Responsiveness in Newborn Infants of Normal Weight and Overweight Parents

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RESPONSIVENESS IN NEWBORN INFANTS OF NORMAL WEIGHT AND OVERWEIGHT PARENTS

A Dissertation
Presented to the Faculty of the Graduate School of
Yale University
in Candidacy for the Degree of
Doctor of Philosophy

Robert Michael Milstein

May, 1978
ABSTRACT

RESPONSIVENESS IN NEWBORN INFANTS OF OVERWEIGHT AND NORMAL WEIGHT PARENTS

Robert Michael Milstein

Yale University, 1978

In exploration of the relation between obesity and heightened responsivity to prominent stimuli, an examination was made of the visual and taste responsiveness of 1-3 day old babies whose parents were both overweight or were both of normal weight. Twelve infants of overweight parentage (OP) and 12 infants of normal weight parentage (NP) were presented with three different intensities of a red stripe, and with three different concentrations of a glucose solution followed by sterile water. Orientation of gaze in the observations of vision was assessed by the corneal reflection technique, and measures of gaze location and shift were analyzed by computer. Root mean square analyses of sucking waveforms from the observations on taste were also performed by computer.

Regardless of parentage, infants preferred glucose to water and preferred higher concentrations of glucose to lower. Babies decreased their response to water over time as a function of the concentration of the preceding glucose solution, with the most rapid initial decrease occurring after the
glucose solution of intermediate concentration. Babies' first visual shifts occurred soonest with an intermediate intensity stripe.

In addition to general effects of stimulus manipulations, results indicated differences in visual and taste responsiveness between NP and OP babies. OP babies' average responses to water following glucose were lower than those of NP babies. Presented with a novel stripe in the visual field, OP babies shifted their gaze significantly more often and with greater magnitude than NP babies did. These findings in babies parallel differences in taste-determined eating behavior and distractability reported in research comparing normal weight and overweight adults.

NP and OP babies did not differ significantly on a variety of physical and developmental measures: Estimated gestational age, birthweight, skinfold thickness (SFT), and weight/length$^2$ (BMI) were similar for the two groups. Supplemental analyses of the taste data, classifying babies according to SFT and BMI, indicated that while most babies preferred increasingly sweet solutions, "thin" babies did not.

The finding of differences in responsiveness at birth related both to parents' weight status and to infant adiposity has implications for the etiology of moderate obesity. Details of the relation between the response measures studied and infants actual eating behavior remain for future research,
but on the basis of the present study, a hypothesis about the relative risk of an infant's becoming overweight is proposed. It is suggested that "thin" infants of normal weight parentage are least at risk, given their relative aversion to high concentrations of sweet and the fact that, on the average, they may be less responsive to environmental food cues. Babies of moderate or greater adiposity whose parents are overweight constitute the greatest risk, bringing both heightened responsiveness and a preference for sweet to an environment likely to abound in food cues.
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Evidence from several lines of research on the problem of obesity invites a unifying interpretation in which the perceptual functioning of newborn infants may play a key role. First, research with adults done by Schachter and his colleagues (Schachter, 1968, 1971; Schachter & Rodin, 1974) has indicated that the eating behavior of overweight adults is far more responsive than that of normal weight people to environmental cues like the taste and sight of food (Nisbett, 1968a, 1968b), the time of day (Schachter & Gross, 1968), and the visual prominence of food cues (Ross, 1974). Interestingly, this heightened sensitivity to prominent cues has been demonstrated not only in relation to the taste of food and eating behavior but also for a diverse group of perceptual phenomena involving vision (Rodin, Herman, & Schachter, 1974), attention (Rodin, 1973; Rodin & Goodman, note 1), and information processing (Pliner, 1974; Rodin, 1975; Rodin & Singer, 1976). In all of these domains, overweight people have on the average been more responsive to prominent stimulus dimensions and less affected by weak cues than normal weight people. Normal weight volunteers made obese experimentally through overfeeding do not develop this stimulus sensitivity (Decke, 1971), and the stimulus sensitivity of overweight individuals does not disappear with weight reduction (Rodin, Slochower, & Fleming, 1977).
A second important line of research into the problem of obesity has been the work of Hirsch and his colleagues (Knittle & Hirsch, 1968; Hirsch & Knittle, 1970) on the effects of early nutritional levels on the cellular development of the adipose tissue mass. Overnutrition during the first years of life, which often leads to early-occurring obesity, apparently results not only in increased fat per cell but also in an increased number of cells (Brook, 1972; Brook, Lloyd, & Wolff, 1972). This relative proliferation does not appear to decrease with subsequent diet and weight loss; rather, the number of cells remains the same but the average cell size decreases. By contrast, later-occurring obesity is accompanied by an increase in average cell size but not in cell number. As for early onset obesity, weight loss in later onset obesity appears to be mediated by cell shrinkage rather than a reduction in cell number.

Schachter and Rodin's notion of heightened responsivity in the overweight and Hirsch's hypothesis about the importance of nutritional level in the first year of life, taken conjointly, point up the importance of finding out if this sensitivity to prominent cues seen in the adult functions from birth. If feeding is influenced by the infant's responsivity to attractive food cues and if abundant and relatively good tasting food is available, then the more responsive infant may overeat and risk the proliferation of fat cells described by Hirsch. In this kind of model, heightened responsiveness
would lead to overweight.¹ A key question for the model is whether the perceptual differences observed between normal weight and overweight adults are to be found at birth, and to what characteristics of parents or infants such differences may be related.

Data from obesity research on familial occurrence (Gurney, 1936; Bauer, 1945), sex ratios (Angel, 1949), weight in identical as compared to fraternal twins (Newman, Freeman, & Holzinger, 1937; von Verschuer, 1927; Withers, 1964), and biochemical defects demonstrated in animal models (Bray & York, 1971) all point to a role of heredity as at least a partial contributor to the development of obesity. Several observers have noted the possible adaptive advantage of obesity as a thrifty trait (see Mann, 1974). In a primitive environment, when prey and meals may have been more infrequent, the ability to store as much energy as necessary or possible may have had survival value. It is only in today's environment of abundant food and leisure that positive energy balance presents a major problem. Sensitivity to prominent cues may also have had selective advantage in getting food or avoiding danger in a more primitive environment. These evolutionary speculations, together with the data from genetic studies, suggest the importance of comparing the responsivity

¹External responsiveness has been shown to predict the influence of a novel feeding environment upon eating and weight (Rodin & Slochower, 1976) even in normal weight persons.
of newborn infants both of whose parents are overweight to that of infants whose parents are both of normal weight.

Consideration of both parents' weight status is important from several theoretical and operational standpoints. First, data from family studies have illustrated the role of similarity of parents' weight in the incidence of obesity. Gurney (1936) found that if both parents were stout, 73% of the offspring were stout, whereas if only one parent was stout, 41% of the offspring were stout. When both parents were lean, only 9% of the offspring were stout. Second, given a putative hereditary characteristic of unknown mechanism, the probability of observing that characteristic in offspring is maximized by selecting parents who are phenotypically similar for that characteristic. Third, results of past research on obesity and external responsiveness (Rodin, Herman, & Schachter, 1974; Nisbett, 1972) indicate that the association of heightened responsivity with obesity is limited by the degree of overweight: Individuals who are grossly obese (more than 50% overweight by actuarial standards) actually respond similarly to those who are of normal weight. Such a finding suggests that, in an investigation of possible infant responsivity correlates of parental overweight, sampling criteria should include constraints for range of overweight.

While the relation between parental overweight and infant responsiveness has not yet been examined, a few
studies (Nisbett & Gurwitz, 1970; Desor, Maller, & Turner, 1973; Engen, Lipsitt, & Robinson, 1978) have examined the
association of birthweight and taste responsiveness in newborn infants. Nisbett and Gurwitz (1970), who divided the babies in their study into three groups by weight, found a 28% greater consumption of sweetened as opposed to unsweetened formula in heavy infants, while for medium and light babies the difference was only 8%. Engen et al. (1978), in a correlational reanalysis of the data of Engen, Lipsitt, and Peck (1974), report a positive relation between birthweight and the number of sucks to a sugar solution. However, Desor, Maller and Turner (1973) found that the tendency for heavy infants to show a greater preference for sweeter solutions varied with the way the sample was divided into weight categories.

Viewed across studies, the relationship of birthweight to taste responsiveness is unclear. However, even if the relation of birthweight and responsiveness is confirmed, interpretation is difficult. Either heaviness per se, adiposity, or gestational maturity may underlie the phenomenon. Prior research has failed to make these distinctions or to clarify the contribution of father's as well as mother's weight status. An additional problem arises from indications that taste responsiveness may be altered by fluctuations in nutritional needs (Cabanac, Minaire, & Adair, 1968; Rodin, Slochower, & Fleming, 1977). For more stable
assessment, and for greater breadth of possible analogy to findings with adults, responsiveness of the newborn should be examined in another perceptual modality besides taste.

Studies of newborn perception suggest that differential responsivity may be appropriately examined through the modality of vision (see Kessen, Haith, & Salapatek in Mussen, 1970, for a review) as well as taste (Nowlis & Kessen, 1976; Desor, Maller, & Turner, 1973). Kessen and his colleagues as well as other investigators (for recent reviews see Bronson, 1974; Fantz, Fagar, & Miranda, 1975; Haith, in press) have looked at congenital strategies for visual scanning in the newborn and have found that, in the midst of considerable individual variation among infants, elements such as edges and contours of figures are high in attractiveness and receive a major share of the newborn's gaze. Peripheral targets (Tronick, 1972; Harris & MacFarlane, 1974) and, in particular, vertical bars of light (Kessen & Milstein, note 2) have been shown to be effective in shifting the direction of gaze. The role of the intensity of a peripheral stimulus in effecting shifts of gaze has yet to be examined.

Thus, paradigms exist in the modalities of vision and taste which afford both an opportunity to look for the kinds of differences in responsivity found in overweight as compared to normal weight adults, and a chance to enlarge the knowledge of newborn infant perceptual functioning in general.
In the present study, in further exploration of the relation between obesity and stimulus sensitivity, an examination was made of the taste and visual responsiveness of babies of parents who were both overweight or who were both of normal weight.
Method

Subjects

Subjects for the study were 24 newly born human infants, 27 to 74 hours of age. Five criteria were used in the selection of subjects: (a) Either both parents were of normal weight (between -15% and +10% of average weight for sex, age, and height) or both parents were overweight (between +15% and +50% of average weight for sex, age, and height) by actuarial standards; (b) the parents were married; (c) neither of the parents had a demonstrated metabolic or endocrine disorder; (d) the mother and infant had had a normal pregnancy and delivery; and, (e) the infant had a five-minute APGAR score at least as high as 7 and was judged healthy on examination by physicians during his or her nursery stay.

During a 16-month period, a two-level search for infants meeting these criteria was carried out on the maternity service of Yale-New Haven Hospital. Screening of more than 5,000 delivery records yielded 633 mothers who

\(^2\) See Appendix A for a table of ranges of weight according to sex, age, and height. Values in that table were derived from average values reported in the Society of Actuaries Build and Blood Pressure Study (1959).

\(^3\) Concern for obtaining accurate health and background information on both parents and for maximizing both parents' participation required the admission only of married couples.
potentially fit the criteria. A brief interview with each of these women served to explain the study and to obtain further health, physical, and occupational information about both parents. Consent for participation in the study was sought for subjects thus confirmed to be suitable. Observations of 26 infants of overweight parents and 36 infants of normal-weight parents were commenced; malfunction of equipment or problems with the infant's condition (swollen eyelids, falling to sleep, or extreme irritability or distress) resulted in the failure of 14 infants of overweight parents and 24 infants of normal-weight parents to complete the course of all parts of the experiment. Complete observations were obtained on 24 infants in all; 6 male and 6 female infants of overweight parents and 6 male and 6 female infants of normal-weight parents.

Design

The 24 subjects participated in both a taste and a vision experiment. In a repeated-measures design, each infant was exposed to three different intensities of visual stimulus and to three different concentrations of a solution of glucose in water. Twelve pairings of one of the six possible sequences of visual stimuli with one of the six possible sequences of taste stimuli were generated at random with the constraint that there be two instances of each possible visual sequence and of each possible taste sequence.
For each of two groups, children of overweight parentage (OP) and children of normal-weight parentage (NP), infants were assigned at random to one of the 12 pairings of sequences; thus vision and taste sequences were counterbalanced across infants and groups.

Procedure

Observations of babies took place at varying times of day, between 6 AM and 2 AM. At an average of 4 hours after the most recent feeding (range = 2.75 to 6.00 hours), the baby, if open-eyed and alert, was carried from the nursery or mother's room to the observation laboratory.

Prior to the infant's arrival, surfaces in the laboratory were disinfected, the taste apparatus and pacifiers had been autoclaved and allowed to cool, taste solutions had been withdrawn from the refrigerator to equilibrate to room temperature, and electronic equipment was turned on for required warm-up periods. A polygraph, which was on during the entire observation, served as a background noise source to mask potentially distracting noises that may have occurred outside the room.

Inside the small dimly lit laboratory, the observation proceeded in three parts: a vision experiment, a physical and developmental assessment, and a taste experiment—typically in that order. Two experimenters ran each observation. One experimenter supervised stimulus presentation and
recording equipment; the other tended to the infant, monitoring and dealing with changes in position, state, or possible distress. Use of two experimenters and division of responsibilities insured ignorance of the stimulus condition on the part of the researcher interacting with the infant.

Dressed in a clean diaper and shirt, the baby, with the left eye occluded by a Dermicel sterile pad, was swaddled in a blanket and placed supine in a padded crib. The crib in turn was placed inside a curtained apparatus which provided stimulus-presentation and eye-movement monitoring equipment for the vision experiment. A videorecording of the infant's eye was begun as the baby lay watching the stimulus field above him. For several minutes, the stimulus field remained blank, allowing time for the baby to adapt to his new situation and for the experimenter to adjust the infant's position and distance from the field. The camera lens was preset to focus sharply at a plane nine inches (22.86 cm) ± 0.1 inches (0.254 cm) below the stimulus field, permitting the infant's eye to be positioned accurately by keeping it in sharpest focus. Throughout the experiment, the position of the infant's head was maintained relatively stable by the experimenter's holding a blind silicone rubber nipple in the infant's mouth.

At first, a medium intensity vertical red stripe appeared alone, two inches (5.08 cm) to the infant's left of center of the field. After 15 secs, this stripe was joined
on the opposite side of the field (5.08 cm to the right of center) by another vertical red stripe for an additional 15 secs. Intensity of the second stripe was greater than, equal to, or less than the intensity of the original stripe. Following an intervening period of blank field for 15 secs, the sequence was repeated twice more, for a total of three times, once for each possible intensity of second stimulus.

Following the vision experiment, a multi-part physical and developmental assessment was begun. The infant was weighed and then placed on an examining pillow. Crown-to-heel length and head circumference were measured. Eight skinfold thicknesses were determined: left and right mid-triceps, subscapular, and suprailliac skinfolds; and supra- and infra-umbilical abdominal skinfolds. These determinations were made by first palming a pinch of skin with thumb and forefinger (making sure not to include underlying muscle in the fold), and then applying a caliper and reading, after several seconds, the first stable measurement. A Yale-New Haven Hospital modification of the Dubowitz (Dubowitz, Dubowitz, & Goldberg, 1970) gestational age assessment was then performed (see Appendix A). Briefly, in this examination, a variety of physical characteristics (skin color, quantity and quality of hair, springiness of ear cartilage, joint mobility, condition of genitalia, visibility of superficial vessels on chest and abdomen, creases on soles of feet) and neurological reflexes
(rooting, Moro, grasp, pupil) are used to estimate the gestational maturity of the baby.

In the taste experiment which followed, one experimenter, seated cradling the baby between one arm and his lap, offered the infant solutions through a nipple delivery system. Three different concentrations of glucose solution were offered in alternation with sterile water on successive trials, for a total of six trials. Each fluid, beginning with a glucose solution, was offered by introducing the nipple into the baby's mouth, and once it was accepted, leaving it there until the other experimenter, who was monitoring the assignment and level of the fluid reservoirs, signalled that 2 ml had been consumed. The first experimenter then removed the nipple from the infant's mouth and held it over a waste receptacle while a digital pump pushed 4 ml of the next fluid (in this instance, sterile water) through the delivery system, forcing out the remainder of the previous solution. This flushing operation required about 20 seconds. The entire procedure was repeated for a total of six trials. The observation was then concluded, and the infant was returned to the nursery or his mother's room.

