Effects of Emotional State and Food Novelty on Preschool Children's Acceptance of Food

by

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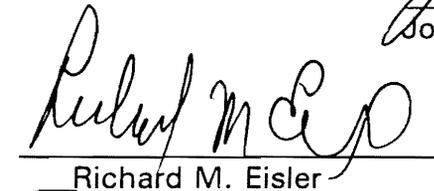
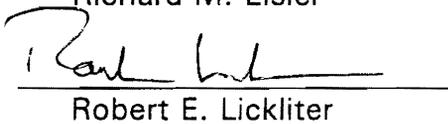in partial fulfillment of the requirements for the degree of

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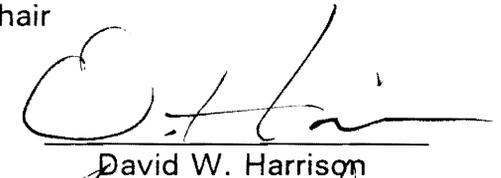Joseph J. Franchina, Chair

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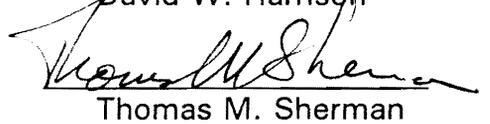
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EFFECTS OF EMOTIONAL STATE AND FOOD NOVELTY ON PRESCHOOL

CHILDREN'S ACCEPTANCE OF FOOD

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(ABSTRACT)

Humans and other animals typically consume less of novel foods than of familiar ones, a phenomenon termed ingestional neophobia. Young children display especially high levels of neophobia, spitting out new foods but accepting those same foods after familiarization. Rejection of novel foods presumably reflects the aversiveness of the food's novel sensory cues, which thereby occasions withdrawal. Familiar foods typically evoke acceptance, suggesting that familiar foods are not categorically aversive. According to a biphasic model of emotion, negative affective behaviors (e.g., withdrawal) are enhanced during negative emotional states and inhibited during positive states. Positive affective behaviors (e.g., approach, consumption) are enhanced during positive emotional states but inhibited during negative states. If neophobia (withdrawal) and food acceptance (approach) reflect negative and positive affective behaviors respectively, according to the biphasic model, emotional state at the moment of food presentation should mediate the display of neophobia and food acceptance. To induce mood, preschool children were asked to think of things that make them happy (positive), sad (negative) or asked to count (neutral). Following mood-induction (MI), children received a familiar- or

novel-appearing food. Acceptance was assessed as latency to touch the food, latency to Bite 1, latency to Bites 2-5, amount eaten, rate of eating, and degree of food contact. Acceptance was expected to be greater for the familiar- than for the novel-appearing food, and greater in the positive MI than in the neutral MI than in the negative MI condition. An interaction between food appearance and MI condition was expected. Results indicated that children who received a novel-appearing food ate reliably less and reliably slower than children who received the same food in its familiar appearance. There were no effects of MI condition. However manipulation checks indicated that MI procedures were ineffective. Participants were therefore reassigned to mood groups based on ratings of expressed affect. Analysis of reassigned groups indicated that the negative mood group took significantly longer to touch the food, to Bite 1, and to Bites 2-5 than did neutral and positive groups. The negative mood group ate reliably less than the neutral group, who ate reliably less than the positive group.

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Children's Acceptance of Food

Statement of Problem

Parents often report a lack of variety in the diets of their

preschool-aged children and express concern over the inadequacy of

their children's nutrient intakes (Bawkin & Bawkin, 1972; Dierks &

Morse, 1965; Jenkins, Owen, Bax, & Hart, 1984; Kram & Owen, 1972;

Plechat & Pliner, 1986; Sabry, Ford, Roberts, & Wardlaw, 1974).

However most young infants readily accept food and nonfood objects into

their mouths. It is therefore some time after the first year of life

that food acceptance typically begins to decline, although food

acceptance generally rebounds toward the beginning of early childhood.

