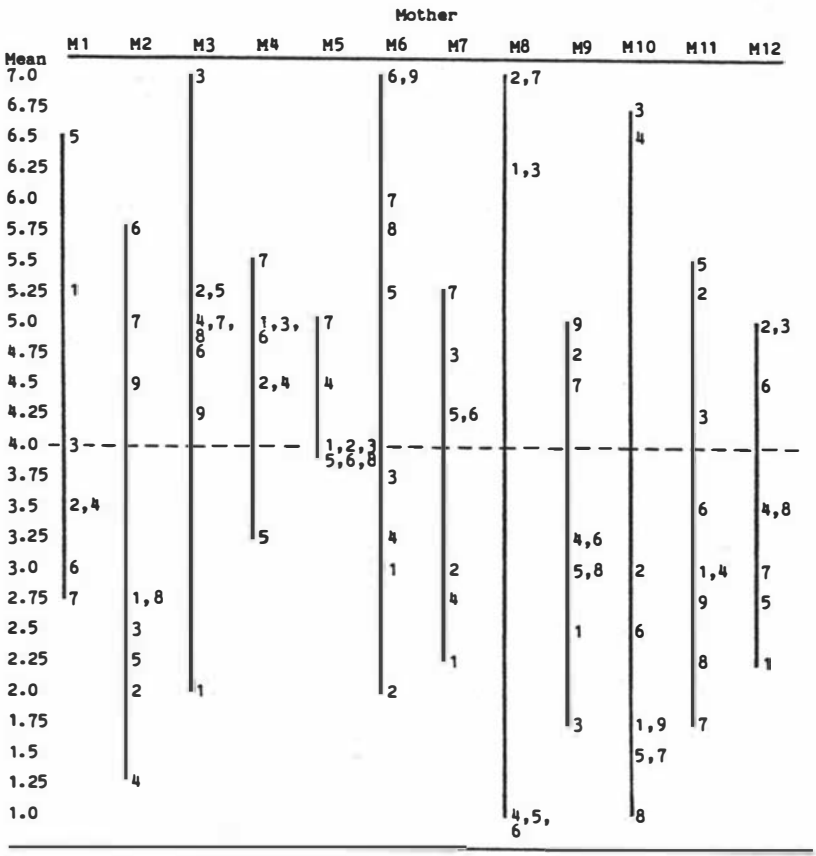

Figure 11. Mean F2 ratings for the cries rated by each mother: Experimental Phase.

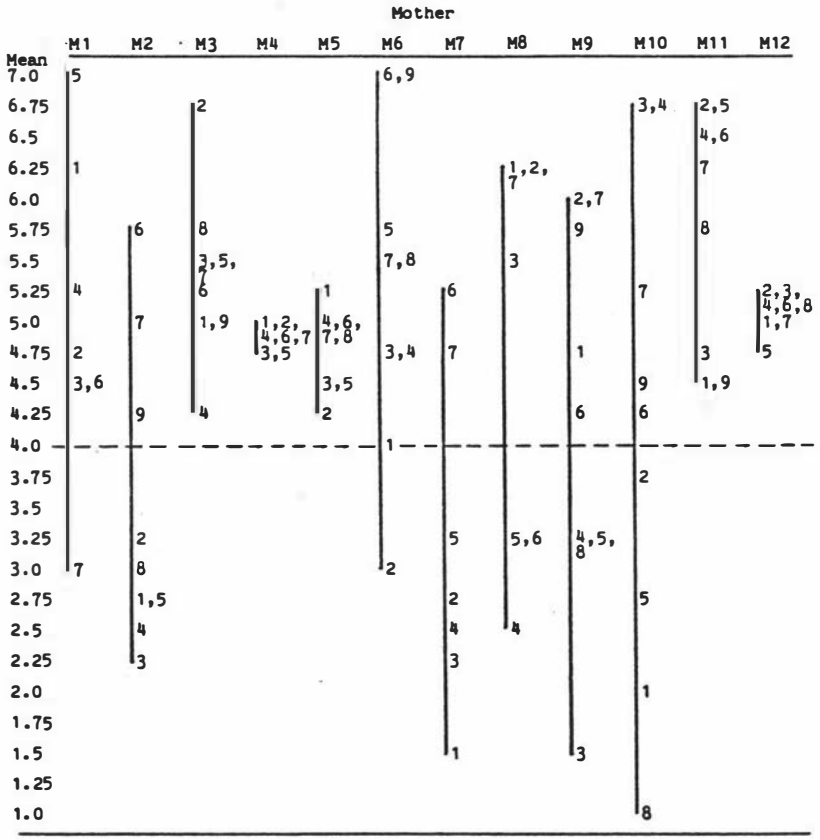

Figure 12. Mean F3 ratings for the cries rated by each mother: Experimental Phase.

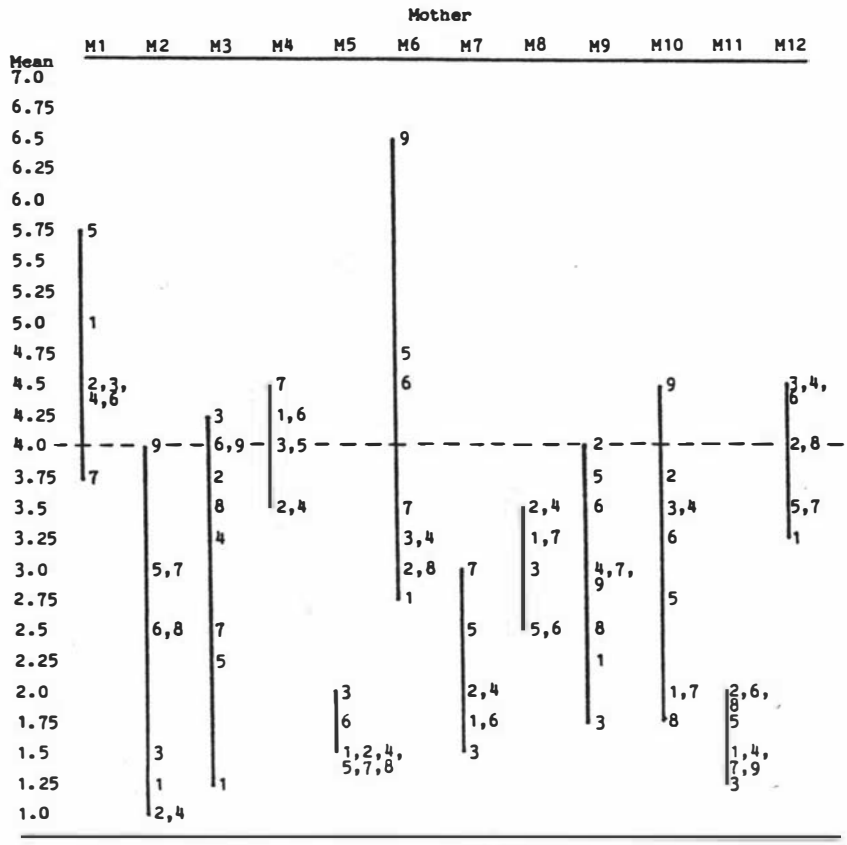

Figure 13. Mean SetB ratings for the cries rated by each mother: Experimental Phase.

Table 31

Direction and Magnitude of Changes in Mean Scale Set Ratings from Home Phase to Experimental Phase for each Mother.

Scale Set		Change	Mother M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Total
F1	+	>2								1		1			2
		>1-2			1			3	2	1	1				8
		>0-1	3	1	5	3	1	2	1	1	4	2	3	2	28
		0		1		1	1	1		2	1		1	2	10
		>0-1	3	4	2	3	6	2	2	1	1	3	5	4	36
	-	>1-2	1	3	1			1	2		1	2			11
		>2								1	1	1			3
F2		>2								1		1			2
	+	>1-2		1	1			3	3		1			1	10
		>0-1	1	1	3	3	4	2	1		3	1	4	1	24
		0	1	1	1		4			3			1	2	13
		>0-1	3	4	4	3		2	1	1	4	1	1	1	25
	-	>1-2	1	2		1		2	2	1		3	1	1	14
		>2	1							1	1	3	2	2	10
F3		>2							1	1	2				4
	+	>1-2	1	1	1			2		2	1			4	12
		>0-1		1	1			3		1	1	2	1	5	15
		0	1		1	3	1	2			1	1		2	12
		>0-1		2	6	4	2	2	2		2	1	3	1	25
	-	>1-2	4	4			4		2			4			18
		>2	1	1			1		2	3	2	1	1		12
SETB		>2	1												1
	+	>1-2	1	1	1			2	1			1		3	10
		>0-1	4		2	3	2	1	2	3	2	1	3	2	25
		0			1	2	3				1		1		8
		>0-1	1	2	2	2	3	6	3	3	3	2	3	2	32
	-	>1-2		5	3				1	1	1	4	2	1	18
		>2		1							2	1			4

Note. + = Mean Scale Set ratings higher in the Experimental Phase.
- = Mean Scale Set ratings lower in the Experimental Phase.

DC response patterns of individual mothers. The frequency of responses (DC ratings of 2) of each mother on each scale are shown in Table 32.

As in Table 17, differences between the mothers have emerged with respect to the total, type, range and frequency with which the various reactions were reported. And some consistency in mothers' response styles is suggested by the relative stability of their rank order on each of the four scale sets in Tables 17 and 32. While there are minor changes in these rank orders, the Spearman Rank Order Coefficients are significant for all four scale sets: Set B, r_s = .682 ($t = 2.949$, $df = 10$, $p < .01$); F1, r_s = .976 ($t = 14.24$, df =

Table 32

Frequency of each Mother's SetA and SetB Ratings (DC = 2): Experimental Phase.

	Scale	Mother														
		M5	M11	M8	M6	M7	M2	M4	M3	M12	M1	M10	M9	NC	NM	GH
	SetB															
B1	UNSYMPATHETIC	0	0	0	1	4	3	0	0	0	0	2	4	14	5	1
B2	DISTRESSED	0	0	0	4	1	2	1	4	5	7	4	1	29	9	2
B3	ANXIOUS	0	0	1	4	0	1	4	6	6	6	4	4	36	9	4
B4	AGITATED	0	0	0	3	1	1	1	3	3	7	3	2	24	9	1
B5	CONTROLLED	0	0	2	3	0	0	1	4	3	6	3	0	22	7	1
B6	GUILTY	0	0	0	3	0	0	3	2	2	1	1	0	12	6	0
B7	RESENTFUL	0	0	0	1	0	0	0	0	3	4	1	0	9	4	1
B8	ANNOYED	0	0	0	1	0	0	0	0	2	6	1	0	10	4	1
B9	ANGRY	0	0	0	2	0	0	0	0	2	6	0	0	10	3	1
B10	REJECTED	0	0	0	3	0	0	1	0	6	6	0	0	16	3	2
	Total	0	0	3	25	6	7	11	19	32	49	19	11			
	%	0.0	0.0	4.3	27.8	8.6	7.7	15.7	21.1	40.0	70.0	21.1	12.2			
	Rank	1	1	3	10	5	4	7	8	11	12	8	6			
	SetA															
A1	UNPLEASANT	3	3	2	6	4	2	4	9	6	7	6	5	57	12	8
F1 A2	AROUSING	5	9	4	5	3	3	5	8	8	7	8	3	68	12	9
A3	TENSE	3	6	3	6	3	3	6	7	7	7	4	3	58	12	6
A4	AGITATED	6	3	2	5	4	2	6	8	8	7	6	4	61	12	8
	Total	17	21	11	22	14	10	21	32	29	28	24	15			
	%	53.1	58.3	39.3	61.1	50.0	27.8	75.0	88.9	90.6	100.0	66.7	41.7			
	Rank	5	6	2	7	4	1	9	10	11	12	8	3			
A5	STRONG	2	3	4	5	3	2	5	8	2	5	2	3	44	12	5
F2 A6	HEAVY	1	1	4	5	2	3	5	7	3	2	2	3	38	12	4
A7	LARGE	2	2	4	5	3	2	5	6	2	3	3	3	40	12	4
A8	THICK	2	5	2	6	3	3	6	2	3	4	2	0	38	11	4
	Total	7	11	14	21	11	10	21	23	10	14	9	9			
	%	21.9	30.6	50.0	58.3	39.3	27.8	75.0	63.9	31.2	50.0	25.0	25.0			
	Rank	1	5	8	10	7	4	12	11	6	8	2	2			
A9	IMPORTANT	5	8	4	8	2	3	7	8	7	5	2	4	63	12	8
F3 A10	INTENTIONAL	7	7	3	7	4	2	7	2	8	6	6	5	64	12	9
A11	MEANINGFUL	8	9	4	7	2	3	6	9	8	7	6	5	74	12	10
A12	SINCERE	6	8	0	5	2	3	6	8	8	4	5	4	59	11	8
	Total	26	32	11	27	10	11	26	27	31	22	19	18			
	%	81.3	88.9	39.3	75.0	35.7	30.6	92.9	75.0	96.9	78.6	52.8	50.0			
	Rank	9	10	3	6	2	1	11	6	12	8	5	4			
	NCR	8	9	7	9	7	9	7	9	8	7	9	9			

Note. NC = Total number of cries with DC ratings of 2 on the scale.
NM = Number of mothers who gave DC ratings of 2 on the scale.
GH = Number of mothers who gave DC ratings of 2 on the scale to 50% of cries.
NCR = Number of cries rated.

10, $p < .01$); F2, r_s = .813 ($t = 4.416$, $df = 10$, $p < .01$); F3, r_s = .862 ($t = 5.377$, $df = 10$, $p < .01$). Furthermore, the predominant types of Set B reaction reported in the Home Phase (see Table 17) are also evident, for several mothers, in Table 32. For example, whereas M2, M5, M6, and M11 reported no typical negative reactions on either occasion, M1 typically felt distressed, anxious, agitated, and controlled, M4 and M5 were often anxious, M7 was typically unsympathetic, and M12 was generally distressed and anxious.

For some mothers, however, the nature of their reactions changed. In the Experimental Phase, M4 was no longer often agitated, M8 no longer commonly felt controlled, M9 was not generally anxious, agitated, and annoyed, and M10 was no longer generally anxious, agitated, resentful, and annoyed. In contrast, two mothers frequently experienced reactions in the Experimental Phase not experienced in the Home Phase: M1 often felt resentful, annoyed, angry, and rejected, and M12 often felt rejected. Thus whereas some mothers appear to have characteristic types of reaction that are relatively stable, this is not the case for others.