Several different procedures were used to deal with marked variations in the state of the infant (falling asleep

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4In order to minimize the role of post-ingestional factors in the infant's response, intake of the test solutions was restricted to a small volume.
or distress) or other interruptions. If during the course of the vision experiment, for example, the infant's eye closed for more than several seconds, or the infant became distressed, the experimenter removed him from the apparatus and crib, and tended to him. Eventually, the experimenter replaced the baby in the crib to complete the experiment, proceeded with another part of the observation, or returned the infant to the nursery. If, during the physical and developmental assessment, the infant fussed or the experimenter was unable to elicit some reflex or obtain some measurement, further attempts were made later in the observation, or, if necessary, the infant was brought back to the observation room sometime during the next few days of his hospital stay. In the taste experiment, on rare occasions of infant distress, or if the infant needed to be burped, breaks between solutions were somewhat longer than usual. In the case of a few excessively long interruptions, solutions were repeated to repair the temporal continuity of sugar and water trials. In sum, the difficulty of obtaining babies meeting our sampling criteria dictated returning the baby to the experimental situation as many times as necessary and possible (usually once, rarely three times, and never more than four), in order to obtain a completed observation with an alert and undistressed infant.
Stimulus Materials

**Taste experiment.** Stimuli were four different fluids: sterile water, and three concentrations of glucose in sterile water. The three concentrations--0.20 molar (M), 0.41M, and 0.85M--were chosen on the basis of previous work with infants (Nowlis & Kessen, 1976; Desor, Maller, & Turner, 1973), work with overweight adults (Rodin, Moskowitz, & Bray, 1976), and psychophysical taste scalings with adults using the technique of magnitude estimation (for a discussion of this technique, see Marks, 1974). Scalings were performed with a wide range of concentrations of glucose (0.03M to 1.46M) followed by water to determine which concentrations reliably led to increases in estimated magnitude of sweet taste and increases in estimated magnitude of a sour, bitter, or unpleasant water taste. The three concentrations finally chosen were the most reliable in the adult scaling, formed equal intervals on a log concentration scale (Δ log concentration = 0.31), and elicited obvious variation in sucking response during pilot work with 10 babies.

**Vision experiment.** Stimuli were two red vertical stripes, one appearing first alone and then joined by the other, the center of each located 5.08 cm (12.5° of visual angle) from the center on opposite sides of a plain dark field (see Figure 1). Stripes were produced by two telephotometrically-matched Sylvania Lumiline 40 watt tubular incandescent bulbs transilluminating an Edmund Scientific...
Figure 1. Visual stimulus field.
(number 823—Medium Red) acetate filter and a brushed, matte-finished plexiglass diffusing screen. Shielding and masking between the bulbs and the filter produced a stripe with well-defined edges, measuring 10 in. (25.4 cm) by 0.25 in. (0.635 cm) and subtending 56.9° by 1.5° of visual angle. The low, medium, and high intensity levels of the stripes were preset with dimmers to values the logarithms of which formed equal intervals (Δ log L = 0.46). These intensity levels were judged by adults to be easily discriminable, well above threshold, below discomfort, and of consistent hue. The stripes were then pretested with 10 babies to be sure that each level would attract some visual fixations. Luminances of these three levels, as measured with a Gamma Scientific Model 2000 Telephotometer, were: 0.8075 footlamberts (2.7667 cd/m²), 2.270 footlamberts (7.7776 cd/m²), and 6.725 footlamberts (23.0146 cd/m²). Background luminance (ambient illumination reflected from the plain dark field) was 0.015 footlamberts (0.0514 cd/m²).

The acetate filter had a bandpass width of from 600 to 800 nm, with a peak transmittance of 90% at 695 nm. Telephotometric measurement of luminance of the stripes at 20 nm intervals, from 600 to 700 nm revealed peak values at 640 nm for all three intensities of our light source. The spectral curves plotted for three source intensities from logs of the luminance values across wavelengths were parallel (see Figure 2), suggesting (together with the evidence from
Figure 2. Spectral curve of log luminance of red stripe at three source intensities.
adult judgments) that hue remained constant across the manipulation of source intensities.

Apparatus

Physical and developmental assessment. Equipment for measurement and examination of the infant included a Continental Health-o-meter Pediatric weighing scale (metric model), a Lange skinfold caliper (Cambridge Scientific Industries), a hospital pediatric examination pillow, disposable metric tape measures, and modified Dubowitz inventory forms.

Taste experiment. Fluids were delivered to the infant via a closed system\(^5\) (see Figure 3), the endpoint of which was a specially constructed silicone rubber nipple (Evenflo Lifetime, modified with Dow Corning silicone rubber materials). At the sealed rear end of this nipple were three connectors. One of these opened to the inside of the nipple, and was joined, externally, by Silastic tubing (inside diameter $\mathcal{I}.\mathcal{D}. = 1.57 \text{ mm}$; outside diameter $\mathcal{O}.\mathcal{D}. = 3.18 \text{ mm}$; length = 1.4 m) to a Statham P23AC pressure transducer which generated voltages proportional to pressures from the expression component of the infant's sucking response. The other two connectors at the rear of the nipple were connected

\(^5\)A closed rather than an open system was chosen because of the need to flush the system quickly between solutions, and in order to avoid a free and running flow of fluid into the baby's mouth. All parts of the system directly or indirectly touching the infant were chosen to be made of autoclavable materials.
Figure 3. Taste experiment apparatus.
internally via short pieces of Silastic tubing to two holes in the tip of the nipple. One of these two connectors was attached by Silastic tubing (I.D. = 4.8 mm; O.D. = 9.5 mm; length = 1.6 m) to a second Statham P23AC pressure transducer which generated voltages proportional to suction pressures from the infant. Voltage outputs from the two pressure transducers were connected to two channels of a Grass Model 7 polygraph, set to generate pen deflections of 1 cm per 25 mmHg expression pressure, and 1 cm per 50 mmHg suction pressure. The third and remaining connector was attached to Silastic tubing (I.D. = 1.98 mm; O.D. = 3.18 mm; length = 1.4 M) through which fluid was delivered to the nipple. Four gum rubber stoppered syringes, one 50 ml and three 10 ml, functioned as fluid reservoirs for sterile water and three concentrations of glucose solution, respectively. These reservoirs were mounted on a four-channel stopcock manifold which permitted selection of one of the four solutions for passage through the tubing and nipple to the infant.

To overcome the negative pressure inherent in a closed system (occurring in response to the negative pressure of the infant's suction) and resistance to fluid flow in the tubing, a Cox-Davis digital pump was used to pressurize the airspaces beneath the stoppers at the tops of the syringes. Circuitry in the pump was connected to amplifiers in the polygraph registering signals from the expressing and suctioning channels. Through this circuitry, the pump responded to
sharp positive changes in pressure in the expression channel and to sharp negative changes in pressure in the suction channel. In response to infant sucking, the pump provided periodic pulses of air pressure to overcome negative pressure and flow resistance, and to return the system to equilibrium. The sucking infant was thus assisted in obtaining fluid from the system. In between trials, the pump was used in a rapid advance mode to flush out the previous solution and instill the next one in the tubing and nipple.

**Vision experiment.** Apparatus for study of the baby's ocular response to visual stimuli has been described in essence elsewhere (Salapatek & Kessen, 1966; Maurer, 1975). A Soligar 75 mm lens with a Cannon 1.5x teleadaptor and a 45 mm extension tube was fitted to a Shibaden HV-15S line-locked, fixed-interlace camera containing a Teltron TV9901 (grade 3) infrared sensitive vidicon tube. The camera and lens assembly, together with an array of six infrared reference light sources (Bausch & Lomb Nicolas Illuminators with Wratten 87C and Corning 7-69 filters) was mounted just behind the stimulus display panel (see Figure 1), with the centers of the vidicon, the lens, the light array, and the stimulus display panel all on a line passing through the center of, and perpendicular to, the display panel. This entire assembly was mounted approximately 60 cm above a wooden table. The table top supported an adjustable height.
platform upon which a padded, head-restraining crib was placed. Three additional infrared light sources, mounted in a coronal plane approximately 23 cm from the head of the supine infant, were used to enhance contrast in the video image of the eye. The video signal from the camera was viewed by the experimenters on a 9 in. Shibaden WM901G television monitor, and taperecorded with a Sony AV3600 ½ in. videorecorder. Temporal intervals for presentations of the stimulus stripes were controlled automatically by custom-made solid-state timing circuitry.

Data Reduction

Taste experiment. A measure of sucking response with respect to time was sought that would reflect the avidity with which the infant responded to the various fluids. The polygraph recordings of infant sucking pressures constitute complex waveforms with instantaneous amplitudes varying across time. The root mean square (RMS) value of a waveform is that value which produces the same effect (in terms of work) as some continuous value applied for the same period of time. Thus, the RMS value is the effective value of a varying waveform. In the context of sucking, it is the continuous pressure over a given period of time that is equivalent to the pressure actually exerted in a varying wave during that period of time. As such, it is a measure of pressure (as work) with respect to time, and should represent the relative avidity with which the infant responded to the
fluid. The RMS value, computationally, equals:

$$\sqrt{\frac{1}{N} \sum_{i=1}^{N} (Y_i^2)}$$

where $Y_i$ is a measured amplitude, and $N$ is the number of amplitudes measured.

Root mean square (RMS) analyses of the expression channel waveforms were performed using a Graf X-Y digitizer interfaced to a PDP-11 digital computer. For any given fluid, the expression and suction waveforms were used to ascertain the beginning of sucking activity. The solution intake period (SIP) was defined as the time from the infant's initiation of sucking activity to his having consumed 2 ml of the fluid. Response during an SIP was assessed by tracing over the expression waveform with the digitizer probe; this procedure in effect stored a high resolution digital representation of the sucking curve in the computer's memory. The digitizer sampled amplitudes in the expression waveform every 0.1 mm of the polygraph record, i.e., every 0.01 sec during the SIP. Using this stored record, a computer program (see Appendix C) calculated the overall RMS value of the expression waveform during the SIP. One RMS

---

6Problems in interpreting the suction waveforms led us to use the suction record as a clinical guide to, rather than a quantitative index of, the infant's response to the fluid. Sameroff (1968) has noted, and the three polygraph records in Figure 3 confirm, the variable relation between the expression and suction components of newborn sucking. Suction almost never occurs in the absence of expression, while expression often occurs by itself.
unit was equal in effect to a continuous expression pressure of 25 mmHg. For each SIP, in addition to an overall RMS value, the program calculated four RMS values for the SIP divided into quarters (each equal to one-fourth the total duration of that SIP).

Vision experiment. Measures of infant visual response were based on calculation of ocular orientations using the corneal reflection technique (Fantz, 1958; Salapatek & Kessen, 1966; Slater & Findlay, 1972; Salapatek, Haith, Maurer, & Kessen, 1972; Maurer, 1975). Essentially, reflections of reference lights (at known positions in the stimulus field) on the corneal surface of the eye enable a calculation of the direction of gaze. During playback of videotaped records of the infant's eye, video frames were sampled and stored on an Ampex DR-10A video disk at a rate of 10 frames/sec. Using a modified Panasonic WV950 video monitor and an electronic video-coordinate generator, a frame-by-frame positional analysis was carried out. Cartesian coordinates of the reference light reflection on the eye and of the center of the pupil were encoded on audio tape in binary form and subsequently were played back to a computer interface. Decimal conversion, calculation of ocular orientations, and calculation of summary measures of response during periods of visual stimulation were all accomplished by a package of computer programs (see Appendix B). For the entire duration of the two stripe periods, three types of
summary measures were computed: (a) central location of gaze (mean and median of ocular orientations), (b) general dispersion of gaze (variance of ocular orientations), and (c) characteristics of shifts of gaze. The computer algorithm for detecting visual shift involved a search across video frames for x-coordinate orientational changes meeting or exceeding both a magnitude criterion (1.5 in. $\sqrt{3.81 \text{ cm}}$) and one of two time criteria ("tight" = 0.1 sec; "loose" = 0.5 sec). Shifts of at least the criterion magnitude occurring within a period of one or five frames were classified, nonexclusively, into five categories: (a) all shifts, (b) shifts to the right, (c) shifts to the left, (d) shifts toward the second stripe, (e) shifts away from the second stripe. For each category of shift, four measures were scored: (a) speed (1/latency) to the first shift, (b) magnitude of the first shift, (c) total number of shifts, and (d) average magnitude of shift. In sum, four measures for each of five kinds of shift judged by two time criteria were evaluated to produce 40 shift variables. As a final assessment of visual response, measurements of pupil diameter were made with the video-coordinate generator every fifth of a second during the last second of the single stripe periods and during the first two seconds of the two stripe periods.
Results

Characteristics of Parents and Infants

A variety of physical and demographic characteristics of the babies and their parents was examined for potential incidental differences between the normal weight parents (NP) and overweight parents (OP) groups; none was found. Mother's and father's age, race, and smoking habits; father's socioeconomic status (score on Hollingshead scale [Note 27]); mother's parity and weight gain during pregnancy; and the type and amount of anesthetic and analgesic medication received during and after delivery were all similar for the two groups. Analyses of variance on continuous variables and chi-square tests on distributions of scores on categorical variables revealed no significant differences between groups (smallest $p > .14$). The number of decisions to breast- or bottle feed was similar for both groups: Six of the 12 NP and five of the 12 OP babies were breast-fed. No significant differences between groups were found on any of a number of indices of the infant's maturity and physical status (smallest $p > .35$): Apgar scores (at one and five minutes after birth), estimated gestational age (from mother's menstrual history), 7

7Tanner (1974), in a discerning review of physical variation among newborns, has noted reports of variation in estimated neurological maturity of as much as three weeks in term infants at 40 weeks. Our assessments, using the Yale-New Haven modification of the Dubowitz criteria, failed to
birthweight, crown-to-heel length, head circumference, average skinfold thickness, and ratio of weight to length squared were distributed similarly for NP and OP babies.

Five of our physical and developmental measures—gestational age, birthweight, length, skinfold thickness, and weight/length\(^2\)—traditionally have been associated with variation in maturity, heaviness, or adiposity. Scores on these five measures looked much the same for the NP and OP groups (see Table 1). Clinical practice asserts the positive correlation of birthweight with both gestational age estimates and measures of fatness. The intercorrelations in Table 2 confirm this relation and suggest that in the present data, skinfold thickness best provides an assessment of fatness unconfounded with variation in gestational age. Both skinfold thickness (Seltzer & Mayer, 1965; Brook, 1971; Brans, Summers, Dweck, & Cassady, 1974) and weight/length\(^2\) (Billewicz, Kemsley, & Thomson, 1962; Keys, Fidanzo, Karvonen, Kimura, & Taylor, 1972), called Quetelet's Index or the Body Mass Index (BMI), have been proposed as measures of body fat. The correlation between these two measures was high, but weight/length\(^2\) was significantly correlated with gestational age while skinfold thickness was not.

add systematic variation supplemental to the obstetric and pediatric staffs' determination of gestational age based primarily on menstrual histories. Thus, we have relied on those determinations in assessing maturity through gestational age.
### Table 1
Means and Standard Deviations of Measures of Physical Development of Babies in the Normal Weight Parentage (NP) and Overweight Parentage (OP) Groups

<table>
<thead>
<tr>
<th>Measure</th>
<th>NP</th>
<th>OP</th>
<th>p</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational Age (weeks)</td>
<td>39.92 0.90</td>
<td>39.42 1.73</td>
<td>0.79</td>
<td>.38</td>
</tr>
<tr>
<td>Birthweight (gms)</td>
<td>3509.67 501.77</td>
<td>3554.42 550.10</td>
<td>0.04</td>
<td>.84</td>
</tr>
<tr>
<td>Length (cm)</td>
<td>51.00 2.87</td>
<td>51.96 1.92</td>
<td>0.92</td>
<td>.35</td>
</tr>
<tr>
<td>Skinfold Thickness (mm)</td>
<td>3.78 0.81</td>
<td>3.81 0.78</td>
<td>0.01</td>
<td>.92</td>
</tr>
<tr>
<td>Weight/Length(^2) (gm/cm(^2))</td>
<td>1.34 0.10</td>
<td>1.31 0.14</td>
<td>0.46</td>
<td>.51</td>
</tr>
</tbody>
</table>
Table 2

Coefficients of Correlation among Four Measures of Physical Development at Birth

<table>
<thead>
<tr>
<th>Measure</th>
<th>Gestational Age</th>
<th>Birthweight</th>
<th>Skinfold Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birthweight</td>
<td>.64***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skinfold Thickness</td>
<td>.07</td>
<td>.65***</td>
<td></td>
</tr>
<tr>
<td>Weight/Length²</td>
<td>.44*</td>
<td>.78***</td>
<td>.73***</td>
</tr>
</tbody>
</table>

Note: Calculations are based on data from all 24 babies.

*p  .05
***p  .001
Taste Experiment

Stimulus factors. Significant main effects of both fluid type and concentration were found. Babies' overall RMS responses were higher for glucose (mean = 1.32 RMS units averaged across concentrations) than for water (mean = 1.13 RMS units), $F(1,22) = 23.50$, $p < .001$. Babies' average responses to glucose increased as the concentration of the solution increased $F(2,44) = 6.22$, $p < .005$. The concentration effect had a significant linear component, $F(1,22) = 9.05$, $p < .01$. Comparisons by the Neuman-Keuls procedure revealed the means for both .85M and .41M glucose to be significantly different from the mean for .20M ($a F(3,44) = 4.82$, $p < .01$, and $a F(2,44) = 3.51$, $p < .05$, respectively) but not significantly different from each other ($a F(2,44) = 1.31$, n.s.). Overall RMS responses on a water "trial" increased in relation to the concentration of the preceding glucose solution. The presence of main effects of fluid (already cited) and concentration ($a F(2,44) = 6.14$, $p < .005$) in the

---

8A general strategy in all the analyses reported was to test the symmetry assumptions (Dixon & Brown, 1977) for all repeated measures error terms in the standard univariate ANOVA. Where the symmetry assumption was judged to be violated ($p < .15$, somewhat arbitrarily, but hopefully conservatively, chosen), the orthogonal polynomial decomposition was examined, correcting probabilities for multiple comparisons, or a multivariate profile analysis was performed. McCall and Appelbaum (1973) and Harris (1975) discuss and contrast the superior power of the univariate test and the freedom from symmetry and homogeneity of covariance assumptions of the multivariate test. Repeated measure effects are cited if they met the symmetry assumptions, if they had an orthogonal polynomial component that was interpretable and significant after correction for multiple comparisons, or if they were significant in the multivariate profile analysis.
full factorial analysis (babies nested in parentage weight groups and crossed with fluid and concentration) and the absence of a fluid-by-concentration interaction confirm an additive relation. Figure 4 illustrates the parallel overall RMS responses to glucose and water across the concentrations of glucose.