For example in a longitudinal study (Jenkins et al., 1984), parental

reports of children's feeding problems increased between 1 1/2 and 3

years of age, but severity of feeding problems began to decline at 4

1/2 years of age. Still, 34% of parents continued to report appetite

problems in their children. Approximately 30% of McCarthy's (1935)

sample of 2- to 7-year-olds reportedly had feeding problems, but again,

frequency of strong likes and dislikes declined over the 5-year-age

span. In Eppright et al.'s (1972) study, parental complaints of

mealtime dawdling increased sharply for infants over 1 year of age,

peaked to 44% for mothers of 3- to 4-year-olds, and declined to 33% for

mothers of 5- to 6-year-olds.

Several hypotheses have been proposed to explain high levels of

food acceptance shortly after birth, and subsequent declines in food

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acceptance. According to one explanation, food refusal in the second year of life partly reflects the body's declining energy needs. (See Recommended Dietary Allowances, 1980). Specifically, during the first year of life growth rate is faster than at any other time (Hepner & Maiden, 1971), and food acceptance is also generally high. At the end of the first year the body's utilization of baby fat accelerates, growth rate slows, and concomitantly food acceptance begins to decline (Aldrich & Aldrich, 1941; Bawkin & Bawkin, 1942).

Another explanation for increased food refusals are motoric, cognitive and psychosocial developments that occur during the first two years of life--developments which increase the child's desire and ability to be independent (e.g., Erikson, 1963). For example 3- to 5-year-olds' self-concepts revolve around physical actions that they can perform independently (Keller, Ford, & Meachum, 1978). Thus some young children may assert their new autonomy by refusing foods that are offered to them (e.g., Eppright et al., 1972).

In addition, between 6 and 12 months of age children begin to make the transition from consumption of a single food to that of a culturally appropriate omnivorous diet (Birch, 1990b). This dietary transition occurs at the same time that the child is gaining mobility and independence, thereby increasing the potential for ingesting poisonous substances (Birch & Marlin, 1982). According to this view, avoidance of unknown foods during the developmental period of early mobility is biologically adaptive in that it protects the child from potential poisoning.

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Although the above explanations for oscillations in food acceptance are largely untested, one explanation has been well researched. Specifically, as children make the dietary transition to that of their culture, by 1 year of age they are receiving exposure to an ever greater variety of foods. Therefore increasing food refusals may partly reflect suppressed intake of novel foods, a phenomenon termed ingestional neophobia. In support of this hypothesis, Kram and Owen (1972) found that children's food refusals are often specific to novel items. When asked whether their child would taste a new food, 82% of parents of 1- to 2-year-olds responded yes, compared to 66% of parents of 2- to 4-year-olds. Decreasing acceptance of novel foods reportedly continued for 4- to 6-year-olds.

Thus frequent parental reports of poor dietary variety among children may be due to the young child's reluctance to try novel foods, or ingestional neophobia (e.g., Birch & Marlin, 1982; Rozin, 1976). The display of neophobia toward new foods presumably reflects the aversiveness of novelty which evokes avoidance or escape from unfamiliar edibles (Domjan, 1976, 1977a). However neophobia can be reduced through repeated contact with the initially novel substance. That is humans (e.g., Birch & Marlin, 1982; Pliner, 1982) and other animals (Rozin, 1976) generally increase intake of an initially novel food following familiarization with that food.

Parents who are concerned with a child's high rate of food refusals face two tasks: increasing the child's oral acceptance of nutritious foods, and establishing long-term food preferences for those

foods. The first task, oral acceptance, involves a series of approach behaviors such as looking at and touching the food, which culminate in oral intake and ingestion. As a consummatory response, oral acceptance is part of the appetitive motivational system and is therefore considered a positive affective behavior (e.g., Lang, Bradely, & Cuthbert, 1990). The proposition that oral acceptance is a positive affective behavior is supported by empirical data which indicate a positive correlation between amount of food consumed and children's and adults' hedonic ratings for that food (e.g., Birch, 1979b; Rolls, Van Duijvenvoorde, & Rolls, 1984).