Other differences in mothers' ratings on the two occasions have also emerged. For example, most of the mothers reported fewer negative responses (DC ratings of 2) in the Experimental Phase, although this decrease was significant only for F1. The results of sign-tests were: Set B ($n = 11$, $x = 3$, $p > .05$); F1 ($n = 12$, $x = 1$, $p < .05$); F2 ($n = 10$, $x = 3$, $p > .05$); F3 ($n = 10$, $x = 2$, $p > .05$). And when the relationships between the ranks on Set B and the three Set A scales sets are considered, there is a significant Spearman Rank Order Correlation between Set B and F1, but not with F2 or F3: Set B / F1, $\underline{rs} = .757$ ($t = 2.004$, $df = 10$, $p < .05$), Set B / F2, $\underline{rs} = .444$ ($t = 1.567$, $df = 10$, $p > .05$), Set B / F3, $\underline{rs} = .259$ ($t = .848$, $df = 10$, $p > .05$). None of these coefficients was significant in the Home Phase.

The most notable change in scale use is shown by a comparison of colums NM and GH in Tables 17 and 32. Considering column NM first, there was generally little change for the Set A scales. On both occasions, most of the mothers used each of these scales to describe at least one cry (DC = 2). However, with the Set B scales, there was

a marked drop in the number of mothers who used scales B7-B10 in the Experimental Phase, a slight drop in the number that used scales B2, B4, B5, and B6, and a slight increase in the number who used scale B3.

An examination of column GH shows that fewer mothers used the Set A scales (DC = 2) to describe at least half of their infant's cries, with the excepton of scale A1. That is, more mothers found over half of the tape-recorded cries unpleasant. Similarly, fewer mothers reported negative Set B reactions to over half of their infant's cries, except on scales B1, B6, and B7 (no change), and B9 and B10. In fact, the increase for B9 and B10 is due to the responses of M1 and M12 who, along with M6, were the three mothers who actually found the tape-recorded cries more aversive that in the Experimental Phase. The reactions of M1 were particularly extreme. Unfortunately, there is no information as to why this should be the case.

Changes in DC responses for individual mothers. Rather than examining the responses of each mother to each cry, it would seem more relevant to examine the changes in DC ratings from the Home Phase to the Experimental Phase. The shifts in DC ratings for each mother are shown in Table 33 for the four scale sets. The table was compiled by summing the cries over each scale within a scale set. A summary of the shifts for each scale is provided in Table 34.

Considering only cries with DC ratings of 2, Table 33 presents four rows of data for each mother, labeled H, C, E, and MRC. H represents a shift from a 2 in the Home Phase to a 1 in the Experimental Phase, C represents no shift, that is, a rating of 2 on

Table 33

Direction and Frequency of Changes in Ratings (DC = 2)
on each Scale Set for each Mother.

		Mother											
Scale Set	Change	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
	H	0	8	3	4	8	6	5	7	8	11	5	2
F1	C	27	8	27	18	11	17	10	6	9	17	17	28
	E	1	2	5	3	6	5	4	5	6	7	4	1
	MRC	96	44	77	72	44	61	53	33	39	49	65	90
	H	6	5	5	6	0	4	5	6	7	12	9	12
F2	C	14	5	17	18	0	17	2	10	4	5	9	9
	E	0	5	6	3	7	4	9	2	5	4	2	1
	MRC	70	33	61	67	0	68	13	56	25	24	45	41
	H	6	15	3	2	5	3	10	7	12	10	3	1
F3	C	20	7	24	26	26	20	7	4	4	18	27	31
	E	1	4	3	0	0	7	3	7	14	1	5	0
	MRC	74	27	80	93	84	67	35	22	13	62	77	97
	H	3	16	7	11	0	3	8	8	30	26	6	12
SetB	C	23	2	12	4	0	12	5	2	6	9	0	14
	E	26	5	7	7	0	13	1	1	5	10	0	18
	MRC	44	9	46	18	-	43	36	18	15	20	0	32

Note. H = DC ratings of 2 in Home Phase only.
C = DC ratings of 2 common to both phases.
E = DC ratings of 2 in Experimental Phase only.
MRC = Mother's Rating Consistency Index.

both occasions, and E represents a shift from a 1 to a 2. The number of negative responses for a mother on a scale set can be determined for the Home Phase by summing the responses in rows H and C (cf. Total in Table 17), and for the Experimental Phase, by summing rows C and E (cf. Total in Table 32). Thus mothers with a higher proportion of cries in row H found more cries negative in the Home Phase, whereas those mothers with a higher proportion in row E found

more cries negative in the Experimental Phase.

The mothers who were most consistent in their ratings are those who have a high proportion of cries reported in row C compared to rows H or E. An index of response consistency (henceforth referred to as MRC) has been derived by computing the percentage of cries rated as 2 in both the Home Phase and in the Experimental Phase. For example, considering only responses on the F1 (four scales), M5 had 19 DC ratings of 2 in the Home Phase (8 + 11), 17 in the Experimental Phase (6 + 11), with only 11 (44%) common to both situations (e.g., MRC = 11 / 8 + 11 + 6 = 44%).

Several points emerge from Table 33. First, there is a wide range of MRC values on each scale set: F1 (33-96), F2 (0-70), F3 (13-97), Set B (0-46). Second, mothers who were consistent in the use of one scale set were not necessarily consistent with the use of other sets. For example, considering only Set A, M12 was very consistent on F1 (MRC = 90) and F3 (MRC = 97) but not on F2 (MRC = 41). M9 was typically inconsistent (MRC on F1, F2, and F3 < 40) whereas M1, M3, M4, and M6 were very consistent (MRC on F1, F2, and F3 > 60). Third, the scale sets on which the mothers were most consistent (highest MRC values) differed from mother to mother. For example, M1, M2, M7, and M9 were most consistent on F1; M6 and M8 were most consistent on F2; and the rest of the mothers were most consistent on F3. And fourth, perhaps the most striking feature of Table 33 are the low MRC values for Set B. None exceed 46, and for six mothers the MRC value is 20 or less. Furthermore, only three of the mothers (M1, M6, M12) reported more negative Set B responses in the Experimental Phase (H) than in the Experimental Phase (E). Whilst many of the mothers rated substantially more cries as negative

in the Home Phase (M2, M7, M8, M9, M10, M11), two (M1, M6) rated more cries negatively in the Experimental Phase and three mothers (M3, M4, M12) reported similar proportions in the Home Phase and the Experimental Phase, but in response to different cries. That is, the value of C is low compared to that of H or E.

Changes in DC responses on individual scales. Differences in response consistency have also appeared for the different scales. These differences are shown in Table 34, where the column headings H, C, and E have the same meaning as in Table 33. SC is an index of Scale Consistency, derived in the same way as MRC in Table 33.

Considering the Set A scales first, fewer negative ratings were made in the Experimental Phase for all scales except A1, and differences between phases are evident with respect to the consistency (SC) with which the various scales were used. The F1 and F3 scales range from approximately 60-70, whereas the F2 scales all have an SC of less than 50. For the Set B scales, the low SC values are particularly striking. None of the SC values exceed 40, six are less than 30, and for two scales (B8, B9) the value is only 9. Overall, all but three scales (B1, B6, B10) were more frequently used to describe cries in the Home Phase and for all but three scales (B2, B3, B4) less than half of the cries were rated as negative in both phases. In other words, the negative affective reactions reported by the mothers on the two occasions frequently described different cries.

Table 34

Direction and Frequency of Changes in Ratings (DC = 2) on each Scale from Home Phase to Experimental Phase.

			H	C	E	SC
		SetA				
	A1	UNPLEASANT	10	40	17	60
F1	A2	AROUSING	15	62	6	75
	A3	TENSE	21	42	16	53
	A4	AGITATED	21	51	10	62
	A5	STRONG	23	33	11	49
F2	A6	HEAVY	15	23	15	43
	A7	LARGE	17	28	12	49
	A8	THICK	22	26	12	43
	A9	IMPORTANT	19	47	16	57
F3	A10	INTENTIONAL	20	53	11	63
	A11	MEANINGFUL	15	65	9	73
	A12	SINCERE	23	49	10	60
		SetB				
	B1	UNSYMPATHETIC	7	6	8	29
	B2	DISTRESSED	14	18	11	42
	B3	ANXIOUS	16	21	15	40
	B4	AGITATED	20	16	8	36
	B5	CONTROLLED	12	12	10	35
	B6	GUILTY	7	4	8	21
	B7	RESENTFUL	15	4	5	17
	B8	ANNOYED	22	3	7	9
	B9	ANGRY	12	2	8	9
	B10	REJECTED	6	3	13	14

Note. H = DC rating of 2 in Home Phase only.
C = DC rating of 2 in both phases.
E = DC rating of 2 in Experimental Phase only.
SC = Scale Consistency Index.

Discussion

The present study examined several issues that are pertinent to the effects on mothers of their infants' crying. Specifically, these issues included the relationships between perceived cry characteristics and mothers' affective reactions; mothers' attributions of the causes of their infants' crying; individual differences between mothers with respect to their perceptions, affective reactions, and attributions; and the effects of the context on mothers' reactions to their infants' cries. In the following discussion, the relevance of the present results for each of these issues is considered in turn. As well, comment is made on the three main theoretical models that attempt to account for the effects that crying has on mothers.

Relationships between perceived cry characteristics and mothers' affective reactions

One of the objectives of the present study was to examine the relationships between mothers' semantic differential ratings of their infants' cry sounds and their ratings of their own affective reactions to these cries. In order to do this two procedures were adopted. The first procedure was to submit the 7-point semantic differential ratings of each cry to a factor analysis in order to examine the factor structure underlying the scales. The second procedure was to transform the 7-point scales into dichotomous categories so that the cries could be classified as having or not having the characteristics described by each scale. Two sets of scales were employed: Set A, which described perceived cry characteristics, and Set B, which described the mothers' affective reactions.

From the factor analyses in both the Home Phase and the Experimental Phase, all but one of the affect (Set B) scales (sympathetic-unsympathetic) and just one Set A scale (pleasant-unpleasant) loaded primarily on a single factor. This suggests that, except for sympathetic/unsympathetic feelings, the mothers' affective reactions to their infants' cries were associated with the unpleasantness of the cries and not their arousal qualities, their potency, the state of the infant, or the mothers' evaluations of the cries.

An examination of the cry descriptions provided by the dichotomous rating classifications, however, indicated that the above interpretation of the scale inter-relationships is erroneous. It would seem that the factor structures simply reflect the different frequency distributions of the 7-point ratings on the different scales. That is, the apparent similarity between these scales appears to be an artifact due to a high proportion of the ratings being distributed about the central scale position. This suggests the cries were in fact generally lacking in the characteristics described by the scales, rather than indicating some inherent association between the scales. These findings should serve as a warning that the factor structure of a set of scales can be misleading when the scales have a restricted distribution centered about the mid-scale position. Since this problem is presumably more likely to occur when only a single type of cry (e.g., pain) is used, these findings also raise the question of whether the factor structures reported by Zeskind and Lester (1978) suffer from a similar effect.

The reason for using the dichotomous classifications was to identify cries that could be considered to have "aversive"

characteristics, and to identify cries that evoked negative affective reactions. Essentially, two questions were being addressed: "Do cries with aversive characteristics neccessarily evoke negative affective reactions?", and "Do cries that evoke negative affective reactions neccessarily have aversive characteristics?".

For the purposes of the present study, "aversive" cries were defined as those that were both unpleasant and arousing. This definition is consistent with the view that unpleasantness and arousal are two basic dimensions of emotion (Russell, 1978), and with the results of Study A and the present study. In Study A, which does not appear to have suffered from the restricted rating distribution described above, a number of scales, including "pleasant-unpleasant" and "soothing-arousing", loaded on the same factor (Affect) as "aversive-not aversive". This suggested that the listeners' associated aversiveness with the affective qualities of the cry sounds rather than the physical characteristics or evaluations of the cries. And in the present study, the dichotomous ratings on scales representing unpleasantness and arousal suggest that they were used independently. That is, whereas unpleasant cries were typically arousing, arousing cries were not neccessarily unpleasant.

In both the Home Phase and the Experimental Phase approximately half of the cries sounded aversive (i.e., unpleasant and arousing), and most of these cries (67%-68%) were perceived as being both strong and important. Furthermore, these aversive (unpleasant/arousing) cries accounted for most of the negative affective reactions.

Two important points should be noted, however. First, the proportion of negative affective reactions evoked by the unpleasant/arousing cries, particularly those that were also strong and

important, varied considerably depending on the type of affective reaction, ranging from 9%-69% in the Home Phase and 0%-65% in the Experimental Phase. In other words, a substantial number of aversive sounding cries did not evoke particular types of negative affective reactions. Second, a not insubstantial proportion of negative affective responses were evoked by cries that were either not unpleasant or not arousing, particularly in the Home Phase.

When the characteristics of cries that did evoke a particular type of negative affective reaction were considered, it would seem that different types of reactions were frequently associated with particular cry characteristics. For example, relatively few cries that evoked unsympathetic reactions had negative affective (Set A) characteristics, were potent, or received a positive evaluation. Quite the opposite description emerged for cries that caused mothers to feel distressed, anxious, agitated, guilty, or rejected. And while most of the cries that caused mothers to feel controlled, resentful, annoyed, or angry, did have negative affective (Set A) characteristics, approximately half were not potent, and, in the Home Phase, not important.

It should be noted, however, that these associations between cry characteristics and mothers' feelings were derived from the responses to all cries across all scales. Thus they give a misleading picture of the actual relationships between scales for individual cries. In fact, the relationships between scales typically differed from cry to cry even for the same mother. Some mothers reported different types of reactions to cries with identical ratings on the Set A scales, and some mothers reported identical reaction patterns to cries with quite different ratings on the Set A scales. Furthermore, separate analyses of each type of affective reaction essentially ignores the fact that

the mothers typically reported a combination of reactions.