When the solution intake period (SIP) was considered as a whole (overall RMS values), the relation of sucking response to concentration was similar for both the glucose solutions and the water which followed them; however, a different relationship was obtained when we examined RMS values for the SIP's divided into quarters. As Figure 5 depicts, RMS values for successive quarters increased for glucose solutions and decreased for water in a fashion differentially related to the concentration of glucose. The Fluid-by-Concentration-by-Quarter interaction was significant, $F(6,132) = 3.16, p < .01$; the linear-by-linear-by-linear component of the orthogonal decomposition of this interaction was also significant, $F(1,22) = 11.61, p < .005$. Thus, the infant sucking response increased across time for glucose and decreased across time for water, with slopes which depended upon the concentration of the glucose solution.

**Effect of parents' weight category.** A significant interaction between parents' weight category (NP or OP) and fluid type was found in the analysis of infants' overall RMS responses during the solution intake periods, $F(1,22) = 5.19,$
Figure 4. Mean overall RMS responses to glucose followed by water for three concentrations of glucose.
Figure 5. Mean RMS response during quarters of solution intake periods for three concentrations of glucose solution followed by water.
p < .05. As Table 3 shows, NP and OP infants' average responses to glucose solutions were almost identical, but OP average responses to water following glucose were significantly lower than those of the NP babies. No other significant effect of parents' weight group upon babies' responses in the taste experiment was found.

Supplemental analyses. To afford comparisons with previous research and to clarify the possible relations of heaviness, maturity and fatness to taste responsiveness in infants, babies were grouped according to their birthweight, gestational age, skinfold thickness (SFT), and weight/length (BMI). Di- and tripartite classification schemes were examined for each of the four variables and yielded similar results. Tripartite divisions generally yielded better balanced group sizes and were potentially more informative, preserving more of the variation present in the continuous variables. No type of division (including the cutpoints used by Nisbett and Gurwitz) produced any significant main effect or interaction related to birthweight. Classifications according to gestational age were similarly unproductive. However, classifications by both skinfold thickness (≤ 3.4 mm, > 3.4 mm)...

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9The advantage of interpretability gained by having group means was judged to outweigh the increased statistical power that might derive from treating these variables as single continuous independent variates. An additional advantage to grouping by cutpoints was that it afforded an opportunity to replicate research described earlier (Nisbett & Gurwitz, 1970; Desor et al., 1973).
Table 3

Mean Response of NP and OP Babies to Glucose and Water

<table>
<thead>
<tr>
<th>Fluid</th>
<th>NP</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>1.31</td>
<td>1.32</td>
</tr>
<tr>
<td>Water</td>
<td>1.21</td>
<td>1.05</td>
</tr>
</tbody>
</table>

**Note:** Values are in RMS units for glucose and water and are averages across concentrations of glucose and water following glucose.
and \( \leq 3.9 \text{ mm}, > 3.9 \text{ mm} \) and weight/length\(^2 \) (\( \leq 1.270 \text{ gm/cm}^2 \), 
\( > 1.270 \text{ and} \leq 1.378 \text{ gm/cm}^2 \), \( > 1.378 \text{ gm/cm}^2 \)) produced significant interactions with concentration in relation to babies' overall EMS response to glucose solutions; \( F(4,42) = 3.26, \ p < .05 \); and \( F(4,42) = 2.62, \ p < .05 \), respectively. Babies classified as medium or fat by SFT or BMI showed responses which at .20M glucose were below those of thin babies but which increased systematically with increasing concentration (see Figure 6). In contradistinction, the response of thin infants increased moderately (BMI classification), or negligibly (SFT classification), from .20 to .41 molar glucose, and dropped off at the highest concentration (.85M). The comparable distribution of skinfold thickness among infants in both parentage groups permitted a two-way between subjects ANOVA; no significant interaction of NP/OP grouping with skinfold thickness was found.

Vision Experiment

Approach to analysis. The techniques for summary assessment of infant eye movement, and shift behavior in particular, are still in exploratory stages of development. Conceptually, the distinction between where the infant looks and how the infant looks must be maintained; the child could vary his total looking time or his average location of gaze without varying his scanning strategy, and vice-versa. The distinction may be more than technical; different psychological processes may be involved. A variety of measures may
Figure 6. Response to three concentrations of glucose solution by infants classified according to two measures of fatness.
reveal systematic response to stimulus manipulations or group organization of individual differences that a single measure might miss. In the analyses which follow, univariate rather than multivariate procedures have been chosen both because the length of the multivariate response vector would be too great for the number of subjects and because the form of the multivariate result might be less interpretable in terms of the distinction being sought among aspects of response. However, multiple analyses performed on large numbers of variables present problems in interpreting significance levels from conventional univariate tests. To protect against capitalizing on chance or unstable findings, results have been considered significant and are reported only if they were convergent across analyses. Specifically, stimulus main effects which replicated across subject groupings, and supplemental grouping effects which replicated across both dipartite and tripartite classification schemes for the grouping variable have been considered stable.

**Stimulus factor.** A significant main effect of second stripe intensity upon speed to first shift was found \( F(2,46) = 3.29, p < .05 \). On the average, babies' first shift—judged under the loose (0.5 sec) time criterion and without regard to direction of shift—occurred sooner with the medium intensity second stripe (mean speed \( \bar{I}/\text{latency} \) to first shift = 3.63 sec\(^{-1}\)) than with the low (mean speed to first shift = 3.13 sec\(^{-1}\)) or high (mean speed to first shift = 1.60 sec\(^{-1}\))
intensity second stripe. Multiple comparisons using the Neuman-Keuls procedure revealed a significant difference ($F_{4,467} = 6.22, p < .01$), only between the medium and high intensity stripe means. Thus, babies' first shift occurred earlier with the medium than with the high intensity second stripe. No other main effects of second stripe intensity were found.

**Effects of parents' weight category.** Main effects of parents' weight category were found for a variety of measures of visual shift behavior. As indicated in Table 4, infants in the OP group made a larger number of shifts than NP infants did, for each of the five categories of visual shift. Additionally, the average magnitude of shifts away; the speed (1/latency) to the first shift away; and the magnitude of first shifts away, to the left, and to the right were all greater for the OP babies than for the NP babies. Thus, babies of overweight parents shift their gaze during the two stripe period more often, with greater magnitude, and, for one category of shift, sooner than babies of normal weight parents do.

In order to assess pupillary response to variations in the intensity of the second stripe, baseline effects were first removed by regressing out average pupil diameter during the last second of the single stripe periods. Analysis of variance with subjects nested in parents' weight group and blocked on sequence of intensities revealed no main effect of intensity of the second stripe upon infants' pupil diameter.
Table 4
Summary of Main Effects of Parents' Weight Group on Measures of Visual Shift Behavior

<table>
<thead>
<tr>
<th>Measures of Shift by Category</th>
<th>NP</th>
<th>OP</th>
<th>F (1,22)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Shifts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of shifts$^a$</td>
<td>3.25</td>
<td>5.83</td>
<td>6.64*</td>
</tr>
<tr>
<td>Number of shifts$^b$</td>
<td>8.89</td>
<td>12.89</td>
<td>8.17**</td>
</tr>
<tr>
<td><strong>Shifts to Right</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnitude of first shift$^a$</td>
<td>2.03d</td>
<td>2.76d</td>
<td>4.98*</td>
</tr>
<tr>
<td>Number of shifts$^b$</td>
<td>4.89</td>
<td>6.86</td>
<td>7.73*</td>
</tr>
<tr>
<td><strong>Shifts to Left</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnitude of first shift$^b$</td>
<td>2.25d</td>
<td>2.99d</td>
<td>4.47*</td>
</tr>
<tr>
<td>Number of shifts$^a$</td>
<td>1.35</td>
<td>2.81</td>
<td>7.64*</td>
</tr>
<tr>
<td>Number of shifts$^b$</td>
<td>4.00</td>
<td>6.03</td>
<td>6.72*</td>
</tr>
<tr>
<td><strong>Shifts toward Second Stripe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of shifts$^a$</td>
<td>2.14</td>
<td>3.39</td>
<td>4.80*</td>
</tr>
<tr>
<td>Number of shifts$^b$</td>
<td>5.25</td>
<td>8.14</td>
<td>11.10**</td>
</tr>
<tr>
<td><strong>Shifts Away from Second Stripe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed (1/latency) to first shift$^a$</td>
<td>0.14c</td>
<td>0.78c</td>
<td>5.23*</td>
</tr>
<tr>
<td>Magnitude of first shift$^a$</td>
<td>1.35d</td>
<td>2.09d</td>
<td>4.83*</td>
</tr>
<tr>
<td>Number of shifts$^a$</td>
<td>1.11</td>
<td>2.44</td>
<td>6.19*</td>
</tr>
<tr>
<td>Average magnitude of shifts$^a$</td>
<td>1.37d</td>
<td>2.23d</td>
<td>6.04*</td>
</tr>
</tbody>
</table>

*Note: Magnitudes are expressed without regard to direction as absolute values.

$^a$Judged by tight (0.1 sec) time criterion.

$^b$Judged by loose (0.5 sec) time criterion.

$^c$seconds$^{-1}$

$^d$inches

* $p < .05$.

** $p < .01$. 

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diameters; however, an interaction between intensity and parents' weight group was found, \( F(2, 24) = 3.76, p < .05 \).

The adjusted means depicted in Figure 7 show that on the average, the pupil diameters of overweight parentage babies decreased with increasing intensity of the second stripe, while normal weight parentage babies' pupil diameters increased from low to medium intensity of second stripe and remained the same from medium to high.

**Supplemental analyses.** As for the taste data, babies were grouped according to their birthweight, gestational age, skinfold thickness (SFT), and weight/length\(^2\) (BMI), in order to investigate the possible relations of heaviness, maturity, and fatness to visual responsiveness. No stable findings emerged from classification according to estimated gestational age or skinfold thickness. However, a stable positional bias related to birthweight (by both di- and tripartite classification) and independent of second stripe intensity was found. The heavier the infant group, the more rightward—or the more close to the location of the second stripe—was the central location of gaze (see Table 5). A very similar finding occurred with classification by weight/length\(^2\) (see Table 5). In light of the substational correlation between birthweight and weight/length\(^2\) (see Table 2), and of the failure to observe such a difference with classification of infants' by skinfold thickness, this positional effect appears to be related to heaviness per se.
Figure 7. Adjusted mean pupil diameter of overweight parents' (OP) and normal weight parents' (NP) babies during the first two seconds of double-stripe periods.
Table 5
Mean and Median X-Coordinate Location of Gaze for Babies Grouped by Birthweight and Weight/Length

<table>
<thead>
<tr>
<th>Estimate of Central Tendency</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>$F (2,21)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification by Birthweight$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean$^c$</td>
<td>-1.07</td>
<td>-0.54</td>
<td>1.58</td>
<td>8.88**</td>
</tr>
<tr>
<td>Median$^c$</td>
<td>-1.27</td>
<td>-0.62</td>
<td>1.66</td>
<td>10.66**</td>
</tr>
<tr>
<td>Classification by Weight/Length$^b$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean$^c$</td>
<td>-0.67</td>
<td>-0.94</td>
<td>1.58</td>
<td>8.48**</td>
</tr>
<tr>
<td>Median$^c$</td>
<td>-0.82</td>
<td>-1.06</td>
<td>1.66</td>
<td>9.86**</td>
</tr>
</tbody>
</table>

Note: Means and medians are expressed in inches.

$^a$Low group $\leq 3.4$ mm, medium group $>3.4$ and $\leq 3.9$ mm, high group $>3.9$ mm.

$^b$Low group $\leq 1.290$ cm/gm$^2$, medium group $>1.270$ and $\leq 1.378$ cm/gm$^2$, high group $>1.378$ cm/gm$^2$.

**$p<.01$.**
Discussion

Stimulus Factors

Taste experiment. Results with root mean square (RMS) values of infants' expression waveforms replicate, extend, and qualify previous reports of infants' abilities to distinguish among tasteful fluids. In most of the previous studies which have described infants' preferences for sugar over water, an individual infant's experience with fluids has been limited to two levels along a single dimension of variation, a sugar of a given concentration and water (Kobre & Lipsitt, 1972; Engen, Lipsitt, & Peck, 1974; Desor, Maller, & Turner, 1973). Each infant in the present study was offered several concentrations of glucose and water and showed an overall preference for glucose across concentrations. The finding of preference for sugar over water, then, has been replicated in a somewhat different paradigm with a new measure.

Lipsitt and his colleagues (Kobre & Lipsitt, 1972; Engen, Lipsitt, & Peck, 1974) have described a negative effect of experience with a sugar solution upon subsequent response to water. In their studies, the number of sucks to water was lower if water followed rather than preceded a sugar solution. In a somewhat different paradigm, and somewhat contrary to expectation, we have found that the overall response
to water is augmented as the concentration of a preceding solution of glucose is increased. This augmentation appears to be a transitory "carry-over" effect of the infants' response to the previous sugar. As the RMS values for quarters of solution intake periods indicate (see Figure 5), responses to water commence at higher levels for the higher concentrations of the preceding sugar solution, but by the fourth quarter response levels to water are similar to one another for all three concentrations of preceding glucose solution. The observed decreasing response to water over time may correspond to what Kobre and Lipsitt (1972) have called a negative contrast effect, a reinforcement phenomenon. It may also be a sensory phenomenon, the equivalent in babies of what is called "water taste" in adults.

Water has a systematic taste related to the quality and concentration of the adapting solution that precedes it on the tongue; after adaptation to sugar, water has a sour-bitter taste as judged by adults (Bartoshuk, 1968). Although the mechanism of water taste after sugar is still unclear, in recent models (Bartoshuk, note 4) sugar is thought to bind to the bitter receptor site. The inflow of water to the tongue withdraws the sugar and triggers anomalous firing of the bitter receptor. Withdrawal rate is believed to mediate the perceived intensity of the phenomenon. As concentration of the preceding sugar solution is increased, rate of withdrawal and perceived intensity of bitter taste should increase.
peak, and fall off, since the flow rate of water remains the same.

If it is increasing bitter taste that produces a sharp decrement in infant response, then the data for water over quarters of intake periods favors interpretation in terms of the water taste model. The sharpest decrease in response from first to second quarter levels occurred with water following the .41 glucose solution. The water taste model would predict such a finding, since maximal rates of withdrawal should occur for an intermediate concentration of sugar. A reinforcement model, on the other hand, would dictate that the most effective reinforcer should produce the strongest negative contrast effect. Since, on the average, the higher response levels were to .85M glucose, the water following that solution should have produced the sharpest first-to-second quarter decrement. It did not.

Concentration effects in infants' preference for sweet have been demonstrated by a number of investigators (Nowlis & Kessen, 1976; Desor, Maller, & Turner, 1973; Engen, Lipsitt, & Peck, 1974) with a variety of sugars and concentrations. Viewed across studies, the magnitude of the concentration effect has been found to be small (Engen et al., 1974), variable with the type of sugar (Desor et al., 1973), or so substantial that it parallels the adult psychophysical function for sweetness (Nowlis & Kessen, 1976). In part, the estimates may vary because of different concentration ranges,
differences in response measures (number of sucks, volume of fluid ingested, anterior tongue pressure), and procedural variation vis-a-vis post ingestional factors (varying amounts of fluid delivered in .024 ml quanta, free access to fluid for fixed amounts of time, fixed small volumes of fluid to be consumed in a relatively unconstrained period of time). Against this background, results from the present study suggest again that the concentration effect is significant, and present a slope across concentration that is intermediate among those reported previously. More important, we have found the infant to prefer yet a higher concentration of glucose than has been previously examined. Even at .85M, for infants on the average,10 there is not evidence of a turn downward in the response curve.

Vision experiment. The finding that infants' first shifts occurred soonest, on the average, when the second stripe was of medium intensity corresponds to Hershenson's (1964) report of infants' preference for panels of intermediate brightness. It is unclear, however, why the longest latency to shift should have occurred with the high intensity second stripe. Perhaps that intensity was sufficiently high to have produced a degree of startle and consequent delay.

10Of course, the response of infants classified as thin by SFT or BMI poses a necessary and interesting qualification. In fact, if one excludes these infants and considers the medium and fat together, the effect of concentration on preference is even more marked.
More important is the fact that the large variety of measures of visual response failed to yield any other significant main effects of second stripe intensity. Plots of scanning over time showed patterns of fixation and contour crossing suggestive of infants' ability to detect the second stripe. The similarity of response across intensities may have resulted from the criteria used to select luminance values in the experiment: The levels of intensity were well above threshold, below discomfort, and easily discriminable by adults; and they were pretested to be sure that each would attract some visual fixations with babies. The intensities thus selected may all have been more than adequate elicitors of visual investigation by the infant. The mere addition of a second stripe may have constituted an interesting field change. Beyond the first shift, infant responses as assessed by our scanning measures did not differ significantly as a function of second stripe intensity.