The investigation of oral acceptance may have particular significance for children's health beyond nutritional concerns. According to Lipsitt, Crook and Booth (1985), child abuse often occurs in the feeding context and whether children respond to food offers with acceptance or refusal may critically influence the continuation of effective nurturance. Specifically, it is proposed that child abuse often results from a failure of anticipated reciprocity. If a parent offers food with the expectation that the child will accept it, but the child violates that expectation, food refusal could place the child at risk for abuse (Lipsitt et al., 1985). Empirical evidence indicates that parents indeed respond more to children's food refusals than to food requests (Klesges et al., 1983), and that highly negative emotional conflicts often escalate out of adult-child-food transactions (e.g., Birch, 1990a; Casey & Rozin, 1989; Eppright, Fox, Fryer, Lamkin, Vivian, 1969).

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Oral acceptance is also fundamental to the development of long-term food preferences. Although the determinants of food preference are many, associative conditioning plays a primary role. That is the sensory characteristics of a food, such as taste or appearance, may become associated with postingestional consequences of consumption such as hunger reduction or nausea (e.g., Franchina & Slank, 1988; Capaldi, Campbell, Sheffer, & Bradford, 1987). These associations lead to conditioned food preferences and conditioned aversions. But for postingestional associative processes to condition a food preference, neophobia must first be reduced to permit consumption of an adequate quantity of that food. Thus if oral acceptance is the first overt eating behavior in a chain of events leading to food preference, the immediate task of parents is to sufficiently reduce neophobia in order to entice the child to accept a small taste of food. The practical question addressed by this study is how can parents get a small taste of new food into a child's mouth? What factors stimulate food acceptance, particularly acceptance of a novel food?

The primary focus of the present investigation was on this rather critical first stage of the eating process--initial acceptance--and two factors which may impact initial as well as continued acceptance: food novelty/familiarity and the emotional state of the child. If novel food objects have aversive qualities that elicit negative affect in the child, a point later substantiated in this paper, this negative affect may interact with the current affective state of the child. Thus at

least two sources of affect may influence food acceptance: the novel

food source and the dispositional state of the child.

The purpose of this study was to investigate the effects of a

novel-appearing food and emotional state on food acceptance in young

children. In the context of daily meals, the child's ongoing affective

state may be a function of a number of environmental events; in the

present investigation, an attempt was made to experimentally induce the

child's affective state. To induce positive and negative emotional

states, children were asked to think of things that either make them

happy or sad, respectively, or children were asked to count (neutral

affect). Following mood-induction procedures, children were offered a

food that was either novel or familiar in appearance. Novel and

familiar foods were identical except that in the novel-appearing

condition, the food was presented in an atypical color (e.g., green

corn). If neophobia (withdrawal) and food acceptance (approach)

reflect negative and positive affective behaviors respectively, the

child's ongoing emotional state at the moment of food presentation

should mediate the display of neophobia and of food acceptance.

The literature review is organized in three major divisions.

Under the topic of food acceptance, definitions are provided for

liking, preference, and food acceptance, and food characteristics which

affect acceptance are briefly outlined. Then literature on ingestional

neophobia in animals and children is reviewed, and it is argued that

novelty has aversive properties which implicates negative affective

responding in the organism. Under the topic of emotion, data

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supporting a two-dimensional biphasic model of emotion are presented,

evidence supporting a relationship between emotion and food acceptance

is considered, and mood-induction procedures are reviewed.

It should be noted that the terms emotion, affect and mood are

used synonymously in the present document. This interchangeability of

terms is common practice among psychologists and in everyday language

usage (Plutchik, 1980).

FOOD ACCEPTANCE: DEFINITIONS AND PROMOTING FACTORS

Definitions

The terms liking, preference, and oral acceptance are overlapping
terms yet they are not entirely synonymous with each other.
Unfortunately they have been defined differently by various authors,
adding an element of confusion to the literature on eating behavior.
To clarify the present author's definitions, and in particular to
differentiate food acceptance from other concepts, a brief review of
their prior usage and operational definitions is provided.