These findings suggest that it is quite inappropriate to make assumptions about the effects of cries on mothers on the basis of the cry characteristics, even for individual infants. An investigation of only aversive cries defined in terms of the perceived sound of the cry, does not provide a reliable indication of the degree, type, or range of reactions such cries are likely to evoke. And such an approach ignores the fact that "non-aversive" cries also evoke negative affective reactions. The findings also highlight the danger of deriving descriptions of cry characteristics associated with various types of affective reaction from the responses of a group of respondents. The reactions of the mothers in the present study were so varied that it was not possible to characterise the cries that gave rise to a particular reaction, even for individual mothers. One of the main reasons for this, it transpires, is that many of the reactions were evoked by situational factors rather than, or at least in addition to, the sound of the cries.

Mothers' attributions

Rather than assuming, as in the Aversive Stimulus Model, that mothers' reactions to cries depend upon the cry characteristics, the Attribution Model suggests that mothers' reactions will vary according to the nature of the causes attributed to the crying.

To examine this proposition, the mothers were asked to indicate, each time they described a bout of crying, why they thought their infant was crying, and what it was about the crying that made them feel the way they did. Two schemes were considered in the analysis. The first scheme was that of Kirkland (1979), who suggests that cries can

be categorised using the classic attribution matrix defined by three dimensions: internal/external, stable/unstable, and global/specific. In this scheme, internal/stable causes are factors such as temperament; external/stable causes are associated with medical conditions, such as having a cold or teething; internal/unstable causes are psychological/emotional factors, such as "wanting attention"; and external/unstable causes are environmental factors such as hunger, wetness, and so on.

A major difficulty with this scheme for the present study was that only two of the eight cells in the attribution matrix were required in order to account for all of the causes reported by the mothers. For this reason, the causal categories reported by Lounsbury and Bates (1982) were employed. These were: Hunger, Minor discomfort, Major Discomfort, and Psychological/ Emotional. In fact, these categories fit into the attribution matrix of Kirkland (1979), since the reported causes associated with Hunger, Minor Discomfort and Major Discomfort were all attributed to external/unstable causes.

The results from Study B suggest that a useful distinction is provided by the Lounsbury and Bates categories, since quite different types and patterns of responses were apparent for each. For example, relatively few Hunger or Minor Discomfort cries evoked negative reactions on any of the Set B scales. The mothers' most common reactions to Hunger cries were distressed, anxious, and guilty (26%), whereas with the Minor Discomfort cries they more commonly felt unsympathetic, anxious, agitated, and guilty (24%). A much higher proportion of negative affective reactions were elicited by cries attributed to Major Discomfort and Psychological/Emotional causes. The most common types of reactions to the Major Discomfort cries were

distressed, anxious, agitated (70%), and guilty (40%). And for the Psychological/Emotional cries, a wide range of reactions were evoked: distressed, anxious, agitated, controlled, resentful, annoyed, and angry (38%-50%).

These results suggest that cries attributed to Psychological/Emotional causes are more likely to evoke feelings of resentment, annoyance, and anger. If one accepts that abuse is more likely to occur if a caregiver feels resentful, annoyed, or angry, then the present findings are consistent with the view proposed by Kirkland (1979) that cries attributed to Psychological/Emotional causes are more likely to trigger acts of abuse. However, it must be noted that at least half of the cries in this category did not evoke these feelings. And except for three types of reaction (distressed, anxious, agitated) commonly elicited by cries attributed to Major Discomfort, less than half of the cries in any of the four causal categories (i.e., Hunger, Minor Discomfort, Major Discomfort, Psychological/Emotional) evoked any of the 10 types of negative affective reactions, and typically this proportion was much less than 30%. Thus, knowledge of the perceived cause of crying does not provide an adequate indication of the type of affective reaction likely to be experienced by a mother.

In order to find out why mothers did feel the way they did about their infant's cries, they were asked to indicate the reasons for their Set B (affective) responses each time they completed the Set B scales. A content analysis of the 60 plus different reasons reduced this number to 16, which appear to be associated with one of three major referents: the crying, the cause, and the mother herself. Of the 98 cries, 30 sets of responses were attributed to the crying; 13 were attributed to the cause of the crying; and 44 were attributed to the mother.

Since the reasons asociated with each of the three referents were so diverse, categories with the same referent were not combined. Instead, a subset of seven categories was devised in order to examine the relationships between the reasons given for the reactions to the cries and the causes of the cries. Two of the categories referred to the crying (High Intensity, Low Intensity), one to the cause of the crying (Specific Causes), and three to the mother (Knowing the Cause, Disrupted, Ineffective). The remaining category (Not Specified) contained cries for which no reasons for the mothers' affective responses were given.

Particular types and combinations of affective reactions were associated with the different Reason categories. For example, when the mothers' attributed their reactions to the Low Intensity crying or Knowing the Cause, only a low proportion (0%-27%) reported any one type of negative reaction. In contrast, a moderate proportion of mothers who attributed their reactions to Specific Causes (31%-39%) or to being Disrupted (47%-53%) reported feeling distressed, anxious, and agitated. These reactions were also reported by a moderately high proportion of mothers who attributed their reactions to feeling Ineffective (44%-78%) or to High Intensity crying (58%-74%). Guilt and rejection, on the other hand, were reported by only a small proportion (22%) of mothers in any of the Reason categories.

Looking at these interactions from a different perspective, mothers who felt resentful, annoyed, and angry were generally those who attributed their reactions to being Disrupted (33%-67%) or to feeling Ineffective (33%-56%). Less than 21% of mothers in the other Reason categories reported these reactions. Unsympathetic reactions were mostly reported by mothers who attributed their reactions to being

Disrupted (47%), and mothers who felt controlled were, in the main, those who attributed the feeling to Specific Causes (31%), being Disrupted (47%), and feeling Ineffective (44%).

The fact that a higher proportion of feelings of resentment, annoyance, and anger were associated with being Disrupted (33%-67%) and feeling Ineffective (33%-56%) than with High Intensity crying (16%-21%) has important implications for the Aversive Stimulus Model since the Model suggests a strong relationship between aversive cry sounds and abusive feelings. Whereas a high proportion of all types of negative reactions were evoked by cries with aversive (unpleasant/arousing) characteristics, many of these negative reactions were attributed to factors other than the aversiveness of the cry sounds. For example, although 48 cries were unpleasant/arousing (i.e., aversive) and 41 of these cries possessed characteristics that might be considered characteristic of High Intensity cries (i.e.,unpleasant/arousing/strong), only 19 cries (39%-46%) had reactions attributed to High Intensity crying. In this case, consideration of only the cry characteristics would have overlooked the fact that the sound of the cries was not the primary reason for the mothers' reactions to over 54% of the cries with "aversive" characteristics. In other words, it was not the sound of the cry that was significant, but what the sound signified; in particular, the demands upon the mother and her feelings of competence as a caregiver.

A further dimension to these analyses was provided when the relationships between the Reasons for the responses and the Causes of the cries were considered. It has been noted above that feeling distressed, anxious or agitated was often associated with cries that were of High Intensity, while reports of feeling resentful, annoyed, or

angry were associated with being Disrupted or feeling Ineffective, regardless of the cause of the cry. It is also apparent that cries attributed to Psychological/Emotional causes were likely to evoke all of these reactions even if the responses were attributed to High Intensity or Low Intensity crying.

Thus the mothers seemed to experience two major types of affective reaction: Distress (distressed, anxious, agitated), which occured particularly with High Intensity crying; and Annoyance (resentful, annoyed, angry) which occured in addition to Distress if the crying was attributed to Psychological/Emotional causes, or if the mother was Disrupted, or if she felt Ineffective.

Individual Differences

Considerable differences between mothers were evident from their ratings of both the cry characteristics and their own affective reactions. While this is perhaps not surprising, given that each mother rated a different set of cries (i.e., those of her own infant), the relationships between the cry characteristics and the affective reactions also differed markedly from mother to mother. Mothers who reported the greatest number of aversive, compelling, or obtrusive cry characteristics were not necessarily those who reported the greatest number of negative affective reactions, and vice-versa. This finding lends further support to the suggestion made earlier that descriptions of cry characteristics do not provide a reliable indication of the likelihood of negative affective reactions to the cries.

The mothers also differed with respect to the types and combinations of negative affective reactions reported. Many of the mothers did not report certain types of reactions very often, if at

all, but appeared to experience characteristic types of reaction and tended to use particular scales to describe their reactions to most of their infant's cries. For example, in the Home Phase, one mother was typically unsympathetic, other mother frequently felt controlled, a third generally felt anxious, agitated and annoyed, and so on. In other words, each scale had a different weight for each mother.

In the present study at least, it would appear that these characteristic types of reaction were stable for some mothers, since a preference for certain scales was evident in both phases. This finding raises some important points regarding the use of semantic differential scales for comparing mothers. For example, the findings suggest a need to examine subjects' responses across scales as well as across cries. The findings also raise questions concerning the significance of characteristic types of affective response. What are the implications of typically feeling distressed, for example, compared with feeling anxious or controlled, or whatever?

Although the range of responses varied from mother to mother and differed on each scale set, most of the mothers reported a wide range of cry characteristics and affective reactions, even for cries of the same cry type (e.g., hunger). As a consequence, it was not possible to select one cry for each infant that could be termed "typical" or representative, either in terms of cry characteristics, or in terms of the types of reaction usually experienced by the mothers.

Part of the reason for the diversity of cry characteristics and affective reactions is a result of the large number of different situations from which the cries were recorded. Indeed, 16 causal categories were represented. The possibility of just such diversity is one of the reasons most studies have used a single cry type, such as

pain or hunger, elicited under controlled or defined conditions. While such an approach may be appropriate in normative clinical studies concerned with the diagnostic value of the cry sound, the present results demonstrate the inappropriateness of using contrived selection criteria when attempting to examine the effects that crying has on mothers. If, on the one hand, the present study examined only cries of pain or hunger, a substantial proportion of the affective responses evoked by cries would not have been reported, and a quite misleading picture would have been gained of the types of cries that elicit negative affective reactions. Furthermore, the individual nature and variety of the response patterns of different mothers would have been lost.

On the other hand, many of the cries were attributed to hunger, and hunger cries from individual infants did show variation, both in terms of their auditory characteristics and the types of reactions they evoked. Clearly, even cries of the same type from the same infant can differ considerably with respect to either the percieved cry characteristics or the affective reactions evoked, even when using tape-recorded samples that remove contextual information.

The present study did not examine the acoustic characteristics of the cries, so it is not known to what extent these vary. The approach adopted by Zeskind and Lester (1978), for example, assume the existance of unique acoustic features that pervade all of an infant's cries thus providing an acoustic "signature" that would identify a cry as coming from a particular infant. The argument put forward by Zeskind and Lester is that in some infants, this acoustic signature is noxious. By implication, since all of that infant's cries would have these characteristics, all of the cries should be aversive to its mother. If

such assumptions were not made, there would be no justification for selecting only a single sample of a single cry type from each infant. However, it is clear from the present study that if there are common acoustic elements present in all of an infant's cries, they certainly do not cause all of the cries to be perceived in the same way; nor do they all evoke the same types of reaction.

The mothers in the present study responded differently to cries, even those of the same type or with the same auditory characteristics. If these cries did differ acoustically, there would have been no point in selecting a single cry sample. And if the cries did not differ acoustically, then, clearly, the different responses to the cries were caused by something other than their acoustic characteristics. In either case, the results argue against using a small number of cries to represent a single individual, let alone a group of individuals, as has been common practice in several recent cry studies.

Effects of context

The purpose of the Experimental Phase was to examine the effects that changing the context in which mothers heard their infants' crying may have on the mothers' perceptions and affective reactions to the cries. The underlying question was whether mothers' responses to short tape-recorded samples of crying (Experimental Phase) would bear any resemblance to their responses to the crying in normal caregiving situations (Home Phase). If they did, then a further question, not addressed in the present study, would be whether strangers' reactions to short tape-recorded cry samples resembled the reactions of the infants' own mothers.

One means of examining the effects of context on mothers'

responses to their infants' cries was to compare the factor structures of the scales uncovered in the two contexts (i.e., the Home phase and the Experimental Phase). Although there are discernable similarities between the sets of factor structures uncovered in the two phases, the results do suggest a stronger relationship in the Experimental Phase between the affective qualities of the cries, their physical characteristics (potency), and the mothers' evaluations of them, since the scales representing these characteristics all loaded on the same factor. This finding suggests, on the one hand, that the use of tape-recorded cry samples may bias the results in favour of an interpretation consistent with the Aversive Stimulus Model, since the mothers' perceptions of the affective qualities of the cries seems to have been associated more closely to the sound of the crying when the tape-recorded cries were rated than when the cries were rated "in situ".

On the other hand, a comparison of the dichotomous ratings indicates that, overall, there were fewer negative ratings of the tape-recorded cries on both the scales describing cry characteristics (Set A) and the scales describing the mothers' affective reactions (Set B). Furthermore, these negative reactions tended to be less extreme for the tape-recorded cries than for the cries rated in the home as they occurred.

While a greater proportion of the negative affective reactions were elicited in the Experimental Phase by cries with aversive (i.e., unpleasant/arousing) characteristics, the actual proportion of aversive cries that evoked aversive reactions was lower for most types of reaction than in the Home Phase. More specifically, the proportion of negative feelings evoked by unpleasant/arousing cries was greater in

the Home Phase for unsympathetic, agitated, resentful, annoyed, and angry feelings, but greater in the Experimental Phase for feelings of being anxious, controlled, and rejected.

So far, the discussion has been concerned with the effects of context on the overall responses of individual mothers and of the mothers as a group. The analyses indicated relatively stable response patterns for some mothers, and systematic effects across mothers due to the change in context. The most striking finding regarding the effects of context, however, came from an examination of the changes in ratings of individual cries. At that level of analysis it was apparent that often the responses to the cries in the Experimental Phase bore little if any resemblance to the responses made in the Home Phase to the same cries. This lack of similarity was shown by the Rating Consistency Indices based on the percentage of cries that received the same dichotomous classification in the two contexts. The consistency with which individual scales were used across mothers ranged from 43% - 75% for the Set A scales, and from 9% - 42% for the Set B scales. And the consistency with which the scales were used by individual mothers ranged from 0% - 96% for Set A and from 0% - 46% for Set B. Furthermore, mothers with a high consistency index on one set of scales did not necessarily have a high index on the other scale sets. Thus, although the relationships between the scales were similar in the two phases, the consistency of the ratings of individual mothers and for individual cries varied considerably.