Preference for novel stimuli, which is well documented in infants from two months of age (see for reviews: Fantz, Fagan, & Miranda, 1975; Cohen and Gelber, 1975), may underlie the differences in central tendency of gaze observed in relation to variation in birthweight and weight/length. While preference for novelty in younger infants is debated, the work of Friedman and his colleagues (Friedman, Nagy, & Carpenter, 1970; Friedman & Carpenter, 1971; Friedman, 1972a, 1972b) showing dishabituation of gaze with novel checkerboards may
serve as evidence for infant response to novelty in the first
days of life. As mentioned previously, the positional bias
observed in infants' gaze locations was probably not a func­
tion of adiposity, since no such bias related to skinfold
thickness was observed. It might, however, have been a func­
tion of differential maturity. Tanner (1974) has reported as
much as several weeks variation in estimated neurological
maturity among term infants. One might speculate that vari­
ation in BMI and birthweight may reflect variation in matur­
ity untapped by estimates of gestational age. To the extent
that this is true, the increasing closeness of gaze location
to the second stripe seen in relation to increasing BMI and
birthweight may represent a preference of more mature infants
for a novel stimulus.

Parents' Weight, Infant Adiposity, Responsivity, and the
Development of Overweight

The main effect of parents' weight on a variety of
measures of visual shift during the two stripe period seems
a direct analogue in infants of the distractability observed
in overweight adults faced with prominent competing cues
(Rodin, 1973). Babies of overweight parents shifted their gaze
more often and with greater magnitude than babies of normal
weight parents did during the two stripe period. The scan­
ning patterns of overweight parents' babies did not appear
to be random or grossly eccentric. Rather, an examination of
plots of these infants' gaze across time showed patterns that were by and large constrained by the location of the stripes in the field, and demonstrated considerable movement back and forth, across and between the stripes. Additional confirmation of the heightened to-and-fro nature of the scan pattern lies in the fact that OP babies made significantly more shifts in both members of complementary shift categories; that is, babies of overweight parents made significantly more shifts both to the left and to the right, both toward and away from the location of the second stripe in the field.

Chaney and McGraw (1932) found an intact pupillary reflex in term infants, and Munsinger and Banks (1974) have used variation in pupil diameter, in somewhat older children, to infer sensitivity to different luminances. Nevertheless, the significant interaction between parents' weight status and the intensity of the second stripe in affecting pupil diameter should be interpreted cautiously; the effect on pupil diameter was small and the variability among infants was great. On the average, the pupil diameters of overweight parentage babies decreased with increasing intensity of the second stripe, while the pupil diameters of babies whose parents were normal weight tended to increase from low to medium and remain the same from medium to high intensity of second stripe. This difference in pupillary response may indicate a greater sensitivity or responsiveness in babies of overweight parentage to variation in luminance. Alternatively, the difference might
have been a consequence of the difference between OP and NP babies in shift behavior; OP babies, shifting more, may have had greater overall retinal exposure to the second stripe.

Rodin (1977) has suggested three possible etiologic relationships between taste responsiveness and obesity: (1) Externality and heightened taste responsiveness may precede and lead to the development of obesity; (2) obesity itself may produce heightened taste responsiveness; (3) taste responsiveness and obesity may be associated but caused by a third factor. Results from the present experiment provide some evidence for both (1) and (2) and do not preclude (3). The finding that overweight parentage (OP) infants on the average responded less to water after glucose than normal weight parentage (NP) infants harkens to Nisbett's (1968b) finding that overweight adults consumed less "vanilla-bitters" (quinine-laced) ice cream than normal weight subjects did. It should be noted that OP infants were not fatter than NP infants on the average and that the phenomenon was not related to fatness of the infant, since the effect did not change and no interaction was found when a parent weight-by-fatness analysis was performed. OP babies then, not yet obese, exhibit some of the taste finickiness often seen in adults who have become overweight. Such behavior, together with the differences in visual response between OP and NP babies, may be viewed as evidence for Rodin's first etiologic hypothesis.
The present study has failed to replicate some earlier findings (Nisbett & Gurwitz, 1970; Desor, Maller, & Turner, 1973) of a relation between birthweight and taste response to sweet. However, an effect related to skinfold thickness (SFT) and weight/length² (BMI) has been found which may serve to clarify earlier reports. The fact that both SFT and BMI were significantly related to preference for sweet, but that estimated gestational age and birthweight were not, suggests that the effect is related to fatness. Babies classified as medium or fat by SFT or BMI seemed to like increasing sweetness more than thin infants did. The finding of differential taste response related to fatness might be interpreted as evidence for Rodin's second etiologic hypothesis—that obesity precedes and leads to heightened taste responsiveness. Close inspection of Figure 6 suggests that this may not be the appropriate point of view. Rather, the curves suggest that most babies, both "medium" and "fat," preferred increasing sweetness. The curves for "medium" and "fat" babies switch relative positions but remain parallel when the classification variable is changed from skinfold thickness to weight/length². The switch in relative level together with the continued parallel relation suggests a commonality among these infants. The anomalously responding babies were the "thin" ones, whose responses declined for the highest concentration sugar solutions.
Desor, Maller, and Turner (1973) found they had to shift to lower values of birthweight as cutpoints in their sample in order to replicate the Nisbett and Gurwitz (1970) finding of greater preference for sweet in heavier infants. Such a shift would tend to delineate more sharply the lower birthweight—and, to the extent birthweight is related to fatness, thinner—infants. It may be appropriate to think in terms of an effect of thinness rather than fatness of the infant on taste. By some unknown mechanism might thinness be self-perpetuating, protected by palatability differences from birth?

To summarize, only thin infants showed an aversion to high concentrations of sweet. Medium and more fat babies—most babies—appeared to respond with great avidity to sweet. This phenomenon seems independent of parents' weight. A comparison of newborn babies of overweight parents with newborn babies of normal weight parents demonstrated differences in vision and taste responsivity analogous to findings of differences between overweight and normal weight adults. Independent of their degree of adiposity at birth, babies of overweight parentage, on the average, showed heightened responsiveness.

To the extent that offspring inherit heightened responsiveness and that food cues abound, a familial tendency to overeat and become overweight might be observed. The effects of the large hormonal and emotional changes of
pregnancy on the measures of external responsiveness used in adult obesity research are unknown. For this reason, no attempt was made to measure the responsiveness of parents of the newborn infants in the present study. While future research must ascertain the precise relation between parental and infant responsiveness, it seems possible, on the basis of finding differences in responsiveness related to parents' weight, that responsiveness is genetically transmitted from parents to infants.

Of course, in analogy to findings with adults (Rodin, Slochower, & Fleming, 1977), it is not to be expected that all infants of overweight parentage will have heightened responsiveness, or that all babies of normal weight parents will be relatively unresponsive. The association, observed on the average, of heightened responsiveness with being overweight may evolve through interaction with food cues in the environment. Eating behavior for people in general can be influenced by a variety of cues besides taste (Wooley, 1972; Wooley, Wooley, & Dunham, 1972). The influence of multiple prominent food cues upon eating would be greater for people with broadly heightened responsiveness. Such people would be more likely to overeat and gain weight.

How might findings from the present study bear upon the development of overweight? Preference for sweet seems to be a characteristic for all except thin babies, and
aspects of heightened responsiveness to visual and gustatory stimuli have been demonstrated for babies of overweight parents. Details of the relation between the response measures studied and actual infant ingestion remain for future research. Nevertheless, on the basis of the present study, a hypothesis about the relative risk of an infant's becoming overweight may be proposed. The hypothesis derives from the possible combinations of infant adipose status and parental weight status, and suggests three categories of risk:

1. Thin babies of normal weight parentage may be at lowest risk, given their relative aversion to high concentrations of sweet and the suggestion that on the average they might be less responsive to environmental food cues.

2. Babies of moderate or greater adiposity at birth whose parents are overweight probably have the greatest risk of overeating and becoming fat; to an environment which most probably abounds in food and eating-related cues, these infants are likely to bring both a natural proclivity for sweet and a heightened responsivity to prominent stimuli.

3. Intermediate levels of risk are ascribable to thin infants of overweight parentage, to "non-thin" infants of normal weight parentage and, by extrapolation, to "non-thin" infants of "mixed" parentage. Their situations may be subject to both greater biological and environmental variation.
While these risk classifications are highly speculative, the present findings of differences in responsiveness at birth, the potential role of these differences in overnutrition, and the immutability of fat cell proliferation described by Hirsch, demand further attention.
Appendix A

Table of Ranges of Weight Used in Sample Selection

Yale-New Haven Hospital Modification of Dubowitz
Assessment of Gestational Age
### Weight Table Used for Identifying Potential Subjects

<table>
<thead>
<tr>
<th>Age</th>
<th>Ht.</th>
<th>Weight</th>
<th>Age</th>
<th>Ht.</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15-16</td>
<td>17-19</td>
<td></td>
<td>15-16</td>
<td>17-19</td>
</tr>
<tr>
<td>4'10</td>
<td>87-109</td>
<td>89-109</td>
<td>5'2</td>
<td>70-83</td>
<td>72-04</td>
</tr>
<tr>
<td>4'11</td>
<td>95-115</td>
<td>97-115</td>
<td>5'3</td>
<td>75-88</td>
<td>77-90</td>
</tr>
<tr>
<td>5'</td>
<td>100-120</td>
<td>102-120</td>
<td>5'4</td>
<td>151-171</td>
<td>153-173</td>
</tr>
<tr>
<td>5'1</td>
<td>105-125</td>
<td>107-125</td>
<td>5'5</td>
<td>156-176</td>
<td>158-178</td>
</tr>
<tr>
<td>5'2</td>
<td>110-130</td>
<td>112-130</td>
<td>5'6</td>
<td>161-181</td>
<td>163-183</td>
</tr>
<tr>
<td>5'3</td>
<td>115-135</td>
<td>117-137</td>
<td>5'7</td>
<td>166-186</td>
<td>168-188</td>
</tr>
<tr>
<td>5'4</td>
<td>120-140</td>
<td>122-142</td>
<td>5'8</td>
<td>171-191</td>
<td>173-193</td>
</tr>
<tr>
<td>5'5</td>
<td>125-145</td>
<td>127-147</td>
<td>5'9</td>
<td>176-196</td>
<td>178-198</td>
</tr>
<tr>
<td>5'6</td>
<td>130-150</td>
<td>132-152</td>
<td>5'10</td>
<td>181-201</td>
<td>183-203</td>
</tr>
<tr>
<td>5'7</td>
<td>135-155</td>
<td>137-157</td>
<td>5'11</td>
<td>186-206</td>
<td>188-208</td>
</tr>
<tr>
<td>5'8</td>
<td>140-160</td>
<td>142-162</td>
<td>5'12</td>
<td>191-211</td>
<td>193-213</td>
</tr>
<tr>
<td>5'9</td>
<td>145-165</td>
<td>147-167</td>
<td>5'13</td>
<td>196-216</td>
<td>198-218</td>
</tr>
</tbody>
</table>

Note. Top row is -10% to +10% of average weight for age and height; second row is +15% to +45% of average; and third row is +13% to +50% of average. Average weight for sex, age, and height is taken from Society of Actuaries Build and Blood Pressure Study, 1959.
### A. Obstetric
1. By L.M.P.

### B. Pediatric

#### Estimation of Gestation Age

<table>
<thead>
<tr>
<th>WEEKS OF GESTATION</th>
<th>24</th>
<th>26</th>
<th>28</th>
<th>30</th>
<th>32</th>
<th>34</th>
<th>36</th>
<th>38</th>
<th>40</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hair</strong></td>
<td>Woolly, fuzzy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Breast</strong></td>
<td>none</td>
<td>2mm</td>
<td>4mm</td>
<td>7mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Areola</strong></td>
<td>none</td>
<td>barely visible</td>
<td>well-defined but flat</td>
<td>well-defined (raised)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sole Creases</strong></td>
<td>none</td>
<td>1-2 anterior creases</td>
<td>2/3 sole creases</td>
<td>to heel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ear</strong></td>
<td>pinna soft, stays folded</td>
<td>returns slowly from folding</td>
<td>thin cartilage springs back</td>
<td>form, erect from head</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>thin, translucent, plethoric veins prominent on abdomen</td>
<td>thicker</td>
<td>pink, few large vessels</td>
<td>pale pink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Genital</strong> (♀)</td>
<td>undescended</td>
<td>high in canal, small nubia</td>
<td>lower, more nubia</td>
<td>testes descended in pendulous scrotum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Genital</strong> (♂)</td>
<td>labia widely separated, clitoris prominent</td>
<td>labia minora &amp; clitoris covered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Posture</strong></td>
<td>lateral decubitus</td>
<td>hypotonia -&gt; increased tone</td>
<td>L.E. flexed</td>
<td>U.E. extend</td>
<td>sometimes</td>
<td>flexion U.E.</td>
<td>total flexion with A tone.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recoil</strong></td>
<td>none</td>
<td>slight L.E.</td>
<td>good L.E.</td>
<td>slight U.E.</td>
<td>slow U.E.</td>
<td>good U.E.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Popliteal angle</strong></td>
<td>180°</td>
<td>150°</td>
<td>120°</td>
<td>120°</td>
<td>100°</td>
<td>90°</td>
<td>90°</td>
<td>90°</td>
<td>90°</td>
<td>90°</td>
</tr>
<tr>
<td><strong>Scarf maneuver</strong></td>
<td>no resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moro</strong></td>
<td>barely present</td>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grasp</strong></td>
<td>feeble</td>
<td>fair</td>
<td>solid, involves arms</td>
<td>may pick infant up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rooting</strong></td>
<td>minimal and irregular</td>
<td>good (no reinforcement)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glabellar Tap</strong></td>
<td>absent</td>
<td>appearing</td>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pupillary</strong></td>
<td>absent</td>
<td>appearing</td>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Computer Programs for Assessment of Infant Eye Movement
THIS IS THE FIRST RFC OF BINDEC -- A FORTRAN PROGRAM

C TO CONVERT RECORDS OF RABINIC VIDEO-SCORE DATA TO
C DISTINGUISHED, AND PREVIOUS RECORDS AND VALUES ARE
C SUBSCRIPTED *(2)*, AND PREVIOUS RECORDS AND VALUES *(1)*
C BINETC2 REVISED DEC 10, 1977. W. W. MISTFEN, YALE PSYCHOLOGY DEPT.

C 1) DIMENSION AND INITIALIZE SOME VARIABLES.

DIMENSION IFRAM(2), INDEX(2), IFLAG(2), IMON(10),
INDEX(1), IFLAG(1), K364, KCODE, J, IFAMF(11),
DATA(2), IFAM, NFRMT, J, IFAM(11),
DIMENSION INDEX(1), IFAMF(11), K364, NCODE, J, IFAMF(11),
INDEX(1), IFAM(11),

C 2) READ IN A RECORD.

50 READ(5,55,PEN=400)IFLAG(2), INDEX(1), IFAM(11), J, IFAMF(11), IMON(10),
INDEX(1), IFAMF(11), K364, NCODE, J, IFAM(11),
DATA(2), IFAM, NFRMT, J, IFAM(11),

C 3) IF BEGINNING A NEW SUBJECT.

C PRINT TITLE & COLUMN HEADINGS

C 4) CONVERT THE BINARY NUMBERS TO DECIMAL FORM FOR HORIZONTAL AND
C VERTICAL AXES , AND FOR THE CODE/MEASUREMENT (INDEX) COUNTER.

116 IFAMF=0
IFAM=0
INDEX=0
IFAM=32
DO 120 J=1,10
IFAM=IPAM(2)+INDEX(1)*IPAM(1)
IFAMF=IPAM(2)

120 IFAM=ifam(2)
DO 121 J=1,4
IFAM=IPAM(2)+INDEX(1)*IPAM(1)
IFAM=IPAM(2)

121 IFAM=IPAM(2)
DO 122 J=1,3
LIGHT(2)=LIGHT(2)+INDEX(1)*IPAM(1)

122 LIGHT(2)=LIGHT(2)+INDEX(1)*IPAM(1)

124 CONTINUE

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IF N AND GET NEW RECORD.

IF (PRINT = N.E.R) GO TO 140
INDEX(2) = INDEX(1)
INDEX(2) = ICODE
GO TO 320

5) MEASUREMENT COUNTER INTERPRETATION -- GENERAL COMMENTS


140 IF (FLAG(1) .EQ. 0) GO TO 295

6) SOME CODE PROCESSING.

SET INDEX TO CODE VALUE.
INDEX(2) = ICODE

CHECK FOR ERROR CODE.

IF (INDEX(2). EQ. 0) GO TO 320

LOOK FOR BEGIN PERIOD CODE. N IS A VARIABLE TO INDICATE END OF READ IN OF SCALE VALUES.
IF (INDEX(2) .NE. 504) GO TO 265
N = 1

DETERMINE THE CODE REPEAT PATTERN FREQUENCY (KODE(1)) BY COUNTING THE NUMBER OF SIDES ("HOUND SCALP DETERMINATION") AND OF "EXPECTED NUMBERS" AND SAVING AS KODE(1) AND KODE(2), RESPECTIVELY.

245 IF (INDEX(2). EQ. 516) GO TO 287
KODE(1) = KODE(1) + 1
287 IF (KCODE(2). EQ. INDEX(2) .OR. INDEX(2). EQ. 320) GO TO 288
KODE(2) = KODE(2) + 1
288 IF (N .EQ. 0) AND (KODE(2) .EQ. 200)
KODE(2) = KODE(2) + 1
IF (INDEX(2) .NE. 504) GO TO 265

IF INDEX HAS NOT CHANGED, OR IF LAST RECORD WAS AN "ERROR CODE", PRINT RECORD WITHOUT N. CONTINUE;
INCORRECTING N.