Liking. People experience events along a continuum of
pleasantness/unpleasantness. When an event is experienced as pleasant,
the term liking is evoked. Therefore liking refers to a positive
affective response based on the appraisal of a single stimulus.
Liking/pleasantness has been operationally defined as participants'
responses on rating scales (e.g., Cabanac & Duclaux, 1970; Rodin,
Moskowitz, & Bray, 1976; Stang, 1975), and with the use of magnitude
estimation (Moskowitz, Kluter, Westerling, & Jacobs, 1974).

Preference. The term preference implies a comparative affective
response based on the relative attraction of two or more stimuli. Thus
the most valid procedures for assessing preference involve simultaneous
presentations of two or more stimuli. This procedure enables
participants to demonstrate preference by rating one item higher, or
eating more of one item, relative to others. Preference has been
inferred from participants' ratings for the pleasantness of food items

(e.g., Moskowitz, Kumaraiah, Sharma, Jacobs, & Sharma, 1975; Conner & Booth, 1988; Rodin, 1975), forced-choice behavior (e.g., Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok, & Steinberg, 1987; Pliner, 1982), participants' adjustments of solutions (e.g., Mattes & Lawless, 1985; Pangborn & Pecore, 1982), responses on a checklist (Blundell & Rogers, 1980), a comparison of intake levels during multiple-stimulus presentations (e.g., Capaldi & Myers, 1982; Davidson-Codjoe & Holman, 1982; Desor, Maller, & Turner, 1973; Sclafani & Mann, 1987) and participants' preferential rankings of food items (Birch, 1979a,b).

Acceptance. The term food acceptance has been used to refer to a variety of appetitive behaviors and has been diversely conceptualized. Booth (1981) regards food acceptance as an individual's dispositional tendency to accept food into the mouth. Acceptance in his view is a dynamic, restructurable relationship between the individual and a particular food within a particular context. This dynamic relationship between person, food and context is influenced by the food's sensory characteristics, the organism's physiological state, prior learning experiences, and social, cognitive and affective variables. As these factors change from moment to moment, so does momentary acceptance. Booth (1981) further assumes that food search, approach, and consumption share a motivational unity. Thus behaviors antecedent to literal consumption (e.g., looking, touching) may reflect a food's acceptability for that individual at that particular moment in time.

Birch and her colleagues (e.g., Birch, 1987; Birch, 1990b; Birch et al., 1987) seemingly use the phrase "patterns of food acceptance"

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interchangeably with preference and consumption. In their conception, learned patterns of food acceptance include learning what to eat, when to eat, how much to eat, and learning affective responses to foods such as conditioned preferences and aversions (Birch, 1987). Birch and her colleagues have used latency to taste a food as an index of patterns of food acceptance (e.g., Birch, McPhee, Sullivan, & Johnson, 1989). Harper and Sanders (1975) have similarly operationally defined acceptance as the placement of food into the mouth within 1 minute of the participant's grasping it. Rozin and his colleagues (Rozin, Hammer, Oster, Horowitz, & Marmora, 1986) defined acceptance as placing food in the mouth, whether or not the item was swallowed. Behaviors which did not culminate in the placement of food in the mouth, such as touching, smelling, and bringing the food to the mouth, were defined as rejection. Acceptance has also been defined as the amount of an edible that is consumed (e.g., Beauchamp & Moran, 1984; Sclafani, 1990).

In the present investigation, oral acceptance refers specifically to the placement of food in the mouth such that the lips or teeth close on or around the food, whether or not swallowing occurs. Consumption refers to the swallowing and ingestion of food. Food acceptance, however, is viewed as a series of appetitive behaviors which vary along a continuum of spatial-temporal similarity to consumption (e.g., Booth, 1981). Looking, smelling, touching, and contacting the lip or tongue to food represent closer and closer approximations to consumption (e.g., Rozin et al., 1986). If these behaviors which are antecedent to literal consumption reflect a food's degree of acceptability (e.g.,

Booth, 1981; Rozin et al., 1986), then discrete behavioral measures may index various points along this continuum and should reflect a participant's dispositional tendency to eat/accept a food. That is, terminal degree of contact with a food which more closely approximates consumption should indicate greater acceptance of the food. If the organism actually ingests food, terminal degree of acceptance would be the amount of food consumed: The greater the amount of food consumed, the greater is acceptance.