Since the results quite clearly reflected the response styles of the individual mothers it would be inappropriate to generalise about the significance of the specific types of reactions that were affected by changes in context in the present study. However, the results do

demonstrate three important points. First, they demonstrate that it is necessary in the analysis of group data, to consider the proportion of aversive cries that evoke negative reactions as well as the proportion of negative reactions evoked by cries with aversive characteristics. Second, they demonstrate that at both the group and individual level of analysis, the extent and nature of the effects of context may differ depending on the type of reaction under consideration. And third, the results indicate quite clearly that analyses conducted at the level of grouped data (i.e., across all cries, whether from individual mothers or the group of mothers) may produce results that have little or no bearing on the relationships between scales with respect to mothers' responses to individual cries.

Models of crying

The three models of crying considered in the present study were the Aversive Stimulus Model, the Attribution Model, and the Empathy Model. The following discussion will examine the implications of the present results for each of these models in turn.

The Aversive Stimulus Model rests on the assumption that cries are aversive stimuli, this aversiveness being a function of the acoustic characteristics of the cry sounds. As a consequence, the model simply treats the cry as a noxious sound, placing no importance upon the context or situation in which the cry is emitted or upon the relationship between the infant and person/s responding to the cry.

From this perspective, one would therefore expect that the strongest negative affective reactions would be elicited by those cries with the most aversive and compelling characteristics. However, the results of the present study indicate that this is not necessarily the

case. Many ostensibly "aversive" cries did not evoke particular types of negative affective reaction, whereas a substantial number of such reactions were evoked by cries that apparently did not have aversive characteristics. Thus, the Aversive Stimulus Model does not appear to offer a particularly useful explanation of the effects of crying on mothers. At best, the model may account for only highly specific situations, while at worst, it encourages researchers to adopt experimental paradigms that may produce neat but meaningless results.

The Attribution Model holds that mothers' reactions to their infants' crying depends upon their causal attributions. In particular, it has been proposed (Kirkland, 1979) that mothers would respond more sympathetically to their infant when the crying was attributed to external causes, whether stable (e.g., illness) or unstable (e.g., injury) and to internal/stable causes (e.g., temperament, teething), that to internal/unstables causes (psychological/emotional) such as "wanting attention". Furthermore, internal/unstable causes are considered more likely than causes in the other attributional categories to provoke acts of abuse.

The results of the present study provide considerable support for this model. For example, feelings of resentment/annoyance/anger were most closely associated with cries attributed to psychological/emotional causes. However, the results also suggest that the model is limited by restricting its focus to the causes attributed to the crying, and could profitably be extended to include attributions associated with the situation, the infant's behaviour, and the mother herself. For example, whereas feelings of annoyance and anger were frequently associated with cries attributed to psychological/emotional causes, the reasons given by the mothers for these reactions were often

related to feeling ineffective or being disrupted. In fact, these two reasons appear to relate to the notion of control/uncontrol, which is one of the three classic dimensions in the attribution matrix reported by Weiner (1972), and may be of more value in the scheme proposed by Kirkland (1979) than global/specific, or at least provide a useful addition.

The third model considered in the present study was the Empathy Model. In this model the cry is considered to be a releaser of a sympathetic distress reaction that serves to prompt the mother to respond to the infant in order to alleviate the infant's distress.

The results of the present study appear to be, at least to some extent, consistent with the Empathy Model. All but one of the mothers were sympathetic to most if not all of their infant's cries and distress was one of the most frequent affective reactions reported, often accompanying other types of reaction including annoyance and anger. However, less than a third of the cries actually elicited strong feelings of distress, and social desirability effects may have caused mothers to be reluctant to report feeling unsympathetic.

In fact, the present study did not attempt to critically examine the Empathy Model. In the first place, the notion of sympathetic distress implies a quality of interaction between caregiver and infant that can probably not be assessed by means of self-reported affective reactions. Indeed, it does not seem reasonable to expect that a mother experiencing sympathetic distress would necessarily report feeling distressed. She may not even be aware of the feelings motivating her behaviour, particularly if responding to low intensity crying. Even so, one of the values of the Empathy Model for the present study is that it drew attention to the need to consider the function and effects of crying within its social context.

CONCLUSION

The two studies presented in this report were conducted in order to examine a number of implicit assumptions underlying recent studies of the effects that infant crying has on listeners, particularly mothers. The approach adopted was based on three major premises: (a) that in order to understand the effects that infant crying has on mothers, it is necessary to examine mothers' responses to their own infants, rather than listeners' responses to the cries of infants they do not know; (b) that it is necessary to examine the effects on mothers of crying that is significant to them, rather than cries selected to meet criteria imposed by the investigator; and (c) that the semantic differential technique provides a reliable and valid means of examining mothers' perceptions and affective reactions to their own infants' crying. Based on these premises, the present studies addressed three major issues.

The first issue concerned the relationships between perceived cry characteristics and mothers' affective reactions to the cries. Most of the recent cry studies employing descriptive scales have adopted, implicitly or explicitly, approaches consistent with the Aversive Stimulus Model. This model implies a strong association between "aversive" cry sounds and negative maternal affective reactions.

The results from the present studies, however, derived from strangers' ratings of short tape-recorded cry sounds, mothers' ratings of their own infants' crying "in situ", and mothers' ratings of tape-recorded samples of their own infants' cries, did not find a strong association between the feelings reported by the listeners or mothers, and their descriptions of the sounds of the cries. Although

negative reactions were evoked by "aversive" cries, such reactions were also evoked by cries that did not have aversive characteristics, and a number of "aversive" cries did not evoke negative affective reactions. The Aversive Stimulus Model would therefore seem to provide an inadequate explanation of mothers' reactions to their crying infants.

The second issue concerned the variability of the cry characteristics of individual infants. Generally, studies have compared the characteristics of cries from different groups of infants, selecting just one of two cries from each infant in the groups. This approach appears to rest on the following assumptions: That the auditory or perceived characteristics of cries are determined by their acoustic attributes; that all cries from an infant have the same acoustic attributes; and therefore, that the perceived cry characteristics and the effects of the cries on listeners, at least for particular cry types (e.g., pain), can be adequately determined by examining just one or two of an infant's cries.

The results of the second study (Study B) argue against this line of reasoning. Cries with similar descriptions often evoked quite different types of reactions from the same mother, even for cries of the same type (e.g., hunger), and marked differences were found in the cry descriptions and reactions reported by different mothers. These results are consistent with the conclusion reached by Truby and Lind (1965) from their spectrographic analyses of pain cries:

> Thus one can posit and readily support this position by demonstration that no two infant cries are alike, and no two infants cry alike (p.42).

The third issue related to the importance of context in determining the effects that infant crying has on mothers. Previous

studies have typically ignored the context in which crying occurs, on the apparent assumption that mothers respond to cries as sounds rather than as signals, and that therefore listeners' responses to tape-recoded cry samples rated under controlled conditions will be indicative of mothers' responses to their own infants' cries in the usual home situation.

Study B examined this assumption in two ways. First, by comparing the relationships between scales in two contexts, that is, to cries "in situ" and to tape-recorded cry samples. Second, by asking mothers to indicate why they reacted to the cries as they did. While the relationships between scales was similar in the two contexts, some changes were evident. Namely, for the tape-recorded cries, a higher proportion of reported negative reactions were associated with cries described as having "aversive" characteristics, although a lower proportion of the "aversive" tape-recorded cries actually evoked negative reactions from the mothers. Thus for the mothers in Study B, the use of tape-recorded cry samples over-emphasised the relationships between aversive sounds and negative affective reactions, but under-represented the negative affective reactions experienced in the home situation.

The reasons given by the mothers for their reactions to the cries in the home demonstrated clearly the importance of situational factors in determining the effects crying has on mothers. In particular, factors that appear to be associated with the concept of control/uncontrol, such as not knowing the cause, being ineffective, and being disrupted, accounted for many of the negative reactions, particularly feelings of resentment, annoyance, and anger. These findings suggest that an examination of the mothers attributions may

provide a particularly productive means of examining the effects infant crying has on mothers.

In addition to their bearing on these major issues, the results of the present studies are also pertinent to the three basic premises upon which the studies rest.

With respect to the first premise, the variability of each mother's responses, the differences in the types of responses reported by different mothers, and the importance of the mothers' attributions, all affirm the decision to examine mothers' responses to a range of cries from their own infants.

The second premise, that mothers rather than the investigators should select the cry samples for consideration, was also supported by the present findings. Information regarding the range of reactions and the types of cries that evoked these reactions would simply not have been gained had pre-determined criteria been imposed and cries selected to represent particular cry eliciting conditions (e.g. hunger) or particular types of crying (e.g. rhythmical crying). The question of why the mothers selected the particular cries they did and ignored others suggests a topic for further investigation that may provide additional insight into the interactions between mothers and their infants.

The third premise related to the use of the semantic differential technique. In Study A, the semantic differential proved to be an effective and reliable means of discriminating between perceptually similar or different cry sounds, and in Study B, it provided a useful means for examining mothers' perceptions and reactions to their infants' cries in both naturalistic and experimental situations. Several limitations were found however when the technique was used to

examine the meaning and significance of the crying for the infants' own mothers. First, it was difficult to interpret the meanings of ratings on the 7-point scales. For this reason, dichotomous classifications were used. Even then the scale ratings provided no indication of the relevance of the scales to the mothers. For example if the strength of a cry was rated as 4 on a 7-point scale, this would simply suggest that the cry is considered to be neither weak nor strong. However it could well be that the most important feature of the cry for that mother was that it was not strong.

Second, there was no way of deciding, since the cries were rated on sets of scales, which scales, if any, described the most salient cry characteristics for a particular mother, or described her primary affective reaction. Some mothers commonly reported certain types of reaction towards their infant's cries, and these reactions differed from mother to mother. A point that is easily overlooked is that not all scales describing cry characteristics or affective reactions are pertinent to each mother.

Thus while the semantic differential technique offers a useful means of examining mothers' responses to their crying infant, certain modifications would seem in order. In particular, it would seem appropriate to employ scales that describe the cry characteristics and feelings most salient to each mother (see Kirkland, Deane, and Brennan, 1983; Kirkland & Brennan, 1985); to use 3-point rather than 7-point scales, to aid interpretation; and to have the mothers rank each scale in order of importance for each cry, in order to identify the key aspects of each cry.

The results of the present studies suggest a number of directions for future research. These include an examination of (a) the cry

repertoires of individual infants, (b) the types and patterns of affective reactions experienced by individual mothers, (c) the attributions of individual mothers regarding their own feelings and their infant's behaviors, and (d) the relationships between mothers' feelings, attributions, and their actual caregiving responses. To investigate these issues it would seem appropriate to put aside, at least for the present, attempts to identify cry characteristics common to groups of infants or types of reactions common to groups of mothers, and to focus instead on the meaning and significance that an infant's crying has for its own mother, and on the ways in which a mother's perceptions, feelings, and attributions influence the quality of her interactions with her infant.

REFERENCE NOTES

1. Murray, A.D. Personal communication, March 5, 1981.

2. Bimler, D. Cluster Documentation. Unpublished manuscript, 1982.

3. Bimler, D. Personal communication, 1982.

REFERENCES

Ainsworth, M.D.S. Infancy in Uganda: Infant Care and the Growth of Love. Baltimore: Johns Hopkins University Press, 1967.

Aldrich, C.A., Sung, C., & Knop, C. The crying of newly born babies: I. The community phase. Journal of Paediatrics, 1945(a), 26 (4), 313-326.

Aldrich, C.A., Sung, C., & Knop, C. The crying of newly born babies: II. The individual phase. Journal of Paediatrics, 1945(b), 27 (2), 89-96.

Aldrich, C.A., Sung, C., & Knop, C. The crying of newly born babies: III. The early period at home. Journal of Paediatrics, 1945(c), 27, 428-435.

Averill, J.R. A semantic atlas of emotional concepts. JSAS Catalog of Selected Documents in Psychology, 1975, 5, 330. (Ms. No. 421)

Bell, R.Q. Human infant-effects in the first year. In R.Q. Bell and L.V. Harper (Eds.) Child Effects on Adults. Lincoln: University of Nebraska Press, 1980, (Chapter 6).

Bell, S.M., & Ainsworth, M.D.S. Infant crying and maternal responsiveness. Child Development, 1972, 43, 1171-1190.

Berkowitz, L. Some determinants of impulsive aggression: The role of mediated associations with reinforcements for aggression. Psychological Review, 1974, 81, 165-176.

Bernal, J. Crying in the first 10 days of life and maternal responses. Developmental Medicine and Child Neurology, 1972, 14, 362-372.

Bowlby, J. The nature of a child's tie to his mother. International Journal of Psychoanalysis, 1958, 39, 350-373.

Boukydis, C.F.Z., & Burgess, R.L. Adult physiological responses to infant cries: Effects of temperament of infant, parental status, and gender. Child Development, 1982, 53, 1291-1298.

Brennan, M. Editorial. Cry Research Newsletter, 1982(a), 4(2).

Brennan, M. Time-referenced automatic cry recording. Cry Research Newsletter, 1982(b), 4(2), 2-3.

Brennan, M., & Kirkland, J.C. Discrimination of infants' cry signals. Perceptual and Motor Skills, 1979, 48, 683-686.

Brennan, M., & Kirkland, J.C. Classification of infant cries using descriptive scales. Infant Behavior and Development, 1982, 5, 341-346.

Brennan, M., & Kirkland, J.C. Perceptual dimensions of infant cry signals: A semantic differential analysis. Perceptual and Motor Skills, 1983, 57, 575-581.

Bush, L.E., II. Individual differences multidimensional scaling of adjectives denoting feelings. Journal of Personality and Social Psychology, 1973, 25, 50-57.

Donovan, W.L., Leavitt, L.A., & Balling, J.D. Maternal physiological response to infant signals. Psychophysiology, 1978, 15(1), 68-74.

Elmer, E., & Gregg, G.S. Developmental characteristics of abused children. Pediatrics, 1967, 40, 596-602.