290 IF (INDEX(2). EQ. INDEX(1)) .OR. INDEX(1). EQ. 0) GO TO 350
OTHERWISE, PRINT RECORD AND N, AND THEN RESET N TO 0.
GO TO 340

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7) MEASUREMENT PROCESSING.

295 INDEX(2)=IFRAME(2)

DO SOME CHECKING BEFORE PRINTING.

CHECK THAT LIGHT IS NOT ZERO OR 7.

IF LIGHT(2).EQ.0.OR.LIGHT(2).EQ.7) GO TO 320

CHECK FOR AN INDEX CHANGE. IF INDEX HAS NOT CHANGED, AND
WE ARE IN A PERIOD RATHER THAN A SCALE DETERMINATION
MODE, CHECK THAT LIGHT NUMBER HAS ALSO NOT CHANGED

(IF THAT THE PUPIL AND LIGHT MEASUREMENTS HAVE THE SAME
LIGHT NUMBER FOR A GIVEN FRAME), IF SATISFIED, PROCEED TO

PRINT RECORD WITHOUT N AND INCREMENT N.

INDEX(INDEX(2),INDEX(1)) GO TO 310.

INDEX(2).EQ.(INDEX(1).OR.ZERO) GO TO 350.

GO TO 320

INDEX HAS NOT CHANGED.

CHECK FIRST WHETHER PRECEDING RECORD WAS AN ERROR CODE.

IF SO, PRINT CURRENT RECORD AND CONTINUE TO INCREMENT N.

CHECK WHETHER INCREMENT WAS BY 1, OR WHETHER PRECEDING
FRAME WAS A CODE.

CHECK FOR A PERMISSIBLE DROP TO 1 WITHIN A PERIOD,
WHICH WILL INCREMENT 'INDEX', A VARIABLE IN SEQ.PORT
ANOTHER PROGRAM TO BE USED SUBSEQUENT TO EDITING

ONGOING V2 OUTPUT.

GOTO 310.

INDEX(INDEX(1).EQ.0.AND.IFRAME(1).EQ.1) GO TO 350

INDEX(INDEX(1).EQ.1.AND.IFRAME(1).EQ.0) GO TO 340

GO TO 340.

INDEX(INDEX(1).GT.1.AND.IFRAME(1).EQ.0.AND.IFRAME(2).EQ.1) GO TO 340.

GO TO 340.

8) PRINTING OPTIONS.

PRINT RECORD, WITHOUT N, MARK "ERROR."

PRINT INDEX(1).EQ.0.AND.IFRAME(1).EQ.1 GO TO 350.

INDEX(INDEX(1).EQ.1.AND.IFRAME(1).EQ.0) GO TO 340.

INDEX(INDEX(1).GT.1.AND.IFRAME(1).EQ.0.AND.IFRAME(2).EQ.1) GO TO 340.

GO TO 340.

PRINT RECORD WITHOUT N; RESET N TO ZERO.

INDEX(INDEX(1).EQ.0.AND.IFRAME(1).EQ.1) GO TO 350.

INDEX(INDEX(1).EQ.1.AND.IFRAME(1).EQ.0) GO TO 340.

INDEX(INDEX(1).GT.1.AND.IFRAME(1).EQ.0.AND.IFRAME(2).EQ.1) GO TO 340.

GO TO 340.

PRINT RECORD WITHOUT N.
300 WRITE(6,359)LINE(1),1Y,INDK(2),LIGHT(2),IFLAG(2),SRIT,LINP

360 IF (INDEX(2).NE.508.OR.IFLAG(2).NE.1) GO TO 380
   INDEX(2)=INDEX(2)+1
   IF (INDEX(2).GT.508) GO TO 380
360 IF END CF SUBJECT, RESET SOME VALUES & CHECK FOR NEXT SUBJECT.
   IFR=0
   INDEX(1)=1
   IFRAM(1)=0
   IFD=0
   N=0
   K50R=0
   DO 370 K=1,2
      X0=0
      KODKF=0
      CONTINUE
    GO TO 80
370 CONTINUE
    GO TO 80
380 IF STILL SAME SUBJECT, TIDY UP, STORING CURRENT RECORD AS PREVIOUS, AND INCREMEANTING LINE NUMBER AND INDEX REPETITION COUNTER BY ONE.
380 IFRAM(1)=IFRAM(2)
380 INDEX(1)=INDEX(2)
380 LIGHT(1)=LIGHT(2)
380 IFLAG(1)=IFLAG(2)
380 LINP=LINE+1
380 N=N+1
380 GO TO 80
400 STOP
END
TO COUNT AND HANDLX FRAMES DURING MEASUREMENT WOPPS. INPUT 
PREVIOUSLY TO CORRECT ERRORS. OUTPUT PMW SPOJ.P0RT IS 
FORTRAN PROGRAM

C 1) DIMENSION AND INITIALIZE SOME VARIABLES.

DIMENSION IFRAM(2), INDEX2(2), IFLAG(2), LIGHT(2), KODE(5), 
& KLUGE(20)
DATA INCR, N, LIGHT(1), IFRAM(1), 
& INDEX1, IFLAG1, K508, KODE-N, IFR, KODE, KFWS8/8, 15=0,1/

C 2) READ IN A RECORD.

READ 5, 20, FHE=400) KLUGE, INDEX(2), IFLAG(2), LIGHT(2), EHT, LINE 
20 FORMAT(2044, T33, 13, T32, 13, TCM, 11, 4, 11, 13, 119) 
IFLINE. NL-1, C M+FWS8/8, NL1) GO TO 40 
WHILE(IN=30) =LUGE 
30 FORMAT(2044) 
DO 35 1=1, 8 
READ3, 0CEND=400) KLUGE 
WHILE(4, 39) =LUGE 
35 CONTINUE 
NE=S8>0 
GO TO 10

C IF HAD TRANSMISSIO, PROCEED (TO PRINT VALUE, MARE ERR OR, 
AND GET A NEW FFCORD).

40 IF(IFR-N)=8) GO TO 320

C 5) MEASUREMENT COUNTER INTERPRETATION -- GENERAL COMMENTS. IF THE FLAG BIT IS AN CNE, TREAT THE MEASURE COUNTER CONTENTS AS A CODE. IF THE FLAG IS ZERO, TREAT THE CONTENTS AS A MEASURE.

1 IF(IFLAG(2). NE. 0) GO TO 305

C 6) SOME CODE PROCESSING.

INDEX IS CODE VALUE.

CHECK FOR CODE ERROR.

1 IF(INDEX(2). EQ. 0) GO TO 320

LOOK FOR BEGIN PERIOD CODE. M IS A VARIABLE TO INDICATE END OF READ IN CP SCALE VALUES.

1 IF(INDEX(2), NE. 504) GO TO 285

Determine the code REPEITION FREQUENCY (KODE) BY COUNTING FREQUENCY OF SLOTS "BEGIN SCALE DETERMINATION" AND OF "EXPERIMENT NUMBER," AND SAVING AS KODE(1) AND
C KODE(2) = KODE(3) IF INDEX(2).NE.391 GO TO 287
KODE(3) = KODE(1) IF INDEX(2).GT.390 GO TO 288
KODE(1) = KODE(2) IF INDEX(2).LT.391 GO TO 289
KODE(1) = KODE(2) IF INDEX(2).GT.390 GO TO 289
C IF INDEX IS CODE FOR BALL BEARING, INCH GP, METRIC GP, BEGIN
C PERIOD, END SUBJECT, OR SCALE DETERMINATION, RESET INC= TO 0.
C
C 210 IF INDEX(2).EQ.491 OR INDEX(2).EQ.490 OR INDEX(2).EQ.496 OR
C INDEX(2).EQ.504 OR INDEX(2).EQ.201 THEN GO TO 285
C
C IF INDEX IS "NEC", "PROV.," "EYE CLOSED," OR "SACCADE," WITH CODE
C HPRITITION FREQUENCY, ADD 1 TO THE FRAME COUNT AND RESET (FLAG TO 0)
C
C IF(INDEX(2).NE.394) GO TO 284
KODE(3) = KODE(1) IF INDEX(2).GT.390 GO TO 288
IF KODE(3).GT.391 GO TO 340
IPRAM 2 = IFRAM(1) IF KODE(1).EQ.60 IFRAM(2) = 1
IF= 1
DO 292 1 = 3, 5
KODE(1) = 0
292 CONTINUE
GO TO 301
294 IF INDEX(2).EQ.448) GO TO 298
KODE(4) = KODE(1) IF INDEX(2).GT.390 GO TO 288
IF KODE(4).LT.391 GO TO 340
IFIPRAM(1),EQ.60 IFIPRAM(2) = 1
IPR= 1
DO 296 1 = 3, 5
KODE(1) = 0
296 CONTINUE
GO TO 301
298 IF INDEX(2).EQ.449) GO TO 302
KODE(4) = KODE(1) IF INDEX(2).GT.390 GO TO 288
IF KODE(4).LT.391 GO TO 340
IFIPRAM(1),EQ.60 IFIPRAM(2) = 1
IPR= 1
DO 300 1 = 3, 5
KODE(1) = 0
300 CONTINUE
301 IF IPRAM(1)=60 AND (IFLAG(1)+80)+OR (IPR+80)+1 AND
IPRAM(2)=60 THEN INCR= IPRAM(1)
C IF INDEX HAS NOT CHANGED, OR IF LAST RECORD WAS AN
C ERROR CODE, PRINT RECORD WITHOUT N. CONTINUE.
C INCREMENTING N.
C
C 302 IF INDEX(2).EQ.INDEX(1)+5 OR INDEX(2).EQ.0 GO TO 350
C OTHERWISE, PRINT RECORD AND N, AND THEN RESET N TO 0.
C GO TO 340

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MEASUREMENT PROCESSING.

305 INDEX(2)=INDEX(1)

AT BEGINNING OF PERIOD, INDEX HAS BEEN SET TO 0. IF,

C WITHIN A PERIOD, THE CURRENT FRAME NUMBER (IFRAM(2)) WAS

GAPPED TO 1, AND THE PREVIOUS FRAME NUMBER (IFRAM(1)) WAS

A MEASUREMENT AND WAS EQUAL TO 60

AND THE PREVIOUS FRAME NUMBER TO INCE.

INDEX (THE CURRENT FRAME NUMBER) IS THEN SET TO THE SUM

OF THE CURRENT FRAME NUMBER AND INCE. Thus, one can have

IFrame number higher than 63 (INARY 111111) (I.E., NUMBERS

UNLIMITED BY MEASUREMENT COUNTER IN VIDEOSCANNER).

IF (IFRAM(1).EQ.0 .AND. IFRAM(2).EQ.0) AND.

INDEX(1).NE.INDEX(2)) GO TO 310

DO SOME CHECKING BEFORE PRINTING.

CHECK THAT LIGHT IS NOT 7; IF SCALE DET HAS BEGUN.

IF (IFRAM(1).EQ.0 .AND. LIGHT(2).EQ.0) AND. LIGHT(2).EQ.7) GO TO 320

CHECK FOR AN INDEX CHANGE. IF INDEX HAS NOT CHANGED AND

C IF ARE IN A PERIOD RATHER THAN A SCALE DETERMINATION

C INDEX THAT THE PUPIL AND LIGHT MEASUREMENTS HAVE THE SAME

C LIGHT NUMBERS FOR A GIVEN FRAME). IF SATISFIED, PROCEED TO

C PRINT RECORD WITHOUT N AND INCREMENT N.

IF (INDEX(2)>INDEX(1)) GO TO 310

IF (INDEX(2)<INDEX(1) .OR. INDEX(2).EQ.0) GO TO 350

GO TO 330

INDEX HAS CHANGED.

C CHECK FIRST WHETHER PRECEDING RECORD WAS AN ERROR CODE.

C IF SO, PRINT CURRENT SECOND AND CONTINUE TO INCREMENT N.

C CHECK WHETHER INCREMENT WAS AT 1, OR WHETHER PRECEDING

C FRAME WAS A CODE.

310 INDEX(1)=INDEX(2) .AND. IFRAM(1).EQ.1) GO TO 360

INDEX(2)=INDEX(1) .OR. IFRAM(1).EQ.1)

GO TO 340

PRINT RECORD OPTIONS.

PRINT RECORD WITHOUT N, MAKE "OOPS:"

320 WRITE(6,325) KlUGE(1),1=1,5,INDEX(2),KLUGE(1),1=1,12

325 FORMAT(5X,5X,5X,5X,5X,5X,1X,"OOPS",5X,6X)

IF (INDEX(2).EQ.TO 10

GO TO 360

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PRINT RECORD AND N; SET N TO 0.

340 PRINT(1,345);(KLUCE(1),1=1,11),INDEX(2),INDEX(2),(KLUCE(1),1=9,12),N,

KLUCE(1),1=15,20)
345 FORMAT(5A4,2X,13,3X,5A4,2NH=N,12,4X,6A4)

GO TO 357

PRINT RECORD WITHOUT N.

350 PRINT(1,355);(KLUCE(1),1=1,5),INDEX(2),INDEX(2),(KLUCE(1),1=8,12),

355 FORMAT(5A4,2X,13,3X,5A4,2X,RX,6A4)

GO TO 357

IF 384, 448, OR 448 CODE, AND LESS THAN CODE REPETITION

FREQUENCY, LOOK FOR NEW RECORD WITHOUT STORING VALUES.

357 DO 358 IF=3,5

IF (KIDP(1),1=0) GO TO 10

358 CONTINUE

81 CHECK FOR END OF SUBJECT CODE HAVING OCCURRED WITH DOMINANT CODE

FREQUENCY NUMBER OF REPETITION .

360 IF (INDF2),1=0 TO 360

365 IF(KΣ08.N,LT,SCRN) GO TO 360

IF END OF SUBJECT, RESET SOME VALUES & CHECK FOR NEXT

SUBJECT.

INDEX(1)=1

IFRAN(1)=0

K=0

INCW=0

KD=0

KΣ08=0

DO 370 E=1,5

KOD(1)=0

370 CONTINUE

CONTINUE

GO TO 10

IF STILL SAME SUBJECT, TIDY UP, STORING CURRENT RECORD AS PREVIOUS,

INCREMENTING INDF REPETITION COUNTER BY ONE, AND SETTING IPH.

380 IFRAN(1)=1 IPSFMN(2)

INDEX(1)=INDEX(2)

LIGHT(1)=LIGHT(2)

IFLAG1=IFLAG(2)

NW=1

IF (INDEX(2),1=0,0,OR,(INDEX(2),1=384,AND,INDEX(2),1=448)

4,AND,INDEX(2),1=448)IPH=0

GO TO 10

END

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DIMENSION CODE(15)
COMMON /HFPK/HFPK(6), HFPK(6)//ISO(3), YUPIN, YUPIN
DATA 6, 125, //*391/

C

10 COMMON PORT

C THIS MAIN PROGRAM - TOGETHER WITH SUBROUTINES
C COMMON, EXP, GRID, HALL, SCALE, GRID, AND ERFTR
C TAKES THE DECIMAL OUTPUT FROM THE HINDEC PROGRAM, TRANSFORMED
C RECENT OUTPUT FROM THE VIDEO-SCANNER AND TRANSLATES CODES, AND
C CALCULATES OCULAR CRIBRATIONS.

C

5 DO 7 X=1,15
       CODEK=0
       CODE=0
       IF(DP=0)
           INCR=0
           INC=0
C READ AND FORMAT FOR FIRST RECORD OF A SUBJECT.
10 READ(S,15,FNC=400) X, Y, INDEX, LITE, IFLAG, SHORT, LINE
   FORMAT(//X,14,2X,13,5X,13,4X,11,6X,13,3X,11,4X,1,13X,19)
   GO TO 40
C READ AND FORMAT FOR ALL OTHER RECORDS OF A SUBJECT.
30 PSREAD(S,35,FNC=400) X, Y, INDEX, LITE, IFLAG, SHORT, LINE
   FORMAT(X,14,2X,13,5X,13,4X,11,6X,13,3X,11,4X,1,13X,19)
   GO TO 70
C IF S HAS BEEN TERMINATED DUE TO SMALL SCALE FACTOR, PASS
C THROUGH RECORDS UNTIL END OF SUBJECT CODE IS ENCOUNTERED.
50 IF INDEX. LT. 1 . OR. INDEX. GT. 10 . THEN GOTO 10
      CODE(DP) = INDEX
      MP=0
      IF/INDEX
      INCR=0
      N=0
      GOTO 10
C CHECK FOR UNDOREIBLE NON-CODE VALUES, SINCE THIS CALLING
C PROGRAM EXPECTS ONLY CODES AS INPUT.
70 IF (SHORT-EF. T. AND. IFLAG. EQ. 1 . AND. INDEX. NE. 0) GOTO 60
   WRITE(S,55) X, Y, INDEX, LITE, IFLAG, SHORT
   GO TO 55
C FORMAT FOR CODES TRANSCRIBED DURING INPUT TO CALLING PROGRAM/100,200:
C SUBJECT LINE RX: =+, Index, Line No. = ,1X,10X, EFLAG=+,SHORT=,INDEX=,13X,13X,13X
C GO TO 30
C WATCH INDEX TO APPROPRIATE CODE. SKIP COUNT OF REPEETITION
C UNOVERSHOWN.
90 IF INDEX.EQ.1 . THEN GO TO 90
C CONDITION CODE OR SKIP.
A0 IF (INDEX.EQ.1) 50 TO 70
   RCODE(1) = RCODE(1)*1
   IF (INDEX.EQ.1) GCODE(1) = GCODE(1)*1
   CALL CODE(INDX, INCH)
   GO TO 30
C RELIABILITY CODE OR SKIP.