Defining discrete behaviors which lead to consumption as varying degrees of food acceptance allows analysis of food acceptance in terms of a two-stage model of eating. In the first stage of acceptance behaviors, prior to actual consumption, the organism has no veridical knowledge of the food's taste and mouth feel, only expectations. Thus initial acceptance behaviors (e.g., touching, smelling, latency to first bite) should be mediated by the food's appearance, smell, and expectations of taste and mouth feel, as well as by the dispositional state of the organism. However following the first bite, continued acceptance (e.g., latency to second bite, amount consumed) could be mediated by the aforementioned factors, as well as by the food's taste and mouth feel.

Liking, preference and acceptance are overlapping concepts, they have been used interchangeably, and they have been assessed with similar measurement techniques. However the present investigation does not treat these concepts synonymously. A person may like chicken,

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prefer steak, but accept either one. The primary difference between

acceptance on the one hand, and liking and preference on the other, is

that acceptance may occur irrespective of hedonic responses. Moreover,

acceptance involves directly observable behaviors rather than the

self-report rating scales of some measures of liking and preference.

Nonetheless, liking, preference and acceptance are expected to

correlate highly, especially in young children who typically do not

reject a well-liked, preferred food for dietary, monetary or other

reasons. As a case in point, Birch (1979b) found that for 3- to

4-year-olds, the correlation between food preference and food intake

was -.80 (with preferred foods assigned lower numbers). This

correlation is higher than that found in an adult population (Pilgrim,

1961).

Food Characteristics Which Affect Oral Acceptance

For newborn humans, taste factors predominantly control food

intake (Desor et al., 1973). However following a history of eating

experiences, a multitude of factors come to influence food acceptance.

These factors include food characteristics (e.g., taste cues, visual

appearance, food novelty/familiarity), the eating context (e.g.,

emotional, social and physical aspects of the context), and

physiological factors (e.g., hunger and postingestional consequences of

food consumption). The specific factors which are expected to

influence food acceptance in the present experiment are two food

characteristics (visual appearance and food novelty/familiarity) and

one contextual factor (emotional context). Other factors which might impact food acceptance will be held constant across experimental conditions and therefore should not differentially affect food acceptance.

The sensory characteristics of a food include its taste (e.g., Beauchamp, Bertino & Engelman, 1983), color (e.g., Guilford & Smith, 1959), texture (Walker, Hill, & Millman, 1973), shape (Rolls, 1985), temperature (Pangborn, 1967), and aroma (Kare & Maller, 1967). Each of these characteristics may serve to stimulate or inhibit oral acceptance, but the effects of taste on acceptance have been most thoroughly researched.

Taste cues. Taste cues have been found to influence intake quite early in life. Newborn infants ingest more sugar solution than water, and amount of ingestion increases as sucrose concentration increases, at least up to 0.3M sucrose (Desor et al., 1973; Engen, Lipsitt, & Peck, 1974; Nisbett & Gurwitz, 1970). Brief intraoral fluid stimulation with sucrose potentiates longer bursts of sucking relative to stimulation with distilled water, but stimulation with salt potentiates shorter bursts of sucking (Crook, 1978). Newborns also show distinct facial expressions to sour, bitter and salty tastes (Steiner, 1974, 1977, 1979). Such gustofacial expressions may be indicative of pleasure, disgust (Ganchrow, Steiner, & Daher, 1983; Pfaffmann, Morgren, & Grill, 1977), and the probability of further acceptance (Steiner, 1977).

Among adult humans, sweet tastes are generally preferred, whereas

bitter and sour tastes are generally deemed unpleasant; low salt concentrations are typically considered pleasant and high concentrations unpleasant (Cabanac, 1975). Taste sensitivity for the bitter substance 6-n-propylthiouracil (PROP) is genetically determined and people who are more sensitive to PROP report more food dislikes than do less sensitive individuals (Fischer, Griffin, England, & Garn, 1961; Glanville & Kaplan, 1965). However even for a preferred well-liked food, preference declines following consumption of that or of a similar tasting food (e.g., Cabanac, 1971; Cabanac & Fantino, 1977; Rolls, 1985; Scherr & King, 1982).