Formby, D. Maternal recognition of infant's cry. Developmental Medicine and Child Neurology, 1967, 9, 293-298.

Friedman, S.L., Zahn-Waxler, C., & Radke-Yarrow, M. Perceptions of cries of full-term and preterm infants. Infant Behavior and Development, 1982, 5, 161-173.

Frodi, A.M. The contribution of infant characteristics to child abuse. Submitted to: American Journal of Mental Deficiency, 1980.

Frodi, A.M., & Lamb, M.E. Child abusers' responses to infant smiles and cries. Child Development, 1980, 51, 238-241.

Frodi, A.M., Lamb, M.E., Leavitt, L.A., & Donovan, W.L. Fathers' and mothers responses to infant smiles and cries. Infant Behavior and Development, 1978(a), 1, 187-198.

Frodi. A.M., Lamb, M.E., Leavitt, L.A., Donovan, W.L., Neff, C., & Sherry, D. Fathers' and mothers' responses to the faces and cries of normal and premature infants. Developmental Psychology, 1978(b), 14(5), 490-498.

Frodi, A.M., Lamb, M.E., & Wille, D. Mothers' responses to the cries of normal and premature infants as a function of the birth status of their own child. Journal of Research in Personality, 1981, 15, 122-133.

Hoffman, M. Developmental synthesis of affect and cognition and its implications for altruistic motivation. Developmental Psychology, 1975, 11, 607-622.

Izard, C.E. Human Emotions. New York: Plenum Press, 1977.

Kerlinger, F.N. Foundations of Behavioral Research. New York: Holt, Rinehart & Winston, 1969.

Kirkland, J. Child Abuse: The crying baby at risk. In A. Neale & R. Renwick (eds.) Early Childhood in New Zealand: Their Needs - Our Concern. Proceedings Second Early Childhood Convention, Christchurch (N.Z) 1979, 114-132.

Kirkland, J., Deane, F., & Brennan, M. About CrySOS, a clinic for people with crying babies. Family Relations, 1983, 32, 537-543.

Kirkland, J., & Brennan, M. Behavior profiles obtained from clustering behaviors in situations related to temperament dimensions. The Exceptional Child, 1984, 31(4), in press.

Klein, M., & Stern, L. Low birth weight and the battered child syndrome. American Journal of Diseases of Childhood, 1971, 122, 15-18.

Kryter, K. The Effects of Noise on Man. New York: Academic Press, 1970.

Lipsitt, L.P. Developmental psychobiology comes of age: A discussion. In L.P. Lipsitt (ed.) Developmental Psychobiology: The Significance of infancy. Hillsdale: Erlbaum, 1976.

Lounsbury, M.L., & Bates, J.E. The cries of infants of differing levels of perceived temperamental difficultness: Acoustic properties and effects on listeners. Child Development, 1982, 53,677-686.

Mehrabian, A, & Epstein, N. A measure of emotional empathy. Journal of Personality, 1972, 40, 525-543.

Mehrabian, A, & Russell, J.A. (eds.) An Approach to Environmental Psychology. Cambridge, Massachusetts: MIT Press, 1974(a).

Mehrabian, A., & Russell, J.A. The basic emotional impact of environments. Perceptual and Motor Skills, 1974b, 38, 283-301.

Michelsson, K. Cry analysis of symptomless low birth weight neonates and of asphyxiated newborn infants. Acta Paediatrica Scandinavica (Supplement), 1971, 216, 1-45.

Muller, E., Hollien, H., & Murry, T. Perceptual responses to infant crying: identification of cry types. Journal of Child Language, 1974, 1(1), 89-95.

Murray, A.D. Infant crying as an elicitor of parental behaviour: An examination of two models. Psychological Bulletin, 1979, 86(1), 191-215.

Murray, A.D. Infant cries and their compelling nature. Cry Research Newsletter, 1980, 3(1), 2-5.

Murray, A.D. Aversiveness is in the mind of the beholder: Perceptions of infant crying by adults. In B.M. Lester & C.F.Z. Boukydis (eds.) Infant Crying: Theoretical and Research Perspectives. New York: Plenum Press, in press.

Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H. Statistical Package for the Social Sciences (2nd Ed.) New York: McGraw-Hill, 1975.

Nowlis, V. Research with the Mood Adjective Checklist. In SS Tomkins and CE Izard (eds.), Affect, Cognition, and Personality. New york: Springer, 1965, pp352-389.

Osgood, C.E. Dimensionality of the semantic space for communication via facial expressions. Scandanavian Journal of Psychology, 1966, 7, 1-30.

Osgood, C.E. On the whys and wherefores of E, P, and A. Journal of Personality and Social Psychology. 1969, 12, 192-199.

Osgood, C.E., May, W.H., & Miron, M.S. Cross-cultural universals of affective meaning. Urbana: University of Illinois Press, 1975.

Osgood, C.E., Suci, G.J., & Tannenbaum, P.H. The measurement of meaning. Chicago: University of Illinois Press, 1957.

Plutchik, R. The Emotions: Fact, Theories, and a New Model. New York: Random House, 1962.

Plutchik, R. A language for the emotions. Psychology Today, 1980, February, 68-78.

Ringel, R.F., & Kluppel, D.D. Neonatal crying: A normative study. Folia Phoniatrica, 1964, 16, 1-9.

Russell, J.A. Evidence of convergent validity on the dimensions of affect. Journal of Personality and Social Psychology, 1978, 36(10), 1152-1168.

Russell, J.A. Affective space is bipolar. Journal of Personality and Social Psychology, 1979, 37(3), 345-356.

Russell, J.A., & Mehrabian, A. Distinguishing anger and anxiety in terms of emotional response factors. Journal of Consulting and Clinical Psychology, 1974, 42, 79-83.

Russell, J.A., & Mehrabian, A. Evidence for a three-factor theory of emotions. Journal of Research in Personality, 1977, 11, 273-294.

Schlosberg, H. S. A scale for the judgement of facial expressions. Journal of Experimental Phsychology, 1941, 29, 497-510.

Schlosberg, H.S. The description of facial expression in terms of two dimensions. Journal of Experimental Psychology, 1952, 44, 229-237.

Schlosberg, H.S. Three Dimensions of Emotion. Psychological Review, 1954, 61, 81-88.

Simner, M.L. Newborn's response to the cry of another infant. Developmental Psychology, 1971, 5, 136-150.

Truby, H.M. Some aspects of acoustic and cineradiographic analysis of newborn infant and adult phonation and associated vocal tract activity. Journal of the Acoustical Society of America, 1960, 32, 1518- .

Truby, H.M., & Lind, J. Cry sounds of the newborn infant. Acta Paediatrica Scandinavica (Supplement), 1965, 163, 7-59.

Valanne, E.H., Vuorenkoski, V., Partanen, T, Lind, J., & Wasz-Hockert, O. The ability of human mothers to identify the hunger cry signals of their own newborn infants during the lying-in period. Experientia, 1967, 23. 768-769.

Wasz-Hockert, O., Lind, J., Vuorenkoski, V., Partanen, T.J., & Valanne, E. The Infant Cry: A Spectrographic and Auditory Analysis. London: Spastics International Medical Publications and Willian Heinemann Medical Books (Clinics in Developmental Medicine No. 29), 1968.

Weiner, B. Theories of Motivation. Chicago: Rand-McNally, 1972.

Weiner, B. Human Motivation. New York: Holt, Rinehart and Winston, 1980.

Wiesenfeld, A.R., & Klorman, R. The mother's psychophysiological reactions to contrasting affective expressions of her own and an unfamiliar infant. Developmental Psychology, 1978, 14(3), 294-304.

Wiesenfeld, A.R., Malatesta, C.Z., & DeLoach, L.L. Differential parental responses to familiar and unfamiliar infant distress signals. Infant Behavior and Development, 1981, 4, 281-295.

Wolff, P. The natural history of crying and other vocalisations in early infancy. In B.M. Foss (Ed.), Determinants of Infant Behavior IV. London: Methuen, 1969.

Woodworth, R.S. Experimental Psychology. New York: Holt, 1938.

Zeskind, P.S. Adult responses to cries of low and high risk infants. Infant Behavior and Development, 1980, 3, 167-177.

Zeskind, P.S., & Lester, B.M. Acoustic features and auditory perceptions of the cries of newborns with prenatal and perinatal complications. Child Development, 1978, 49, 580-589.

Appendix A:

Instruction Sheet IS1 for Scale Set 1 (Study A).

CRY

The booklet in front of you contains 11 identical pages of descriptive scales. These scales are for describing infant cries.

Your task is to listen to 10 short cries and rate each cry in turn on a page of scales. Each cry will be repeated until you have finished the page. Then the next cry will be played reatedly while you rate it on the next page, and so on.

Simply place an X in the scale position that you think best describes the cry.

Do you have any questions?

Before you begin, read through the scales and circle any words that you are not sure of.

Appendix A -continued

Scale Set 1 (BK15/ZL8) for Study A (order 01).

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insincere ___:___:___:___:___:___:___ sincere

light ___:___:___:___:___:___:___ heavy

weak ___:___:___:___:___:___:___ strong

not piercing ___:___:___:___:___:___:___ piercing

calm ___:___:___:___:___:___:___ agitated

important ___:___:___:___:___:___:___ unimportant

shallow ___:___:___:___:___:___:___ deep

grating ___:___:___:___:___:___:___ pleasing

thick ___:___:___:___:___:___:___ thin

happy ___:___:___:___:___:___:___ sad

arousing ___:___:___:___:___:___:___ soothing

large ___:___:___:___:___:___:___ small

discomforting ___:___:___:___:___:___:___ comforting

colourful ___:___:___:___:___:___:___ colourless

nonaversive ___:___:___:___:___:___:___ aversive

not distressing ___:___:___:___:___:___:___ distressing

meaningless ___:___:___:___:___:___:___ meaningful

healthy ___:___:___:___:___:___:___ sick

unpleasant ___:___:___:___:___:___:___ pleasant

urgent ___:___:___:___:___:___:___ not urgent

unintentional ___:___:___:___:___:___:___ intentional

tense ___:___:___:___:___:___:___ relaxed

Appendix A -continued

Scale Set 1 (BK15/ZL8) for Study A (order 02).

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relaxed ___:___:___:___:___:___:___ tense

intentional ___:___:___:___:___:___:___ unintentional

not urgent ___:___:___:___:___:___:___ urgent

pleasant ___:___:___:___:___:___:___ unpleasant

sick ___:___:___:___:___:___:___ healthy

meaningful ___:___:___:___:___:___:___ meaningless

distressing ___:___:___:___:___:___:___ not distressing

aversive ___:___:___:___:___:___:___ nonaversive

colourless ___:___:___:___:___:___:___ colourful

comforting ___:___:___:___:___:___:___ discomforting

small ___:___:___:___:___:___:___ large

soothing ___:___:___:___:___:___:___ arousing

sad ___:___:___:___:___:___:___ happy

thin ___:___:___:___:___:___:___ thick

pleasing ___:___:___:___:___:___:___ grating

deep ___:___:___:___:___:___:___ shallow

unimportant ___:___:___:___:___:___:___ important

agitated ___:___:___:___:___:___:___ calm

piercing ___:___:___:___:___:___:___ not piercing

strong ___:___:___:___:___:___:___ weak

heavy ___:___:___:___:___:___:___ light

sincere ___:___:___:___:___:___:___ insincere

Appendix A -continued

Instruction Sheet IS2A for Scale Set 2 (Study A).

FEELING

The booklet in front of you contains three separate pages of descriptive scales.

On these scales it is possible to indicate how tou feel in various situations. You can also use them to indicate how you think other people are feeling.

To use the scales, you simply put an X between each pair of words in the space that best describes your feeling.

For example:

good	___:_X_:___:___:___:___:___	bad
hot	___:___:___:_X_:___:___:___	cold
tense	___:___:___:___:___:___:_X_	relaxed
uncomfortable	___:___:_X_:___:___:___:___	comfortable

on these scales the person has indicated that they feel

quite good,
neither hot nor cold,
relaxed,
and slightly uncomfortable

Do you have any questions?

Before we begin, please read through the scales and circle any words that you are not sure of.

Appendix A -continued

Instruction Sheet IS2B for Scale Set 2 (Study A).

FEELING

The booklet in fron of you contains 10 separate pages of descriptive scales.

On these scales it is possible to indicate how you feel when you hear an infant's cry.

To use the scales, you simply put an X between each pair of words in the space that best describes your feeling.

For example:

good	___:_X_:___:___:___:___:___	bad
hot	___:___:___:_X_:___:___:___	cold
tense	___:___:___:___:___:___:_X_	relaxed
uncomfortable	___:___:_X_:___:___:___:___	comfortable

on these scales the person has indicated that they feel

quite good,
neither hot nor cold,
relaxed,
and slightly uncomfortable

Your task is to listen to 10 short cries and rate each cry in turn on a page of scales. Each cry will be repeated until you have finished the page. Then the next cry will be played repeatedly while you rate it on the next page, and so on.

Simply place an X in the scale position that you think best describes how the cry makes you feel.

Do you have any questions?

Before we begin, read through the scales and circle any words that you are not sure of.

Appendix A -continued

Scale Set 2 (MR18) for Study A (order 01).

---

dull ___:___:___:___:___:___:___ jittery

guided ___:___:___:___:___:___:___ autonomous

frenzied ___:___:___:___:___:___:___ sluggish

dominant ___:___:___:___:___:___:___ submissive

bored ___:___:___:___:___:___:___ relaxed

in control ___:___:___:___:___:___:___ cared for

unaroused ___:___:___:___:___:___:___ aroused

happy ___:___:___:___:___:___:___ unhappy

calm ___:___:___:___:___:___:___ excited

awed ___:___:___:___:___:___:___ important

hopeful ___:___:___:___:___:___:___ despairing

influenced ___:___:___:___:___:___:___ influential

stimulated ___:___:___:___:___:___:___ relaxed

melancholic ___:___:___:___:___:___:___ contented

controlling ___:___:___:___:___:___:___ controlled

annoyed ___:___:___:___:___:___:___ pleased

satisfied ___:___:___:___:___:___:___ unsatisfied

wide-awake ___:___:___:___:___:___:___ sleepy

Appendix A -continued

Scale Set 2 (MR18) for Study A (order 02).