CALIBRATION CODE OR SKIP.
190 IF INDEX.LE.45000 TO 120
       KODF(1)=KODE(1)
       IF INDEX.LT.1000 TO 30
       WRITE(6,50)
       105 FORMAT(10X,*THIS IS A CALIBRATION SUBJECT*,T67,13/)
       GO TO 30

SUBJECT CODE OR SKIP.
120 IF INDEX.LE.100 OR INDEX.GT.199300 TO 130
       KODE(4)=KODE(4)
       IF INDEX.GT.200 TO 30
       WRITE(6,135)
       135 FORMAT(10X,*THIS IS SUBJECT NO. *,T67,13/)
       GO TO 30

VIDEO DISK SAMPLING RATE OR SKIP.
130 IF INDEX.LE.201 OR INDEX.GT.230100 TO 140
       KODE(5)=KODE(5)
       IF INDEX.GT.200 TO 30
       WRITE(6,145)
       145 FORMAT(10X,*DISK SAMPLED AT *,T67,13/)
       GO TO 30

SCORER CODE OR SKIP.
140 IF INDEX.LE.251 OR INDEX.GT.269300 TO 160
       KODE(6)=KODE(6)
       IF INDEX.GT.200 TO 30
       WRITE(6,155)
       155 FORMAT(10X,*SCORER CODE NO. FCM THE SCORER OF THIS DATA *,T67,13/)
       GO TO 30

EXPERIMENT CODE OR SKIP.
160 IF INDEX.LE.301 OR INDEX.GT.380100 TO 180
       KODE(7)=KODE(7)
       IF INDEX.GT.200 TO 30
       WRITE(6,165)
       165 FORMAT(10X,*THIS IS EXPERIMENT NO. *,T67,13/)
       GO TO 30

EYE CODE OR SKIP.
180 IF (INDEX.GT.100).OR.0 TO 185

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KODFEN*KODFEN
IF KODE(1).NE.100 GO TO 30
CALL PyTuple(INDEX,INDEX)
GO TO 30
C GRID CODE OR SKIP.
C 105 IF(INDEX.NE.4&INDEX.NE.496) GO TO 100
KODFEN*KODE(8)
IFKCODE(11).NE.130 GO TO 30
CALL GRID(INDEX)
GO TO 30
C CALL READING CODE OR SKIP.
C 110 IF(INDEX.NE.481)GO TO 300
KODE(11)=KODE(10)
IFKCODE(11).NE.130 GO TO 30
CALL FALI(INDEX)
GO TO 30
C SCALE DETERMINATION CODE OR SKIP.
C 200 IF(INDEX.NE.510)GO TO 370
KODE(1)=KODE(11)
IFKCODE(11).NE.130 GO TO 30
C BUT KODEN = NUMBER OF REPETITIONS OF CONDITION OR SUBJECT CODE.
C KODE(1)=KODE(1)
IF(ECSFEN.EQ.0).KODE(1)=KODE(4)
CALL SCALE KODEN
C IF EITHER SCALE FACTOR IS LESS THAN 0.5, GO TO NEXT SUBJECT.
C IF(ABS(YUPIN).GT.0.5 AND ABS(XUPIN).GT.0.5) GO TO 225
WHITE(1)=WHITE(YUPIN)
YUPIN
215 IF(ABS(YUPIN).GT.5.0 AND ABS(XUPIN).GT.5.0 AND ABS(CUPIN).GT.5.0) GO TO 225
160=160
GO TO 30
C PRINT TITLES PRIOR TO FIXATIONS.
C 225 WRITE(6,230)SUBJ,IEPS
230 FORMAT(1/10");"DECODED OUTPUT POP VIDEO SUBJECT No. ",
YUPIN,"IN VISUAL SCANNING EXPERIMENT No. ",YUPIN","
LABEL THIS PERIOD.
C 240 CALL PDLR(KPD,IND,IEPS,IEPS,SUBJ)
C CALCULATE OCULAR ORIENTATIONS FOR THIS PERIOD
C CALL FIXED(KCODE,INDEX,LABEL)
KPD=KPD+1
C IF END OF SUBJECT IS ENCOUNTERED, PRINT MESSAGE, REINITIALIZE,
AND LOCK PCB FOR NEXT SUBJECT; OTHERWISE, PRINT HEADINGS FOR NEXT
PERIOD.
C
ILLEGAL CODE MESSAGE.

400 WRITE(6,405) LASTN, SUBJ, INP
405 FORMAT(1X, 'END OF INPUT FILE OCCURRED AT LINE ', I4, ' OF SUBJ. NO. ', 1X, 13X, ' IN EXPERIMENT NO. ', 1X, 13X)
STOP
END
SUBROUTINE EYEBLINK(IEY)
DIMENSION ICC(4)
DATA ICC/*'NCM', 'CCL', 'HOM', 'HOL'*/
C
THIS SUBROUTINE DETERMINES THE SUBJECT'S VIEWING MODE
C AND WHICH OF THE SUBJECT'S EYES HAS BEEN USED IN SCORING
C
THIS DATA
C
1=INC/100
GO TO (10,20,30,40,50),1
10 IEX=IOC(1)
WRITE(6,15)END
15 FORMAT(1X, 'VIEWING MODE WAS MONOCULAR, ',T67,13/
20 IEX, 'RIGHT EYE WAS SCORED, '/)
GO TO 60
20 IEX=IOC(2)
WRITE(6,25)END
25 FORMAT(1X, 'VIEWING MODE WAS MONOCULAR, ',T67,13/
30 IEX, 'LEFT EYE WAS SCORED, '/)
GO TO 60
30 IEX=IOC(3)
WRITE(6,35)END
35 FORMAT(1X, 'VIEWING MODE WAS BINOCULAR, ',T67,13/
40 IEX, 'RIGHT EYE WAS SCORED, '/)
GO TO 60
40 IEX=IOC(4)
WRITE(6,45)END
45 FORMAT(1X, 'VIEWING MODE WAS BINOCULAR, ',T67,13/
50 IEX, 'LEFT EYE WAS SCORED, '/)
GO TO 60
50 CONTINUE
60 RETURN
END
SUBROUTINE CCND(VCCND, IINCH)
COMMON /PRFCS/PRP(6), DEFY(6),/ISDI(3)
DATA L4,IR,'L Can','MED','HIGH'/
CC
CCMCN /PRFCS/CCND/3KRNX
CC
THIS SUBROUTINE -- SPECIFIC TO ESOT STUDY -- DETERMINES
CC
INTENSITY SEQUENCE, ACTIONS LABELS TO ISD, PRINTS SEQUENCE
CC
AND RETURNS VALUES TO THE CALLING PROGRAM.
CC
ROBERT M. TELSTEIN, YALE PSYCHOLOGY DEPT., 2/23/78
CC
ICM=2
DO 5 $=1,3
5 CONTINUE
GO TO (10,20,30,40,60),IICND
10 ISDI(I)=L
ISDI(2)=N
GO TO 100
20 ISDI(1)=N
ISDI(2)=L
GO TO 100
30 ISDI(1)=L
ISDI(2)=N
GO TO 100
40 ISDI(1)=N
ISDI(2)=L
GO TO 100
50 ISDI(1)=L
ISDI(2)=N
GO TO 100
60 ISDI(2)=N
ISDI(3)=L
GO TO 100
100 IF (I10=1) IICND,(ISDI(J),J=1,3)
110 FORMAT/10X, 'CONDITION FOR THIS SUBJECT IS: ',T67, '(3'/
      '*10L, '2ND STMIPF SEQUENCE: ',A4$, ',',A4$)/
RETURN
END
SUBROUTINE GRID(INDEX)
DIMENSION KCORD(5,4)
C THIS SUBROUTINE RECEIVES GRID COORDINATES AND
C CALCULATES DISTANCE/MACHINE UNITS CONVERSION
C FACTORS FOR THE CAMERA'S FIELD OF VIEW.
C INDEX = GRID INDEX
25 FORMAT(10X,'{ENGLISH GRID: 12.7 MM PER SIDE\',T67,13/)
35 FORMAT(10X,'{ENGLISH GRID: 12.7 MM PER SIDE\',T67,13/)
RFA(D(5,5)KCORD
55 FORMAT(10X,'{ENGLISH GRID: 12.7 MM PER SIDE\',T67,13/)
WHITE(6,65)KCORD
65 FORMAT(10X,'{ENGLISH GRID: 12.7 MM PER SIDE\',T67,13/)
RETURN
END
SUNGOLING FALL(INDEX)
DIMENSION XCCRD(2,3)
C THIS SUBROUTINE RECEIVES FALL BEAMING COORDINATES AND
C CALCULATES ROTATION AND OTHERS
C FACTORS FOR THE CAMERA'S FIELD OF VIEW*
C IF I IN RXP.F,482 RITEX6,251INDEX
25 FORMAT(10X,FALL_BEAfING.x*y,z,13/)
READ(55,FOXDB)
55 FORMAT(1X,43,5X,13)
WRITE(A,63)RECCD
63 FORMAT(18X,*X,X,X,X/118,13,5X,13/)
RETURN
END
SUBROUTINE SCALE(KCODE)
C THIS SUBROUTINE READS IN DATA TO CALCULATE AND PRINT
C SCALE FACTORS TO BE RETURNED TO THE CALLING PROGRAM.
C
C DIMENSION CXL(6),CYL(6),DXF(3),DYF(3),IDIFX(6),IDIFY(3),
C IXL(6),IYL(6),ISL(5,6),JYL(5,6),JXM(3),KXL(6),KYL(3),
C INSL(6),ISLF(3),JSLF(3),VPM(6),VPM(3)
COMMON /SEPFC/ESX(6),ESY(6)/ISL(3),JSL(3),JUP(3),YUP(3)
DATA E,0.1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
C 85,4/
C
C PRINT FIRST HEADINGS
C
C WRITE(6,15)
C 15 FORMAT(10X,'BEGIN SCALE READINGS'/)
C
C INITIALIZE INPUT ARRAYS TO PREPARE FOR DATA READ-IN.
C
DO 25 I=1,6
DO 25 J=-1,6
ISL(I,J)=0
25 CONTINUE

C READ DATA. CHECK FOR AND PRINT 'NON-SCALE' OR WEIRD-VALUE RECORDS.
C STORE DATA IN ISX AND ISY ARRAYS. WHEN SCALE INITIALIZATION DATA
C ENCOUNTERED, GO DO SCALE CALCULATIONS.
C
35 IF(IX,EQ.15),I INDEX, IY INDEX, LITE, IPLAG, SHORT
45 FORMAT(I6,14,25,13,52,13,42,13,32,32,11,4,11)
IF(SHORT,FO,F,INDEX,LO,51)GO TO 35
IF(INDEX,NE.504,IN IPLAG,NE.116)GO TO 50
K50=K504
IF(INDEX,LT,KCDEN)GO TO 35
GO TO 75
50 IF(INDEX,GE.1072),AND, IX,GE.1,AND, IY,LE.500
AND, INDEX.GT.10,AND, IPLAG,GT.0)GO TO 65
55 IF(INDEX,GT,1)PRINT, IINDEX, LITE, IPLAG, INDEX, IY
60 FORMAT(6,06,116,116,116,116)
IF(INDEX,GT,KCDEN)SCALE DETECTION DATA READ-IN PROV
2/10X,'FINDFC OUTPUT LINE ',14,' FLAG=',11,' INDEX=',13,
33,' HINE=',12)
GO TO 35.

C SAVE FIRST LINE NUMBER ASSOCIATED WITH EACH OF
C THE SCALE DETECTION FRAMES. KEEP COUNT
C NP THE NUMBER OF FRAMES (N1).
C
65 IF(INDEX,GT.IND)GO TO 70
LINE(INDEX)=LINE
N=NP1
GO TO 70.

C STORE X AND Y IN THE APPROPRIATE LIGHT AND FRAME
C CELL OF THE STORAGE ARRAY. SAVE INDEX FOR
C COMPARISON WITH FRAME NUMBER ON WHICH THE NEXT
C LINE WAS BASED.
C
70 ISX(INDEX,LITE)=IX
GO TO 35.
ISY INDEX,LITE+1
INDEX
GO TO 35

PRINT FACING FOR SCALE ARRAYS
75 WHIT(6,90)
76 FORMAT(33X,E10.4)
77 FORMAT(33X,7X,F8.4,10X)
78 FORMAT(1X,10X,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4)
79 FORMAT(1X,10X,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4)
80 FORMAT(1X,10X,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4)
81 FORMAT(1X,10X,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4,1X,R4F4.4)

CALCULATION OF X AND Y DISTANCES BETWEEN LIGHTS, CHECK FOR UNLIKELY
COORDINATES; IN MORE THAN 1 IS WHEN THEY SHOULD ACTUALLY
BE THE SAME - SEND TO PRINT WITH CHECK, BUT DO NOT USE THESE
SOMETHINGS IF ETIQUETTE MEMBER OF A PAIRING IS =0 DO NOT USE IN
DISTANCE CALCULATIONS. PRINT X AND Y ARRAYS FOR EACH FRAME.

INITIALIZE X AND Y DIFFERENCE ACCUMULATORS AND COUNTERS FOR ADDING
DISTANCES BETWEEN PAIRS OF LIGHTS OVER FRAME.

DO 85 K=1,6
IDIFY(1)=0
IDIFY(2)=0
85 CONTINUE
DO 86 K=1,3
IDIFY(1)=0
86 CONTINUE
100 DO 250 I=1,K

CHECK X PAIRING
DO 105 K=1,6
IF(ISY(I),JA(K))EQ.0,OR.ISY(I),JA(K),EQ.0)GO TO 105
105 IF((ISY(I),JA(K))-ISY(I),JA(K))**2>21.7255 GO TO 260
106 CONTINUE

CHECK Y PAIRING
DO 110 K=1,3
IF(ISY(I),JH(K))EQ.0,OR.ISY(I),JH(K),EQ.0)GO TO 110
110 IF((ISY(I),JH(K))-ISY(I),JH(K))**2>21.7255 GO TO 260
111 CONTINUE

CALCULATE 6 X-DIFFERENCES AND 6 COUNTS
DO 125 K=1,6
IF(ISY(I),JA(K))EQ.0,OR.ISY(I),JA(K),EQ.0)GO TO 125
125 IF(ISY(I),JA(K))**2<21.7255 JX(I)=JX(I)+1
126 CONTINUE

CALCULATE 3 Y-DIFFERENCES AND 3 COUNTS
DO 145 K=1,3
IF(ISY(I),JH(K))EQ.0,OR.ISY(I),JH(K),EQ.0)GO TO 145
145 IF(ISY(I),JH(K))**2<21.7255 JY(I)=JY(I)+1
146 CONTINUE

PRINT ISX AND ISY FOR THIS FRAME.
C WRITE(*,165)LINE(1),I,(ISX(I,J),JSY(I,J),J=1,6)  165 FORMAT(1X,6I3,6I3,1X,6I3,1X)
GO TO 250  
C PRINT ISX, JSY, AND CHECK MESSAGE FOR THIS FRAME.
200 WRITE(*,220)LINE(1),I,(ISX(I,J),JSY(I,J),J=1,6)  220 FORMAT(1X,6I3,1X,6I3,1X,6I3,1X)
250 CONTINUE
C CALCULATE THE 6 X AND 3 Y DIFFERENCES FOR THE ACTUAL LIGHT POSITIONS.
   DO 253 K=1,6
      DIFFX(K)=REFX(IA(K))-REFX(JA(K))
253 CONTINUE
   DO 255 K=1,3
      DIFFY(K)=REFY(IB(K))-REFY(JB(K))
255 CONTINUE
C USING TOTALS, FIND AVERAGES AND CALCULATE SCALE FACTORS.
C BEGIN BY INITIALIZING SCALE FACTORS AND COUNTS.
XUPIN=0.0  YUPIN=0.0  CTX=0.0  CTY=0.0
C CALCULATE x AVERAGE DISTANCES AND SCALE FACTORS.
   DO 27C K=1,6
      SPM(K)=0.0
      CYK=0.0
      IF(I(K).Lt.IDIFX(K)) THEN TO 270
         DIFX(K)=DIFX(K)+1/CTK(K)
      ELSE \ END
         DIFX(K)=0.0 TO 270
      IF(J(K).Lt.IDIFY(K)) THEN TO 270
         DIFY(K)=DIFY(K)+1/CYT(K)
      ELSE \ END
         DIFY(K)=0.0 TO 270
      XUPIN=XUPIN+SPM(K)
   XUPIN=CYK+1.0
270 CONTINUE
C CALCULATE y AVERAGE DISTANCES AND SCALE FACTORS.
   DO 28C K=1,3
      TYP(K)=0.0
      CTK=0.0
      IF(I(K).Lt.IDIFY(K)) THEN TO 280
         DIFY(K)=DIFY(K)+1/CTK(K)
      ELSE \ END
         DIFY(K)=0.0 TO 280
      IF(J(K).Lt.IDIFX(K)) THEN TO 280
         DIFX(K)=DIFX(K)+1/CYT(K)
      ELSE \ END
         DIFX(K)=0.0 TO 280
      YUPIN=YUPIN+TYP(K)
   YUPIN=CTY+1.0
280 CONTINUE
C THE SCALE FACTORS ARE:
   IF(CX*.LT.0.0) GO TO 285
   XUPIN=XUPIN/CTX
285 IF(CY*.LT.0.0) GO TO 290
   YUPIN=YUPIN/CTY
C
C PRINT X AND Y SCALE INFORMATION.