---

sleepy ___:___:___:___:___:___:___ wide-awake

unsatisfied ___:___:___:___:___:___:___ satisfied

pleased ___:___:___:___:___:___:___ annoyed

controlled ___:___:___:___:___:___:___ controlling

contented ___:___:___:___:___:___:___ melancholic

relaxed ___:___:___:___:___:___:___ stimulated

influential ___:___:___:___:___:___:___ influenced

despairing ___:___:___:___:___:___:___ hopeful

important ___:___:___:___:___:___:___ awed

excited ___:___:___:___:___:___:___ calm

unhappy ___:___:___:___:___:___:___ happy

aroused ___:___:___:___:___:___:___ unaroused

cared for ___:___:___:___:___:___:___ in control

relaxed ___:___:___:___:___:___:___ bored

submissive ___:___:___:___:___:___:___ dominant

sluggish ___:___:___:___:___:___:___ frenzied

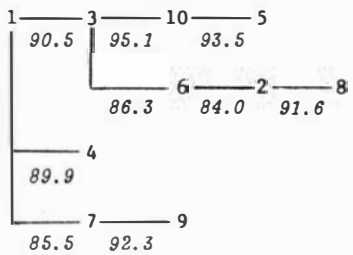
autonomous ___:___:___:___:___:___:___ guided

jittery ___:___:___:___:___:___:___ dull

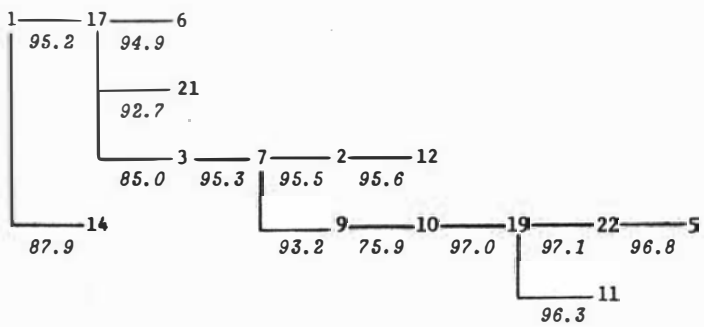
Appendix B:

Minimum Spanning Trees for Figures 1 - 5.

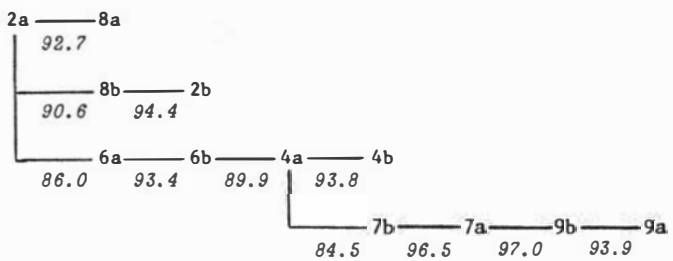
Minimum spanning tree: Figure 1.



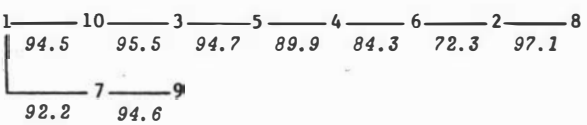
Minimum spanning tree: Figure 2.



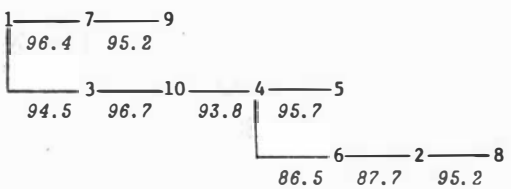
Minimum spanning tree: Figure 3.



Minimum spanning tree: Figure 4.



Minimum spanning tree: Figure 5.



Note. Numbers in italics are similarities.

Appendix C:

Consent Form for Study B.

MB/3

CRY STUDY CONSENT FORM

I _____

of _____

_____

agree to participate in the study being conducted by Mr. M. Brennan of the Education Department, Massey University, and give my consent for Mr. Brennan to:

a. record my infant's crying during the PKU test.
b. obtain details of my infant's medical history from medical records.

I have had the nature and aims of the study explained to me, and understand them.

I understand that my participation in the study is entirely voluntary, and that any information collected during the study will be treated with the strictest of confidence.

_____ _____
signature date

_____ _____
researchers signature date

Appendix D:

Preliminary Medical Information Form for Study B.

MB/1

CRY STUDY

ID _____ Ward _____ Room _____

Name _____ _____ Birth date _____
surname first

Address _____ Birth weight _____

_____ Phone _____ Gest. age _____

Father's name _____ Occupn. _____ Age ___ Apgar - 1 min _____

Mother's name _____ Occupn. _____ Age ___ - 5 min _____

R _____ Marital status _____ No. Chn. ___ Resus. _____

Dr. _____ S.E.S. ___ B.W./G.A. _____

Date PKU test _____ Date discharged _____

Appendix E:

Preliminary Information Sheet for Study B.

CRY STUDY

I am studying infant crying and its effects upon mothers.

I would like to know if you would be willing to participate.

There will be two parts to the study.

The first part will involve taperecording your infant's crying on two occasions:

1. During the PKU test conducted here in the hospital when your infant is 5 days old.
2. In your home, over a 48 hour period, when your infant is one month old.

The second part of the study will involve you. I would like you to describe your infant's cries, and how they make you feel, using descriptive scales.

There will be three of these tasks:

1. To describe your infant's PKU cry and cries from 5 other infants.
2. To describe your infant's crying, as it occurs, during the 48 hour period.
3. To describe the taperecorded cries made during the 48 hour period.

As you can see, your involvement is very important. The purpose of the study is not to judge you, but to obtain as accurate and honest a picture as possible of how crying affects mothers. Obviously, only mothers can provide this information.

If you are willing to participate, I will need your consent to make the PKU cry recordings. Also, as I wish to compare your infant's PKU cry with cries from other infants, I will need some information about your infant's medical history from hospital records. This information will be treated confidentially, and I have permission from the hospital to see the records, provided I have your consent.

I am very happy to answer any questions, and to explain the study in detail.

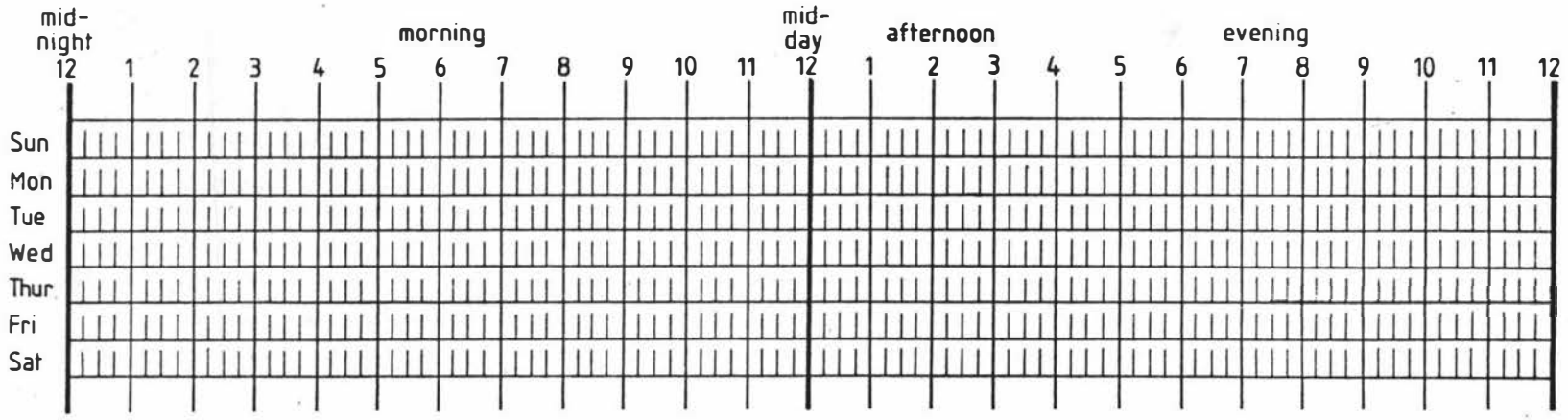
Mike Brennan

Education Department
Massey University
Phone 69099 extn. 2358

Diary form Parent name: _____ (last) _____ Baby's name: _____ Start date: _____

Each of the little boxes stands for 15 minutes.
When you have completed this sheet continue onto another diary form.

For the present diary form: _



Comments:

Sunday

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Appendix G:

Plots of each Infant's Cry Bouts During Study B: Home Phase.

For each mother, each 24 hour recording period is represented by three rows labelled AC, DR and Cry, respectively.
Row AC shows the cry bouts according to the Audio-Clock records.
Row DR shows the mothers' Diary Sheet records. The row labelled Cry shows the times of occurance of cries used in Study B.

Key

Row: AC

▬ = crying

Row: DR

blank = awake but quiet

—— = asleep

X = crying

∿∿ = not home

F = feed

b = bath

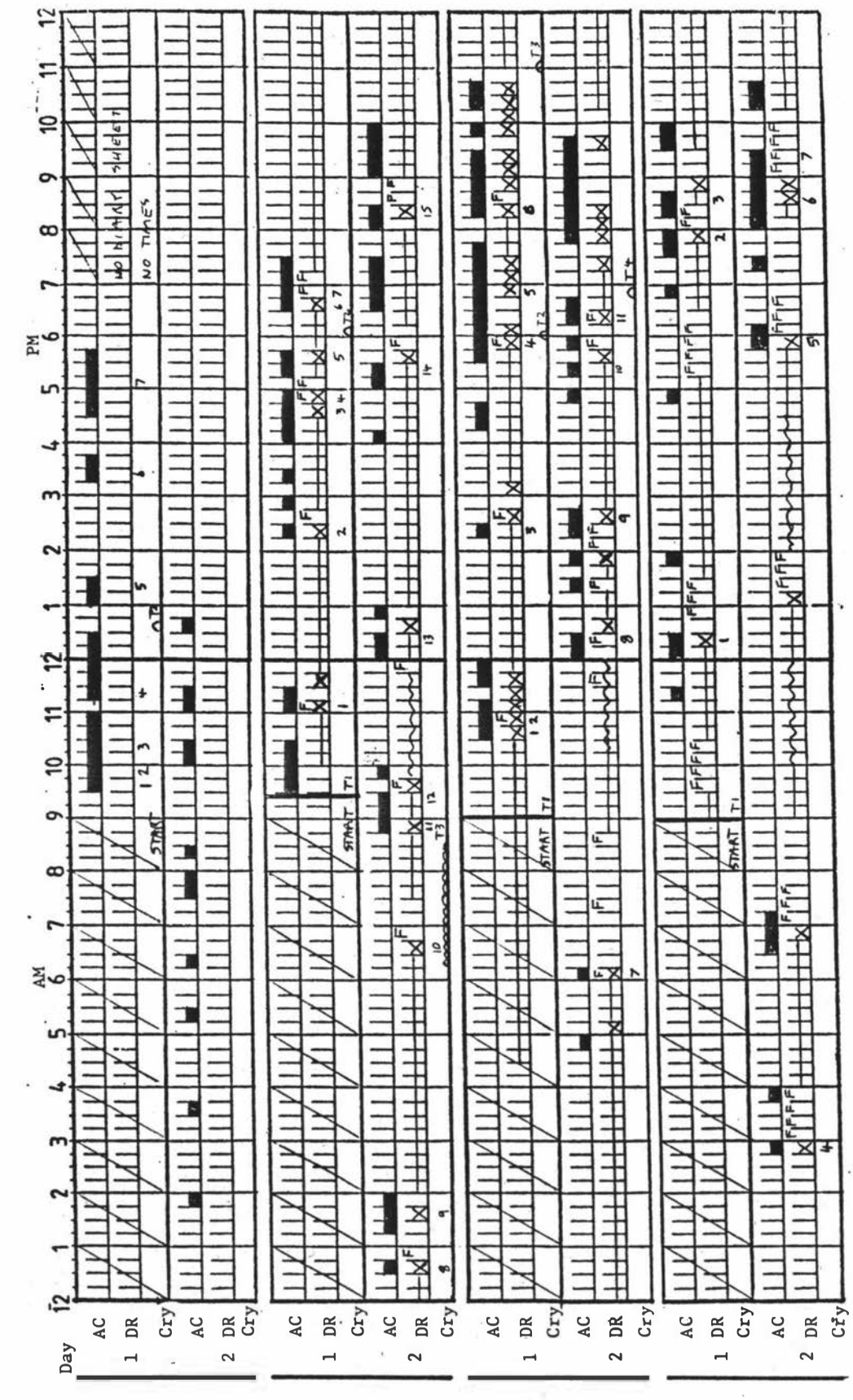
Row: Cry

1, 2, etc. = cry 1, 2, etc.

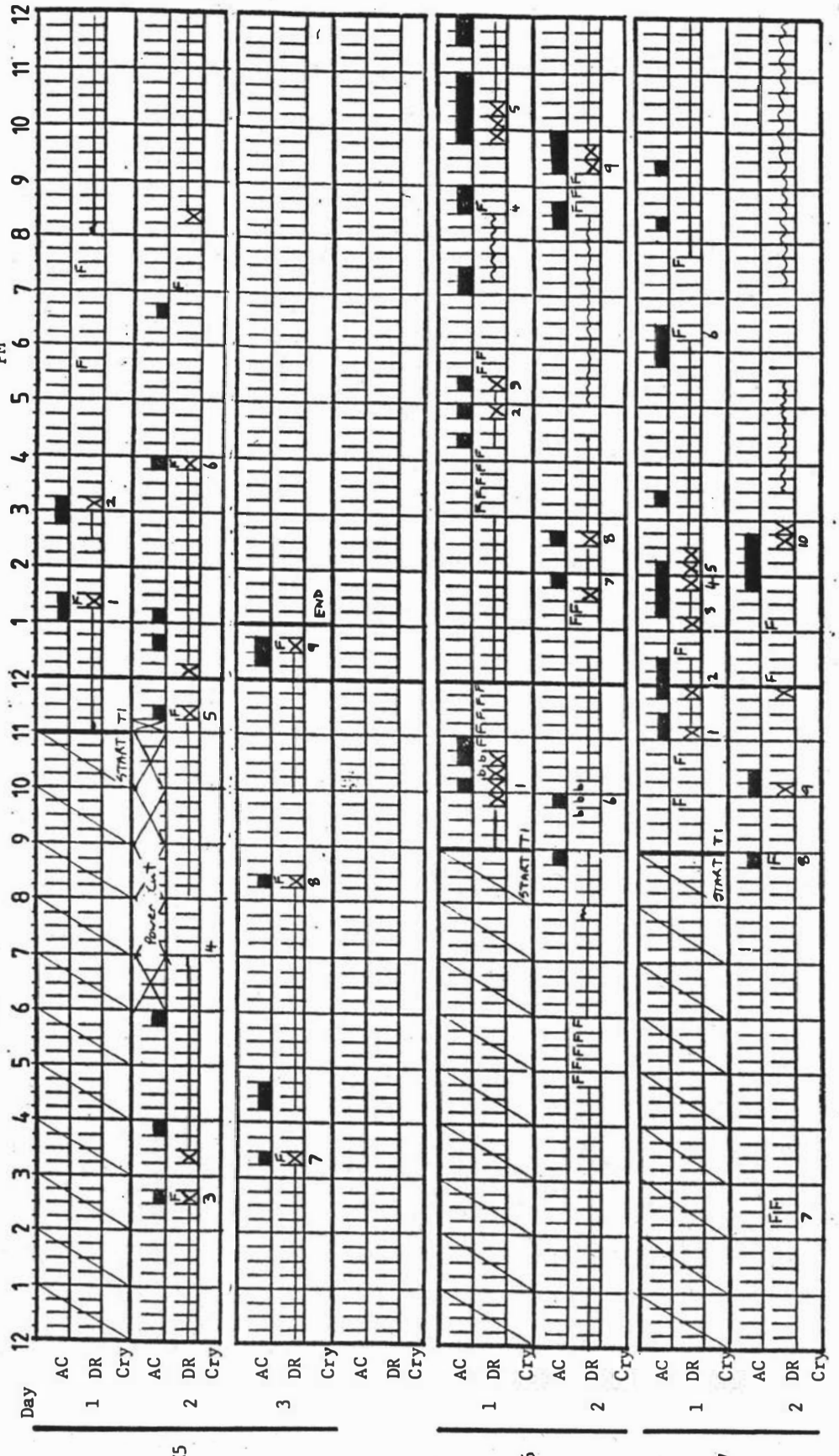
T1, T2, etc. = Tape 1, tape 2, etc.

∿ = Interval between tape changes.

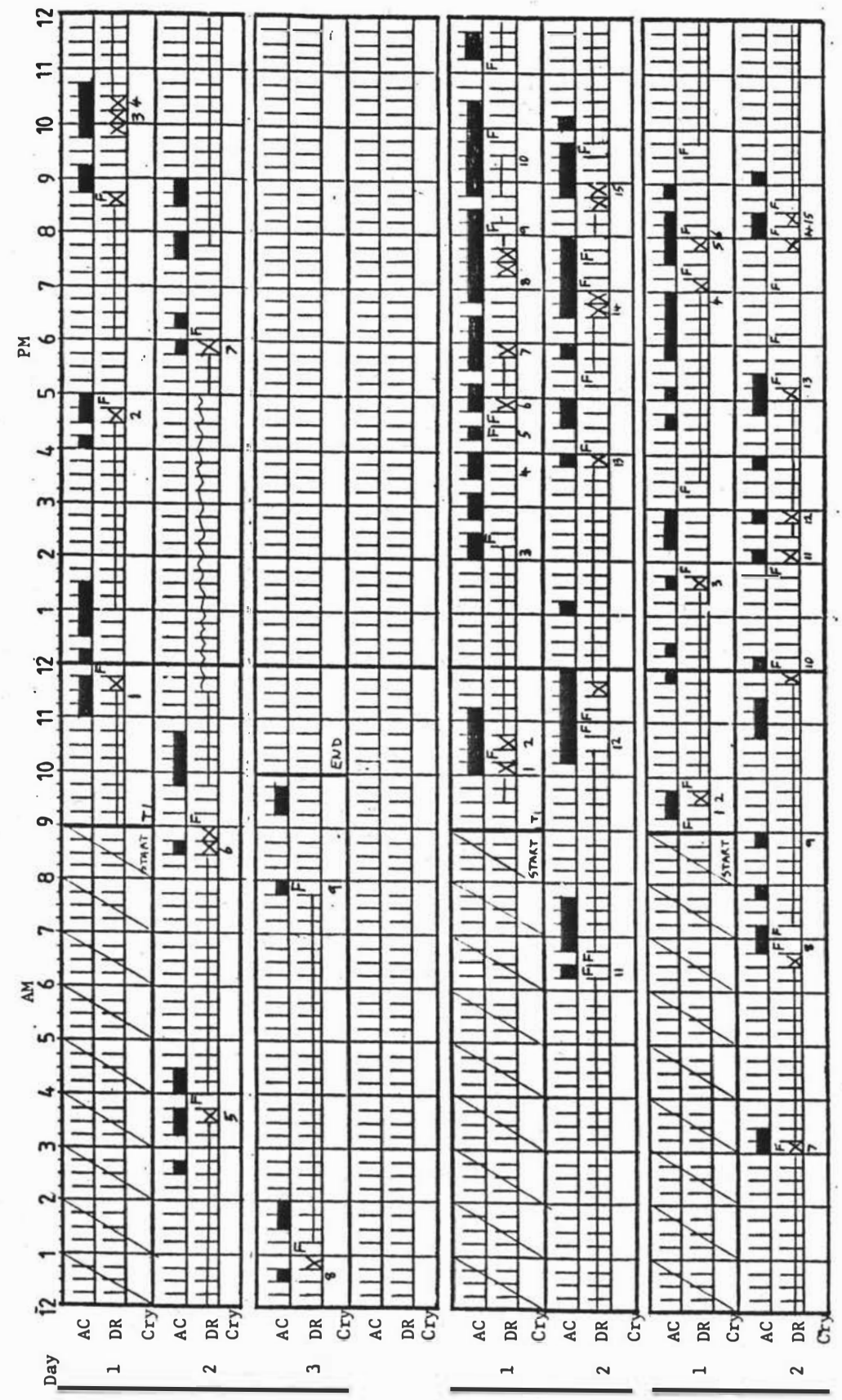
Appendix G -continued



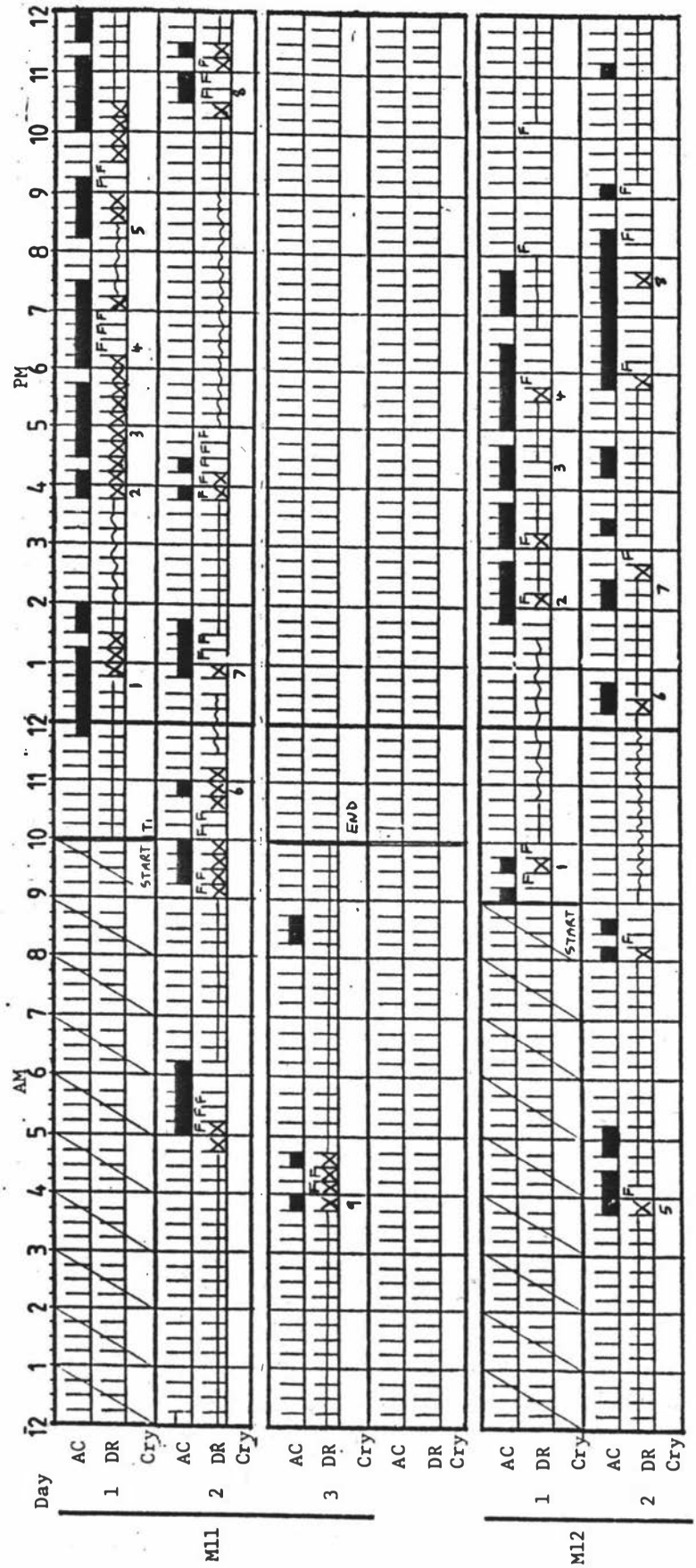
Appendix G -continued



Appendix G -continued



Appendix G -continued



Appendix H:

Instruction Sheet IA for Study B.

INSTRUCTIONS

This booklet contains 7 identical pages of descriptive scales.
On each page there are two sets of scales.
The first set is for describing infant cries.
The second set is for describing how the cries make you feel.

Your task is to listen to 7 short cries and rate each cry in turn on a page of scales. Each cry will be repeated until you have finished the page. Then the next cry will be played repeatedly while you rate it on the next page, and so on.

To use the scales, simply place an X in the scale position that best describes the cry or your feeling. Use your first impression.
For example: A person might describe how they are feeling as

good ___:_X_:___:___:___:___:___ bad
hot ___:___:___:_X_:___:___:___ cold
tense ___:___:___:___:___:___:_X_ relaxed
uncomfortable ___:___:_X_:___:___:___:___ comfortable

On these scales the person has indicated that they feel

quite good
neither hot nor cold
relaxed
and slightly uncomfortable

After completing a page, check that you have not missed any scales. Then turn the page and wait for the next cry.
Before we begin, please read through the scales and circle any that you are not sure of.

Do you have any questions?

Appendix H -continued

Scale Sheet A for Study B.

Describe this cry

pleasant ___:___:___:___:___:___:___ unpleasant

unimportant ___:___:___:___:___:___:___ important

heavy ___:___:___:___:___:___:___ light

arousing ___:___:___:___:___:___:___ soothing

relaxed ___:___:___:___:___:___:___ tense

thin ___:___:___:___:___:___:___ thick

intentional ___:___:___:___:___:___:___ unintentional

large ___:___:___:___:___:___:___ small

meaningful ___:___:___:___:___:___:___ meaningless

agitated ___:___:___:___:___:___:___ calm

weak ___:___:___:___:___:___:___ strong

sincere ___:___:___:___:___:___:___ insincere

Indicate how this cry makes you feel

distressed ___:___:___:___:___:___:___ not distressed

sympathetic ___:___:___:___:___:___:___ unsympathetic

angry ___:___:___:___:___:___:___ not angry

calm ___:___:___:___:___:___:___ agitated

resentful ___:___:___:___:___:___:___ not resentful

not annoyed ___:___:___:___:___:___:___ annoyed

guilty ___:___:___:___:___:___:___ not guilty

anxious ___:___:___:___:___:___:___ not anxious

controlled ___:___:___:___:___:___:___ in control

rejected ___:___:___:___:___:___:___ accepted

Appendix I:

Instruction Sheet IB for Study B.

INSTRUCTIONS

This booklet consists of alternating coloured and white pages of descriptive scales. These scales will be used to describe your infant's crying, your feelings, and your infant's behaviour. There are also some questions to answer.

The coloured pages are all identical, and contain scales for describing your infant's crying and how the crying makes you feel.
I would like you to complete a coloured page BEFORE you attend to your crying infant.
It is most **IMPORTANT** that you record the exact time at which you rate the crying.

The white pages are also all identical, and contain scales for describing how you felt after attending your infant, how your infant responded, and how you were feeling before the crying began.
I would like you to complete a white page AFTER you have finished attending to your infant.

The scales are used in exactly the same way as previously. That is, simply place an X in the scale position that provides the best description.

Remember, I am not judging you. I want you to provide me with as honest and accurate a picture as possible of how you feel when your infant cries at different times during the day and why, as well as descriptions of the crying and your infant's behaviour.

Please check each page to make sure you have recorded the TIME, answered all of the questions, and used all of the scales.

IF POSSIBLE, complete the two pages of scales for EACH BOUT OF CRYING YOU ATTEND during the next 36 hours.

Appendix I -continued

Scale Sheet B for Study B.

DATE _____ (BEFORE) A

Describe your infant's crying at this moment (TIME is _____)

pleasant	___:___:___:___:___:___:___	unpleasant
unimportant	___:___:___:___:___:___:___	important
heavy	___:___:___:___:___:___:___	light
arousing	___:___:___:___:___:___:___	soothing
relaxed	___:___:___:___:___:___:___	tense
thin	___:___:___:___:___:___:___	thick
intentional	___:___:___:___:___:___:___	unintentional
large	___:___:___:___:___:___:___	small
meaningful	___:___:___:___:___:___:___	meaningless
agitated	___:___:___:___:___:___:___	calm
weak	___:___:___:___:___:___:___	strong
sincere	___:___:___:___:___:___:___	insincere

Indicate how this crying makes you feel (TIME is _____)

distressed	___:___:___:___:___:___:___	not distressed
sympathetic	___:___:___:___:___:___:___	unsympathetic
angry	___:___:___:___:___:___:___	not angry
calm	___:___:___:___:___:___:___	agitated
resentful	___:___:___:___:___:___:___	not resentful
not annoyed	___:___:___:___:___:___:___	annoyed
guilty	___:___:___:___:___:___:___	not guilty
anxious	___:___:___:___:___:___:___	not anxious
controlled	___:___:___:___:___:___:___	in control
rejected	___:___:___:___:___:___:___	accepted

What is it about the crying that makes you feel this way?