C

200 WRITE(6,201)
201 FORMAT(///,9F14.7)

202 WRITE(6,202) X SCALE INFORMATION FOR THE Dimensions
       WRITE(6,202) X, Z, X SCALE IN FORMATION FOR THE X-DIMENSION

203 WRITE(6,203) X SCALE INFORMATION FOR THE Y-DIMENSION

204 CONTINUE
205 END

206 DATA REFX,REFY/*8.5,9.6,-9.5,-8.5,0.0,8.5,3.5,3.5,3.5,-3.5,-1.5*/
207   */3.5/*

END
SUBLTIN PDLI(EPD, INCH, IEXP, IYEY, ISUBJ)
COMMON /EPFD3, EPFD4, EPFD5 / / SD(3)

PELARY3. PORT

THIS SUBLTINE PRINTS OUT THE STIMULUS CONDITION FOR A GIVEN
PERIOD ON THE BASIS OF THE PERIOD NUMBER SENT FROM THE CALLING
PROGRAM. THIS SUBLTINE IS SPECIFIC TO THE STUDY
COFFEE. INFORMATION READINGS ARE ALSO PRINTED PRIOR TO RETURN.
REVISED 2/25/78. ROBERT W. MILSTEIN, YALE PSYCHOLOGY DEPT.

IF (INCH.EQ.0) GO TO 10
WITH 6,5LING,IEYP,IEYJ,ISUBJ,EPD
S FORMAT //10X,1PERIOD;'12,142,1B',13,4,
B X ',13,1IP',12,1X,1*1 MENT')
GO TO 50
10 IF (MOD(IEXP+2,2).EQ.0) GO TO 40
30 IF (IYEY.EQ.5) GO TO 35
35 FORMAT //10X,1PERIOD;512,1SINGLE STRIPE';142,1P',13,4,
B X ',13,1IP',12,1X,1MEN
GO TO 50
40 IF (EPD.EQ.2) RETURN
45 FORMAT //I0X,1PERIOD;512,1*2 STRIPES;2ND',142,1P',12,1X,1
B X ',13,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,10,1',770,75,1')
GO TO 55
50 FORMAT //10X,1PERIOD;512,1*3 STRIPES;3RD',142,1P',12,1X,1
B X ',13,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
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B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
B X ',13,1IP',12,1X,11,4,
SUBROUTINE FIXKODEN,INKUT,INDEX)

C FIXK3.FORT
C THIS SUBROUTINE PROCESSES CODES AND MEASUREMENTS ASSOCIATED
C WITH THE OBSERVATION PERIODS DURING THE EXPERIMENT. HORIZONTAL
C AND VERTICAL MEASUREMENT COLUMNS INFORMATION IS PRINTED IN
C A FORMATED FORM, FOLLOWED BY THE CALCULATED COGLAN ORIENTATIONS.
C CODES ARE PROCESSED AND APPROPRIATE MESSAGES ARE PRINTED. ENDS
C OF PERIODS ARE SPENSED, NUMBER OF FRAMES PROCESSED IS PRINTED.
C AND CONTROL IS RELAINED TO THE CALLING PROGRAM. TOGETHER WITH
C CODE REPETION FREQUENCY AND MOST RECENT CODE.
C REvised 2/25/78. SHERW W. HILSTEIN, TALK PSYCHOLOGY DEPT.
C
DIts: KODE(6)
DIMENSION KODE(6)
CONNECT (MEPPO/REFX(6),REFY(6),XUP,YUP)
DATA INDEX
C INITIALIZE SCHE VARIABLES.
DO 10 K=1,5
KODE(K)=0
10 CONTINUE
NP=0
IN2=0
LH=0
LT=0
IN=0
IPUT=0
IKIP=0
IOLD=0
READ A RECORD.
20 READ 5,25,HX,IX,IT,INDEX,L1,FLAG,SHORT
25 FORMAT(1X,3I3,1L3,3I3,IL3,4I3,1L3,4I3)
C CHECK FOR CODE HAVING REACHED REPETITION FREQUENCY REPORT CONTINUING
50 IF(IP=0.100.0) GOTO 110
C MECHANICAL PROCEDURES CODE OR SKIP.
IIF(INDEX.NP.384) GOTO 60
LJOIN(1)=JOIN(1)+1
IIF(LJOIN(1).LT.KODFM) GOTO 20
DO 55 K=1,5
ACDE(K)=0
55 CONTINUE
GOTO 110
C END CLSRED CODE CR SKIP.
C 60 IF(INDEX.NP.448) GOTO 67
KODFM=JOIN(1)+1
IIF(LJOIN(1).LT.KODFM) GOTO 20
DO IF (X + 5, Y <= 5, Z + 6) CONTINUE
GO TO 110

C SACCADE CODE OR SKIP
C
67 IF (INDEX, MF. 440 MG TO 70
  IF (INDEX, MF. 450 MG TO 70
  IF (INDEX, MF. 460 MG TO 70
  IF (INDEX, MF. 470 MG TO 70
  GO TO 110

C BEGIN PERIODE CODE OR SKIP, ON REACHING CODE REPETITION FREQUENCY, PASS TO COMPUTATIONS ONE MORE TIME
C
70 IF (INDEX, MF. 500 MG TO 80
  IF (INDEX, MF. 510 MG TO 80
  IF (INDEX, MF. 520 MG TO 80
  IF (INDEX, MF. 530 MG TO 80
  GO TO 110

C END OF SUBJECT CODE OR SKIP, ON REACHING CODE REPETITION FREQUENCY, PASS TO COMPUTATIONS ONE LAST TIME
C
80 IF (INDEX, MF. 600 MG TO NO
  IF (INDEX, MF. 610 MG TO NO
  IF (INDEX, MF. 620 MG TO NO
  IF (INDEX, MF. 630 MG TO NO
  GO TO 110

C ILLEGAL CODE MESSAGE
C
90 GO TO 110
C
C CHECK THAT MORE THAN 1, AND AN EVEN NUMBER OF RECORDS HAVE BEEN PLACED IN THE BUCKET BRIGADE STORAGE
C REGISTERS: THE APPROPRIATE VARIABLE IS NR
C
110 IF (INDEX, LT. 2) GC TC 240
  NR = NR + 1
C
C CHECK THAT FRAME NO. IS THE SAME FOR BOTH THE LIGHT AND THE PUPIL RECORDS
C
111 IF (INDEX, MF. 120 MG TO 120
  IF (INDEX, MF. 130 MG TO 120
  IF (INDEX, MF. 140 MG TO 120
  IF (INDEX, MF. 150 MG TO 120
  GO TO 340
C
C IF FRAME NO. ARE THE SAME, CHECK THAT LITE NO. ARE ALSO THE SAME FOR LITE AND PUPIL RECORDS
C

120 IF(LT2.5E,LT1.1E0 TO 130
125 RENAT10X.1,14 Their LINTER WOR. FOR LITE AND PUPIL: "+13,14,13/ 
200 AT LINE "+14, AND LINE "+14, RESPECTIVELY."
1279 RENAT1
1280 GO TC 240
130 CHECK FOR INCREMENT OF FRAME NUMBER BY ONE COMPARED TO THE 
1329 FRAME NUMBER OF THE LAST CALCULATED OCULAR ORIENTATION.
1339 C 240. 44P, OR 440 WILL HAVE INCREMENTED 665 TO PROTECT ALLOWABLE 
1349 SPACIOUS GAPS.
1359 130 IF(INF-10Lin.665*61KIF).EQ.0 GO TO 140 
1369 WRITE(6,125)
1379 \(665) (6,125)
1389 \(665)
1399 \(665)
1409 \(665)
1419 \(665)
1429 \(665)
1439 \(665)
1449 \(665)
1459 \(665)
1469 \(665)
1479 \(665)
1489 \(665)
1499 \(665)
1509 \(665)
1519 \(665)
1529 \(665)
1539 \(665)
1549 \(665)
1559 \(665)
1569 \(665)
1579 \(665)
1589 \(665)
1599 \(665)
1609 \(665)
1619 \(665)
1629 \(665)
1639 \(665)
1649 \(665)
1659 \(665)
1669 \(665)
1679 \(665)
1689 \(665)
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1919 \(665)
1929 \(665)
1939 \(665)
1949 \(665)
1959 \(665)
1969 \(665)
1979 \(665)
1989 \(665)
1999 \(665)
2009 \(665)
2019 \(665)
2029 \(665)
2039 \(665)
2049 \(665)
2059 \(665)
2069 \(665)
2079 \(665)
2089 \(665)
BEGIN PERIOD CODE OR SKIP ON REACHING CODE REPETITION FREQUENCY, PASS

\[270 \text{IF INDEX NE 504 GO TO 280} \]
\[\text{GO TO 400} \]

\[\text{END OF SUBJECT CODE OR SKIP ON REACHING CODE REPEITION FREQUENCY, PREVIOUSLY} \]
\[\text{INDEX = 506 TO 380} \]
\[\text{GO TO 400} \]

ILLEGAL CODE MESSAGE.

\[290 \text{WRITE} (6,265) \]
\[\text{INDEX, INDEX = 13, NOT ACCEPTABLE CODE DURING P.D.)} \]
\[\text{GO TO 20} \]

CHECK FOR WRITTEN SCORES IN Y OR Y COUNTERS, GETTING A NEW RECORD.

\[300 \text{IF INDEX NE 506 IOC 10 TO 290} \]
\[\text{GO TO 400} \]

INCORRECT CODE OR SKIP.

\[\text{WRITE} (6,265) \]
\[\text{INDEX, INDEX = 13, NOT ACCEPTABLE CODE DURING P.D.)} \]
\[\text{GO TO 20} \]

CHECK THAT THERE ARE NOT MORE THAN 2 CONSECUTIVE RECORDS WITH THE SAME FRAME NUMBER.

\[320 \text{IF INDEX NE IN LOC TO 360} \]
\[\text{WRITE (6,322) INDEX, LINE} \]
\[\text{FORMAT (10T,10C WANT RECORDS WITH FRM. NO. = 13, AT LINE = 14) \}
\[\text{GO TO 20} \]

SHIFT VALUES THROUGH REGISTRATION VARIABLE.

\[350 \text{IF I = IPU1} \]
\[\text{IPL1 = IPU1} \]
\[\text{IPL2 = IPU1} \]
\[\text{LIN1 = IPU2} \]
\[\text{LIN2 = IPU2} \]
\[\text{L11 = L12} \]
\[\text{L22 = L12} \]

\[\text{INCREMENT SHIFT COUNTER BY 1, THEN GO READ A NEW RECORD.} \]
\[\text{GO TO 20} \]

PRINT NUMBER OF FRAMES FOR WHICH OCULAR ORIENTATION WERE CALLED.

\[\text{GO TO 400} \]
\[\text{WRITE (6,410) \}
\[\text{INDEX, INDEX = 13, ORIENTATION CALCULATED FOR FRAME, DURING PREVIOUS PERIOD.} \]
\[\text{RETURN} \]

END
THIS PROGRAM READS BACKGROUND INFORMATION FROM DUMMY.DAT, AND HEADS OCULAR ORIENTATIONS FROM DUMMY.OUTPUT DATA, CALCULATES MEASURES OF VISUAL RESPONSE, AND WRITES A SUMMARY OUTPUT FOR EACH SUBJECT — ONE FILE OF MEASURES AND ONE FILE OF SHIFT IDENTIFYING MESSAGES.

THE INPUT IS DUMMY.DAT, AND THE OUTPUT IS DUMMY.OUTPUT.

THE MEASURES OUTPUT FILE IS "MEASURES", AND THE SHIFT MESSAGES FILE IS "SHIFT MESSAGES".

THE PROGRAM WORKS IN YALE PSYCHOLOGY DEPT., J/19/78.

FOR MEASURES FROM TRANSFORMED DATA IN DEGREES LEFT FOR AVERAGE VISUAL ANGLE CORRECTION, CHANGE LINE 1140 TO THE FOLLOWING:

1140 TAN1 = ATAN2(X /t), 0.1396 = .0

OUTPUT FORMAT FOR MEASURES FILE:
LINE 1: 1.02 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
LINE 2: BACKGROUND INFORMATION FOR SUBJECT FROM DUMMY.DAT.
LINE 3: BACKGROUND INFORMATION FOR SUBJECT FROM DUMMY.OUTPUT.
LINE 4: SUBJECT*, CONDITION*, EXPERIMENT*, DISK SAMPLING RATE, SCORER*, IS 47
LINES 5 - 32 M M BLK-THER-SECOND STRIPE TRIAL I AS 5-18
LINE 5: SHIFT*, PERIOD, # OF FRAMES, 1ST POSITION, LAST POSITION, MEAN, STD, CV, DEVIATION, VARIANCE, Y DIMENSION
LINE 6: Y DIMENSION FOR SAME PERIOD. FORMAT AS FOR LINE 5.
LINE 7: X DIMENSION FOR TWO STRIPE PERIOD. SEE LINE 5.
LINE 8: X DIMENSION FOR SAME PERIOD. FORMAT AS FOR LINE 5.
LINE 9: ALL SHIFTS, TIGHT WINDS
LINE 10: ALL SHIFTS, LOOSE WINDS (AS FOR LINE 9)
LINE 11: COMMON X(29), Y(20), NAME(20), SID(4,5,2,3), SHD(4,5,2,3),
LINE 12: INPUT X(29), Y(20), NAME(20), SID(4,5,2,3), SHD(4,5,2,3),
LINE 13: OUTPUT FORMAT FOR SHIFT MESSAGES FILE:
LINE 14: START AND END FRAME OF EACH SHIFT IS GIVEN WITH SUBJECTS
LINE 16: COMMON X(20), Y(20), NAME(20), SID(4,5,2,3), SHD(4,5,2,3),
LINE 17: DIMENSIONUpDown(24,4,20), 19HJ(241,612),
```
      54窮 6,2, 2, 3, 1, INH(3,2), INH(3, 3), INH(3, 4), INH(3, 5)
      DATA FN, PE, OCUL/ESC/15, 1/3
      56SIFMT, *OCUL/15, 1, 1, 2, 1, 2, 1, 3, 2, 1, 1, 2, 3, 2, 1
      58C INPL DNNY
      59A  DO 5 1=1,24
         60FADRI 9,4,6KDU(1,1),K=1,20)
      61C CONTINUE
      62C READ MLCODES LOOKING FOR GIANT OR SCALE DATA.
      63C INPUT CODES FOR SUBJ, CONDI, EXP, SAMPR, SCORBR TO KOD.
      64C TRY TO MATCH SUBJECT TO RECORDED INFO. WRITE IN TRANSITION CODES.
      65C GO TO 50, 1 = 1, 24
      66C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      67C CONTINUE
      68C CONTINUE
      69C CONTINUE
      70C PRINT SCALE DATA.
      71C 50 PRINT(14)
      72C CONTINUE
      73C PRINT SCALE DATA.
      74C 50 PRINT(14)
      75C CONTINUE
      76C 51C INPUT CODES FOR SUBJ, CONDI, EXP, SAMPR, SCORBR TO KOD.
      77C TRY TO MATCH SUBJECT TO RECORDED INFO. WRITE IN TRANSITION CODES.
      78C GO TO 50, 1 = 1, 24
      79C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      80C CONTINUE
      81C CONTINUE
      82C CONTINUE
      83C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      84C GO TO 50, 1 = 1, 24
      85C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      86C CONTINUE
      87C CONTINUE
      88C CONTINUE
      89C CONTINUE
      90C CONTINUE
      91C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      92C GO TO 50, 1 = 1, 24
      93C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      94C CONTINUE
      95C CONTINUE
      96C CONTINUE
      97C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      98C GO TO 50, 1 = 1, 24
      99C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      100C CONTINUE
      101C CONTINUE
      102C CONTINUE
      103C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      104C GO TO 50, 1 = 1, 24
      105C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      106C CONTINUE
      107C CONTINUE
      108C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      109C GO TO 50, 1 = 1, 24
      110C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      111C CONTINUE
      112C CONTINUE
      113C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      114C GO TO 50, 1 = 1, 24
      115C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      116C CONTINUE
      117C CONTINUE
      118C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      119C GO TO 50, 1 = 1, 24
      120C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      121C CONTINUE
      122C CONTINUE
      123C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      124C GO TO 50, 1 = 1, 24
      125C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      126C CONTINUE
      127C CONTINUE
      128C MATCH SUBJ TO RECORDED INFO. WRITE IN TRANSITION CODES.
      129C GO TO 50, 1 = 1, 24
      130C IF (SIFMT, 9, 3, INH(1,1), INH(1,1)) INFO TO 17
      131C CONTINUE
      132C CONTINUE
```
DO 60 KE=1,2
DO 60 LL=1,3
IF (LL,KE,JJ,II) EQ 0
60 CONTINUE
DO 70 LL=1,6
IF (LL,KE,JJ,II) EQ 0
70 CONTINUE
80 CONTINUE

START STORAGE OF OX AND OY VALUES IN X AND Y ARRAYS.
110 READ*,125,END=750,LIST=NO,OY
125 FORMAT(//14,5E13.3,44,170,FS,11,F$)
IF (YY,GG,OO,NO) TO 340
GO TO 70
200 READ*,56,END=750,LIST=NO,OY
205 FORMAT(//14,5E13.3,44,170,FS,11,F$)
IF (YY,GG,OO,NO) TO 70
GO TO 200
210 CALL AVGIN,AVX,AVY
220 CALL VARI,AVX,AVY,VARX,VAHY,
230 CALL MAVN,XHCN,VMCN
240 CALL SHIFT,1,1,1,X(N),Y(N)
250 CALL SHIFT,2,1,1,X(N),Y(N)
260 CALL SHIFT,3,1,1,X(N),Y(N)
270 CALL SHIFT,4,1,1,X(N),Y(N)
280 CONTINUE
300 READ*,540
310 READ*,545
320 CONTINUE
LOOK FOR END OF SUBJECT.
350 DO 330 I=1,J
360 CONTINUE
C WRITE 'IN CUT.
DO 410 R,R=1,3
WHITE
C LOOK FOR END OF FILE AFTER END OF SUBJECT.
C READ (^,465,FROM=700)
455 FORMAT(/I7X,*END OF FILE OCCURRED DURING PERIOD.*)
GO TO 10
C END OF FILE MESSAGES.
500 WRITE(^,505)
5/5 FORMAT(/I7X,*END OF FILE OCCURRED DURING SKIP TO 510.*)
GO TO 50
600 WRITE(^,605)
6/6 FORMAT(/I7X,*END OF FILE OCCURRED DURING SKIP TO SCALE.*)
GO TO 60
700 WRITE(^,705)
7/7 FORMAT(/I7X,*END OF FILE OCCURRED DURING SKIP TO*,
# BEGIN PERIOD.*)
GO TO 70
750 WRITE(^,755)
7/5 FORMAT(/I7X,*END OF FILE OCCURRED DURING FIRST LINE*,
# OF PERIOD.*)
GO TO 75
760 WRITE(^,765)
7/6 FORMAT(/I7X,*END OF FILE OCCURRED DURING PERIOD.*)
GO TO 76
790 WRITE(^,795)
7/9 FORMAT(/I7X,*END OF FILE OCCURRED AFTER SKIP*)
GO TO 79
END
SUBROUTINE AVG(X,Y)
CCFUN1 XI200, XI300
CGFPLDA(X)
AT=0
AY=0
NO STOP
END

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SUBROUTINE VANCE(AX,AY,AX,AY)

COUNTRY {200,200)

C1=PLC(100)

VX=0.