Why do you think your infant is crying?

Appendix I -continued

Scale Sheet C for Study B.

(WILR) 1

(TIME is _____)

What was the cause of the crying?

What exactly did you do when you attended to your infant?

How did your infant respond?

Indicate how you feel as a result of your infant's response

not guilty	___:___:___:___:___:___:___	guilty
annoyed	___:___:___:___:___:___:___	not annoyed
not distressed	___:___:___:___:___:___:___	distressed
in control	___:___:___:___:___:___:___	controlled
agitated	___:___:___:___:___:___:___	calm
not resentful	___:___:___:___:___:___:___	resentful
accepted	___:___:___:___:___:___:___	rejected
not anxious	___:___:___:___:___:___:___	anxious
unsympathetic	___:___:___:___:___:___:___	sympathetic
not angry	___:___:___:___:___:___:___	angry

What specifically has made you feel this way?

Describe your infant's behaviour after you attended

good	___:___:___:___:___:___:___	naughty
loud	___:___:___:___:___:___:___	quiet
having me on	___:___:___:___:___:___:___	in distress
wouldn't settle	___:___:___:___:___:___:___	settled quickly
accepting	___:___:___:___:___:___:___	rejecting

How were you feeling just before your infant began crying

energetic	___:___:___:___:___:___:___	exhausted
calm	___:___:___:___:___:___:___	agitated
unhappy	___:___:___:___:___:___:___	happy
sociable	___:___:___:___:___:___:___	unsociable
in a bad mood	___:___:___:___:___:___:___	in a good mood

What were you doing when the crying began?

Comments

Appendix J:

Cry Ratings on Set A and Set B: Home Phase and Experimental Phase.

		Home Phase				Experimental Phase			
		Set A			Set B	Set A			Set B
M	C	A1-4	A5-8	A9-12	B1-10	A1-4	A5-8	A9-12	B1-10
M1	1	6656	5655	6643	2144144414	7676	6555	6667	2665635556
	2	7767	6536	7765	1676644413	5555	5333	3655	2655643355
	3	4667	6455	5777	1665645554	6666	5335	5553	3555635535
	4	6566	5225	6776	1512111111	5555	3335	6555	3555533555
	5	7757	6655	7777	2646745564	7777	7676	7777	1777766556
	6	7656	5332	6776	1656642213	6555	5322	5553	3555615555
	7	6656	6564	6776	1556741111	5655	2252	2262	3535323553
M2	1	2334	4334	3455	2217111211	2332	2333	2333	2111111111
	2	1255	3225	2665	2322222222	3222	2222	3262	1111111111
	3	1455	3135	1543	2332622232	4332	2323	3222	6111111111
	4	3343	3334	3555	3432324533	1112	1121	1225	1111111111
	5	3555	5345	5555	5544525545	3333	2223	3233	5323223332
	6	3554	4335	3554	4444435534	4566	6566	5666	2533222222
	7	6555	6455	4555	4425625656	5555	5555	5555	2426324223
	8	3444	4434	5444	3523223222	3223	3332	3234	5222223222
	9	5545	5335	3555	2323223322	5554	4545	5444	3554344442
M3	1	7546	3242	7376	4143114244	5433	1322	3575	1111111212
	2	5777	6665	7177	1676544444	7777	7662	7677	1525644334
	3	7767	6576	7477	1777474444	7777	7777	7177	1677354414
	4	4656	3234	6267	1322144444	5767	5753	5174	1351524424
	5	6746	5554	7377	1365344446	5757	6564	6277	1323411214
	6	6777	7561	7177	1555544244	6766	7642	5277	1563544344
	7	4666	3752	6177	1353645444	7777	6356	7177	1152324114
	8	5757	6556	4577	1551144144	5745	5573	5477	1352354434
	9	4636	5236	6277	1421142114	5666	5543	5177	1555544344
M4	1	4455	5345	5565	3424444434	5455	5555	5555	3454454444
	2	4555	5555	5555	2454533333	4555	5355	5555	3344443334
	3	5665	6656	6555	3555453445	4555	5555	5554	3453444444
	4	5656	5665	5666	3455435343	5555	4545	5555	3334434344
	5	4555	5455	6566	2341344444	4434	3334	5545	3444544443
	6	4555	5455	5555	3555444444	5555	5555	5555	3455454444
	7	4555	5555	5555	3455434444	5655	6655	5555	3554454445
M5	1	4746	4444	7777	1111111114	5555	4444	6555	3111111114
	2	4645	4234	4677	4111111114	4444	4444	4454	3111111114
	3	4655	4444	7776	2111111113	4545	4444	3555	3114111114
	4	4544	4434	6566	2111111114	5555	5355	5555	3111111114
	5	4555	4444	7566	4111111114	4544	4444	4554	3111111114
	6	4656	4444	6776	3111111114	4445	4444	5555	4111111114
	7	5656	4444	6666	2112111114	5555	5555	5555	3111111114
	8	4544	4434	5555	4111111114	4445	4444	5555	3111111114
M6	1	3444	4344	4555	3443333234	5454	3324	5434	3223232324
	2	4453	3434	3433	4433334443	2443	2114	2424	5133233334
	3	4554	4334	4444	4443333434	3344	4335	5554	3343333333
	4	5554	5555	5554	3544444444	3343	4333	5554	4443232334
	5	6566	6566	6665	3666666666	6665	5565	6665	3556554355
	6	6556	6565	6666	3322222233	7777	7777	7777	1777651146
	7	5544	5454	5444	3322222223	5656	6666	5665	2663232234
	8	6554	5455	6555	3343433233	7765	6656	6655	3433223244
	9	5565	5556	5555	3555435544	7777	7777	7777	4777677776

Appendix J -continued

Cry Ratings on Set A and Set B: Home Phase and Experimental Phase.

		Home Phase				Experimental Phase			
		Set A			Set B	Set A			Set B
M	C	A1-4	A5-8	A9-12	B1-10	A1-4	A5-8	A9-12	B1-10
M7	1	4333	3124	1331	5111111111	2233	3222	1221	7111111111
	2	5536	5535	5533	6212111111	5233	3324	2522	5212112122
	3	3657	4322	2525	6422111321	2556	5356	2322	2212111112
	4	5566	5354	5655	6515112555	5443	3323	3223	5212111221
	5	2332	3222	6565	3111111111	4235	4554	2722	6213112223
	6	3345	2323	2522	6212112221	5665	5445	5565	3211112122
	7	5556	4554	5565	5525212343	7667	6566	6676	2615212233
M8	1	1447	7774	4774	4111144411	7774	7774	7774	4444414114
	2	6777	7777	1144	7444434164	7777	7777	7774	4414414444
	3	7774	7777	1474	4447444774	4747	7774	7474	4144414114
	4	4711	7111	7774	4411711144	4441	1111	1144	4444413414
	5	1411	1111	7744	1111711114	1444	1111	1444	4111713114
	6	4747	7777	7474	4141714114	4414	1111	1444	4114414113
	7	4747	1111	4744	4414714744	4774	7777	7774	4454711114
M9	1	4445	4244	4566	3111111214	3442	2323	5554	2152221214
	2	6665	6655	2453	6555555554	6666	5554	6666	2566342244
	3	2435	3123	4665	2111111111	2211	2221	2112	4111111114
	4	4535	5254	3554	4453342334	6344	3334	3343	5123233434
	5	3435	3233	2542	4354342434	5335	3333	3253	6255233244
	6	4433	3333	1553	5455444534	3444	4333	4535	6243323344
	7	4435	3333	3443	5555444554	6555	5553	6666	3452441214
	8	6677	6677	6776	2666454547	3344	3333	3433	6232211213
	9	5545	5444	4344	5566665664	6656	5654	6665	3444322224
M10	1	5253	4245	2545	2335445544	2533	3112	1313	1142411114
	2	5666	6366	2667	1176472424	6533	3252	2553	3552225624
	3	3353	2113	7664	1451111114	7777	6777	7776	2667221224
	4	7766	7666	7776	2666224624	6777	7676	6777	1777611113
	5	7655	5232	2355	3166626664	1725	2112	1154	5143411214
	6	7634	4233	2535	3455665654	5565	3223	4535	3234424244
	7	6654	3215	7676	2114716724	6545	2112	4656	1212511114
	8	7656	5563	6666	7646117774	1117	1111	1111	7111111111
	9	7676	6656	6666	3455414244	6774	4111	2655	1777771114
M11	1	2714	5142	7777	1111111111	4653	3225	6165	1112241111
	2	2735	5445	7176	1111111111	5663	6456	7776	2222341111
	3	5757	6756	6376	3355411231	4765	6425	7174	1111211111
	4	5767	6576	6174	2522441213	6655	3423	7667	1112141111
	5	5766	5556	6276	2353211111	3666	5566	7776	1112341111
	6	4755	3325	5565	2162311111	4753	3335	7766	2123341112
	7	3733	3323	7777	1111141111	3732	2212	7666	1112141111
	8	2554	6353	1767	1111111111	4543	2223	6566	2212341112
	9	5323	1322	5557	2112351112	5533	3233	2556	2111241111
M12	1	5555	5555	5555	3555445544	4545	3222	5555	4333243243
	2	5555	5555	5555	3554353324	6555	5555	6555	3553353535
	3	6555	5555	6555	3555555555	6555	6455	5565	2666653225
	4	5555	5353	5555	3522222222	6566	3443	5565	3455535555
	5	4655	3223	5555	2411211111	3555	3323	4555	3354333333
	6	5545	1522	5555	4323222222	6555	4545	6555	4555435345
	7	5565	3545	6555	3522222222	5556	3333	5555	3563323225
	8	6666	6656	6556	3555535545	5555	3533	6555	3533535255

Note. M = Mother
C = Cry

GLOSSARY

This Glossary is presented in order to provide ready clarification of acronyms used in the text in reference to the various semantic differential scales.

BK1 Scales B1 - B5 from the BK15 scale set, representing a factor labelled Affect. The scales are: pleasant/unpleasant (B1), soothing/arousing (B2), relaxed/tense (B3), happy/sad (B4), and calm/agitated (B5).

BK2 Scales B6 - B10 from the BK15 scale set, representing a factor labelled Potency. The scales are: heavy/light (B6), deep/shallow (B7), strong/weak (B8), large/small (B9), and thick/thin (B10).

BK3 Scales B11 - B15 from the BK15 scale set, representing a factor labelled Evaluation. The scales are: important/unimportant (B11), intentional/unintentional (B12), colourful/colourless (B13), meaningful/meaningless (B14), and sincere/insincere (B15).

BK15 The set of 15 7-point semantic differential factor-scales reported by Brenman and Kirkland (1983), representing three independent factors labelled Affect, Potency, and Evaluation. In Study A, these factors are referred to as BK1, BK2, and BK3 respectively, and individual scales are labelled B1 - B15.

F1 Scales A1 - A4 from the Set A scale set, representing a factor labelled Affect. The scales are: pleasant/unpleasant (A1), soothing/arousing (A2), relaxed/tense (A3), and calm/agitated (A4).

F2 Scales A5 - A8 from the Set A scale set, representing a factor labelled Potency. The scales are: weak/strong (A5), light/heavy (A6), small/large (A7), and thin/thick (A8).

F3 Scales A9 - A12 from the Set A scale set, representing a factor labelled Evaluation. The scales are: unimportant/important (A9), unintentional/intentional (A10), meaningless/meaningful (A11), and insincere/sincere (A12).

MR1 Scales M1 - M6 from the MR18 scale set, representing a dimension labelled Pleasantness/Unpleasantness. The scales are: relaxed/bored (M1), happy/unhappy (M2), hopeful/despairing (M3), contented/melancholic (M4), pleased/annoyed (M5), and satisfied/unsatisfied (M6).

MR2 Scales M7 - M12 from the MR18 scale set, representing a dimension labeled Degree of Arousal. The scales are: jittery/dull (M7), frenzied/sluggish (M8), aroused/unaroused (M9), excited/calm (M10), stimulated/relaxed (M11), and wide awake/sleepy (M12).

MR3 Scales M13 - M18 from the MR18 scale set, representing a dimension labelled Dominance/Submissiveness. The scales are: autonomous/guided (M13), dominant/submissive (M14), in control/cared for (M15), important/awed (M16), influential/influenced (M17), and controlling/controlled (M18).

MR18 The set of 18 7-point semantic differential scales reported by Mehrabian and Russell (1974a), representing three independent dimensions of affect labelled Pleasantness/Unpleasantness, Degree of arousal, and Dominance/submissiveness. In Study A, these dimensions are referred to as MR1, MR2, and MR3 respectively, with individual scales labelled M1 - M18.

Set A A subset of the 7-point semantic differential scales reported by Brenman and Kirkland (1983), representing three independent factors labelled Affect, Potency, and Evaluation. In Study B, these factors are referred to as F1, F2, and F3 respectively, and individual scales are labelled A1 - A12.

Set B A set of 10 7-point semantic differential scales describing affective reactions. Labelled B1 - B10 in Study B, the scales are: unsympathetic/sympathetic (B1), not distressed/distressed (B2), not anxious/anxious (B3), calm/agitated (B4), in control/ controlled (B5), not guilty/guilty (B6), not resentful/resentful (B7), not annoyed/annoyed (B8), not angry/angry (B9), and accepted/ rejected (B10).

ZL8 The eight 7-point semantic differential scales reported by Zeskind and Lester (1978). Labelled Z1 - Z8 in Study A, the scales are: not piercing/piercing (Z1), pleasing/grating (Z2), soothing/arousing (Z3), comforting/discomforting (Z4), nonaversive/aversive (Z5), not distressing/distressing (Z6), healthy/sick (Z7), and not urgent/urgent (Z8).