VY=0.

IF (C1=1.0) GO TO 40

GO TO 60

CONTINUE

VX=VX/CNT

VY=VY/CNT

60 RETURN

END

SUBROUTINE VEN(N,AX,AY,AX,AY)

COUNTRY {200,200)

C1=PLC(100)

AX=AX(1:N)

AY=AY(1:N)

60 CONTINUE

END
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C AS=1, SHIFT TO LEFT HAS BEEN FOUND.
C
LOC#==1
DO 2000 I=1,LOC#
C
SHIFT.
C
IF(I.LT.EXIF+100 TO 2000
C
OPEN WINDOW A FRAME AT A TIME TO SIZE K.*
C
DON'T LET START WINDOW EXCEED N. IF ACTUAL # OF FRAMES
C
FROM START EXCEED N. LOC FOR SHIFT OF CRITERION SIZE.
C
CHECK DIRECTION OF SHIFT.
C
DC=1500,J1=1
IF(1(J1).LT.L) GO TO 2000
1001
IF(NFPK-1,J1).LT.(NPAK+1,J1) GO TO 2000
1002
IF(J1+JX,J1).LT.-289) GO TO 2000
1003
IF(1(J1).LT.) GO TO 103
1004
CONTINUE
1005
C
SHIFT IS TO RIGHT. CHECK FOR FALSE STARTS OR REVERSALS
C

NMAX=0
DO 140 J=1,1
IF(1(J).LT.L-J) GO TO 2000
132
IF(1(J).LT.-289) GO TO 2000
133
NPAK(NPA)=1
GO TO 140
134
CONTINUE
C
NO FALSE SHIFT RECOGNIZED (EVEN BEYOND TIME
C WINDOW). ALLO\nC
K NEW WINDOW CALL.
C
NMAX=0
DO 160 J=1,NEX
IF(1(J-JX).LT.(NPAK+1,JX)) GO TO 170
152
IF(1(J-X).LT.-289) GO TO 170
153
NPAK(J)=J
GO TO 160
154
CONTINUE
155
CONTINUE
156
CONTINUE
157
STORE IN RIGHT SHIFT TOTALS & INCREMENT COUNT. RECORD FIRST.
C
SHC1,J1,JX,INT)=SHC1,J1,JX,INT+1
SHT1,J1,JX,INT)=SHT1,J1,JX,INT+1,JX-11
1194,1111,J1) GO TO 260

CALL CATG(1,1,1+J),KS(1,4,KN,INT),KS(2,4,KN,INT)
KS(3,4,KN,INT)=DON(1,1,1+J)
KS(1,4,KN,INT)=DON(1,1,1+J)-DFP(1)
SHI(1,4,KN,INT)=DFP(1)\[DFP(1)]
SHE(1,4,KN,INT)=DFP(1)\[DFP(1)]
SHE(2,4,KN,INT)=DFP(1)\[DFP(1)]
SHE(4,4,KN,INT)=DFP(1)\[DFP(1)]
COMMON
GO TO 260
C SHIFT IS TO LEFT. CHECK FOR FALSE STARTS OR REVERSALS
C BEFORE CRITERION.
180 MAXI=1
FALSE=0
GO 270 MAXI,J1
IF(1<MAXI+J1) GO TO 200
IF(1<MAXI+J1) GO TO 200
MAXI=MAXI+J1
210 IF(1<MAXI+J1) GO TO 200
MAX=1
FALSE=0
220 CONTINUE
C FIND EXTENT OF SHIFT PLACE REVERSAL (EVEN BEYOND TIME WINDOW). ALLOW FALSES IF WEAK WINDOW CALL.
C MAX=1
FALSE=0
DO 230 MAXI,J1,KN,J2
IF(J1>MAXI+J1) GT 250
IF(J1>MAXI+J1) GT 250
MAXI=MAXI+J1
230 IF(MAXI>J1) GO TO 250
IF(MAXI>J1) GO TO 250
MAX=1
FALSE=0
240 CONTINUE
C STORE IN LEFT SHIFT TOTALS & INCREMENT COUNT. RECORD FIRST.
C SHI(1,5,KN,INT)=SHI(1,5,KN,INT)+1
SHI(1,5,KN,INT)=SHI(1,5,KN,INT)+1
SHI(1,5,KN,INT)=SHI(1,5,KN,INT)+1
SHI(1,5,KN,INT)=SHI(1,5,KN,INT)+1
CALL CATG(1,1,1+J),KS(1,5,KN,INT),KS(2,5,KN,INT)
KS(3,5,KN,INT)=DON(1,1,1+J)
KS(1,5,KN,INT)=DON(1,1,1+J)-DFP(1)
SHE(1,5,KN,INT)=DFP(1)\[DFP(1)]
SHE(1,5,KN,INT)=DFP(1)\[DFP(1)]
SHE(2,5,KN,INT)=DFP(1)\[DFP(1)]
SHE(4,5,KN,INT)=DFP(1)\[DFP(1)]
COMMON
C STORE IN ALL SHIFT TOTALS & INCREMENT COUNT. RECORD FIRST.
C
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FUNCTION KDIR(X1, X2)

IF MLTR IS TOWARDS SECOND STRIPE, KDIR=2.

IF MLTR IS AWAY FROM SECOND STRIPE, KDIR=1.

ADIR=1
IF(X1.LE.X2+0.5) GO TO 10
IF(X1.LT.X2) KDIR=1
GO TO 20
10 V[X1.GT.X2] KDIR=2
20 RETURN
END

SUBROUTINE CATC(X1, X2, AS, KE)

IF LEFT CV -2, AS (COE) =1; BETWEEN -2 AND 2, AS (COE) =2;
RIGHT UP 2, AS (COE) =3.

KE=2
IF(X1.LT.-2.0) AS=1
10 IF(X1.GT.2.0) AS=3
IF(X2.LT.-2.0) KE=1
IF(X2.GT.2.0) KE=3
RETURN
END
A PROGRAM TO READ OCULAR ORIENTATIONS FROM OUTPUT AND TO PLOT THE X COORDINATE OF THE INFANT'S EYE IN THE PERIOD BETWEEN 10 AND 20 MIN. OF AGE.

DIMENSION X(200), Y(200), XM(200), T(7), P(121), SMALL(25), SMALL(10)

DATA PAM, PERI, CULF, FFM, DPD, PLUS/.,*/./.,'*/.,'*/.,'*/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'/.,'.
WRITE PERIOD TITLE AND AXIS LABELS AT TOP OF PLOT.

WRITE PERIOD TITLE AND AXIS LABELS AT BOTTOM OF PLOT.

WRITE PERIOD TITLE AND AXIS LABELS AT BOTH TOP AND BOTTOM OF PLOT.
Appendix C

Computer Programs for Root Mean Square Analyses of Infant Sucking Waveforms
CRAFLI, POR DIGITIZER INPUT PROGRAM

FORTRAN IV VOIC-030 WED 20-DEC-77 08:22:20 PAGE 001

0001 DIMENSION DISP(1000), NAMER(4), NAMEA(8), YRAY(1000)
0002 INTEGER IBUF(200)
0003 DATA IX,TXT /36FIC/
0004 CALL SPFILE(NAMER,NAMER, ITEXT, -1, 'PICTURE')
0005 J=IRSIGN(I,NAMER,NAMER(N)+1,0)
0006 DEFINE FILE (O+2, O+1, IREX)
0007 DO 10 I=1,1000
0008 YRAY(I)-1000.
0009 10 DISP(I)=0.
0010 CALL INIT(IBUF,200)
0011 CALL SCROLL(6,744)
0012 CALL YORAS(1.,DISP(1000))
0013 ISTOP=1
0014 20 TYPE 500
0015 500 FORMAT(' DIGITIZE LEFT HAND END OF BASELINE '/X)
0016 CALL COORD(XO,YO,IREX)
0017 TYPE 510 XO,YO
0018 510 FORMAT(' X='F6.1, ' Y='F6.1)
0019 TYPE 520
0020 520 FORMAT(' DIGITIZE RIGHT HAND END OF BASELINE'/X)
0021 CALL COORD(X1,Y1,IREX)
0022 TYPE 510 X1,Y1
0023 TYPE 530
0024 530 FORMAT(' DIGITIZE PICTURE'/IX)
0025 30 CALL COORD(X)Y,IREX)
0026 IF(IREX,NE.0) GO TO 40
0027 IF(X.LT.XO.OR.X.GE.XO+1000.,GO TO 30
0028 XFRACl=X-XO)/(X1-X10)
0029 YVAL=(Y-(Y(X0)XFRACI(Y1 YO))/100.
0030 Y1=100. YVAL+100.
0031 IF(Y.LT.0.,OR.Y.GE.768.,GO TO 30
0032 I=IFIX(X-XO+1)
0033 YRAY(I)=YVAL
0034 CALL APUT(DISPl Y)
0035 GO TO 30
0036 40 DO 50 I=1,1000
0037 IF(YRAY(I).LT.-5.) GO TO 40
0038 IRED=+ISTOP
0039 WRITE(1*IREY) YRAY(I)
0040 50 CONTINUE
FORTRAN IV       VO1C-030       WED 29-DEC-77 00:22:23       PAGE 001

0001       SUBROUTINE COORD(X,Y,IRET)
0002       BYTE STRING(9)
0003          CALL OPEN(STRING,E=1)
0004          IF(IRET.EQ.1) GO TO 30
0005          IF(IRET.NE.1) GO TO 40
0006          TYPE 500(STRING(1)),I=1,LEN(STRING)
0007          FORMAT('X\%10A/(\%X')
0008          CALL INDEX(STRING,'PAGE',I)
0009          IF(I.EQ.0) GO TO 30
0010          I=1
0011          RETURN
0012          CALL INDEX(STRING,'STOP',I)
0013          IF(I.EQ.0) GO TO 01
0014          RETURN
0015          IF(I.EQ.0) GO TO 30
0016          I=2
0017          RETURN
0018          TYPE 510
0019          FORMAT('IGNORED')
0020          GO TO 10
0021          TYPE 520
0022          FORMAT('OPEN ERROR')
0023          GO TO 10
0024          TYPE 520
0025          FORMAT('CLOSED')
0026          GO TO 10
0027          IF(IRET.EQ.0) RETURN
0028          RETURN
0029          END
0030          END
FORTRAN IV

C

RMS FOR ROOT MEAN SQUARE ANALYSIS PROGRAM

0001 DIMENSION NAME(R), NAMFA(H)
0002 INTEGER YESNOC
0003 DATA YESNOC /3MFIC/

0004 CALL SPITLE(NAME,R,NAMFA,IEXT,'PICTURE')
0005 IF(IGN,1,NAMER,NAMER,'&'1+1+1+1+1)
0006 DEFINE FILE 1 (10000,2),U(REC)
0007 READ(I'1')X
0008 ISTOP=IFIX(X-.5)
0009 TYPE SO:ISTOP
0010 56 FORMAT('ISTOP=',16)
0011 TYPE 80
0012 60 FORMAT('SPECIFY START POINT IN HUNDREDTHS OF SECONDS.(15) ',$)
0013 ACCEPT 70,KF
0014 70 FORMAT(I)
0015 KF=KF+1
0016 NHUN=ISTOP-KF+1
0017 SEC=FLOAT(NHUN)/100.
0018 CALL RMS(KF*ISTOP,RF+AVG+SUM)
0019 TYPE 120=SEC+AVG+SUM
0020 110 FORMAT('OVERALL RMS VALUE FOR '.F6.2,' SECONDS IS '.F8.3/
1 ' OVERALL AVERAGE VALUE IS '.F8.3' OVERALL AREA IS '.F10.3/$

C

ASK FOR WINDOW SIZE AND CHECK THAT IT IS NOT TOO LARGE

0021 115 TYPE 120
0022 120 FORMAT('SPECIFY WINDOW SIZE IN HUNDREDTHS OF SECONDS (14) ',$)
0023 ACCEPT 130,I N T
0024 130 FORMAT(14)
0025 IF(INT.LT.NHUN) GO TO 140
0027 TYPE 135
0028 135 FORMAT('ERROR - WINDOW LARGER THAN INTAKE PERIOD')
0029 GO TO 115
0030 140 NFRM=NHUN/INT
0031 SEC=FLOAT(INT)/100.
0032 TYPE 150=NFRM+SEC
0033 150 FORMAT('VALUES TO BE DETERMINED FOR '.F5.2
1 ' SECOND WINDOWS/IX)
0034 CALL WND(KF+INT,NFRM+SEC)
0035 TYPE 180
0036 180 FORMAT('/ANOTHER WINDOW SIZE ? ')
0037 IF(YESCHK(0),EQ.0) GO TO 115
0038 TYPE 200
0039 200 FORMAT('VALUES FOR FIFTHS OF INTAKE PERIOD/')
0041 INT=NHUN/5
0042 SEC=FLOAT(INT)/100.

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0043  TYPE 205*SEC
0044  205  FORMAT(1x,FS,2,' SECONDS PER FIFTH,'/)
0045  CALL W05(KF*(MT+5),SEC)
0046  TYPE 210
0047  210  FORMAT(1x,'VALUES FOR QUARTERS OF INTAKE PERIOD,'/)
0048  INT=NHUN/4
0049  SEC=FLOAT(INT)/100.
0050  TYPE 215*SEC
0051  215  FORMAT(1x,FS,2,' SECONDS PER QUARTER,'/)
0052  CALL W05(KF*INT+4,SEC)
0053  STOP
0054  END

FORTRAN IV  VO1C-03G  SUN 22-JAN-78 02:23:18
SUBROUTINE WDM(KF,INT,NFRM,SEC)

SRM=0.
SRM2=0.
ST=0.
ST2=0.
SI=0.
SI2=0.
SKI=0.
SKT=0.

TYPE 30

FORMAT(' WINDOW MIDTIME RMS SLOPE INTCFP RSORD AVG',
1 ' AREA TRONSLP' )

DO 90 I=1,NFRM
F=FLOAT(I-1)+.5)*SEC
K=I*INT+KF=1
CALL RMS(K,KS,RM,AVG,SUM,0)
S=SRM=SRM+RM
SRM2=SRM2+RM*RM
ST=ST+T
SI=SI+I
SKI=SKI+1
SRT=SRM+RM
SRM=SRM2+RM*RM

IF(I,GT.,1000) GO TO 30

TYPE 40,1,INT,RM,AVG,SUM

FORMAT(3X,T3F2X,F6.2,3X,T3F2X,F6.3,26X,T3F2X,F6.3,1X,F8.3)

GO TO 90

CNT=FLOAT(I)

SI=SI2-(SI*SI/CNT)

S=ST2-(ST*ST/CNT)

SSRM=SRM2-(SRM*SRM/CNT)

IF(SST,NE.0.)GO TO 55

S=99,999

GO TO 60

SLP=(SRT-(SRM*ST/CNT))/SST

YINT=(SRM-SLP*ST)/CNT

IF(SSRM,NE.0.)GO TO 62

R=99,999

GO TO 64

R=((SRT-(ST*SRM/CNT))**2.)/(ST*SSRM)

IF(SST,NE.0.)GO TO 66

TRSLP=99,999

GO TO 68
0049 66  TRSLP=((DH-J-(SRM+SI/CNT))/50)  
0050 60  TYPE 70:1.1X+RM+ULF+YMT+MSD+AVG+SUM+TRSLP  
0051 70  FORMAT(1X,I3,2X,F6.2,3X,F6.3,1X,F7.4,1X,F6.3,4X,F6.3, 
0052 90  CONTINUE  
0053  RETURN  
0054  END
Reference Notes


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