Visual cues. Whereas taste cues elicit innate hedonic responses, organisms must learn appropriate responses to the visual cues that foods afford. Through associative conditioning, organisms learn to associate the visual appearance of a food (e.g., color, shape, or texture) with a specific taste or flavor. Humans are particularly influenced by the color of foods and often form expectations for a food's taste based solely on its color (e.g., purple-grape; red-cherry; yellow-lemon). Other colors (e.g., brown, black) may signal spoiled or decaying food.

Color-flavor associations can stimulate or inhibit an eating response. For example Guilford and Smith (1959) found that when a food is associated with a specific color (e.g., apples-red), the food is accepted or rejected depending on how closely its actual color approximates the expected color. Foster (1965, cited in Sharpe, 1981) further demonstrated that people do not prefer one food color over

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another, but that color preference is specific to the food item. For example participants preferred unspeckled snack foods over speckled ones, but they preferred speckled grilled items over unspeckled ones.

Color-flavor associations are potent enough to influence subjective taste perceptions, and by implication, future food acceptance (e.g., Hyman, 1983; Hall, 1958; Kanig, 1955; Moir, 1936; Pangborn, Berg, & Hansen, 1963; although see Christensen, 1985). For example Hall (1958) offered participants flavored sherberts in three forms: their natural or commonly associated color, in an inappropriate color, or as white/uncolored. Participants successfully identified the flavor of a sherbert when it was appropriately colored, but they incorrectly identified flavors when they were inappropriately colored (e.g., they identified an orange-flavored sherbert as grape when colored purple). Even when flavors were correctly identified, participants provided lower hedonic flavor ratings for sherberts that were inappropriately colored than for the same tastes that were appropriately colored. Similarly, when food colorings were added to dry white wine, experienced wine drinkers rated white and pink wines as sweeter than yellow, brown, red and purple wines, even though sucrose level was held constant (Pangborn et al., 1963). The ratings of inexperienced wine drinkers were not systematically affected by color, indicating that learned color-flavor associations influenced the subjective taste perceptions of the experienced wine drinkers. Finally, Schutz (1960, cited in Sharpe, 1981) found that flavor ratings for orange juice increased when its color was changed to resemble that

of a higher quality juice, despite no actual change in the juice's
flavor.

Another food characteristic expected to influence acceptance in
the present experiment is food novelty/familiarity.

Overview: Approach-Avoidance Behaviors Toward Novel Objects

Novelty reflects the unfamiliarity of a stimulus relative to

previously experienced events of the same class (e.g., Coppinger, 1970;

Mitchell, Kirschbaum, & Perry, 1975; Sheldon, 1969; Welker, 1961).

Although novel edibles rarely elicit approach behaviors, other novel

objects such as visual arrays (Linn, Reznick, Kagan, & Hans, 1982) and

toys (Gunnar & Stone, 1984) sometimes elicit approach behaviors in

infants. Approach behaviors include visual attention, question asking,

physical approach, and tactile manipulation (e.g., Berlyne, 1960;

Fenson, Sapper, & Minner, 1974; Fowler, 1965; Hutt, 1970; Rubenstein,

1967, 1974; Ruff, 1976; Schaffer, Greenwood, & Perry, 1972; Sigman,

1976; Welker, 1961). However novel objects may elicit avoidance

behaviors such as retreat, fretting, or crying (e.g., Garcia-Coll,

Kagan, & Reznick, 1984). For example some children display active

avoidance and withdrawal from a strange sound (Buhler, Hetzer, & Mabel,

1928; cited in Zajonc, 1968) or a novel toy such as a mechanical monkey

that claps cymbals (Gunnar, 1980; Gunnar & Stone, 1984).

Whether an object elicits approach or avoidance depends, in part,

on the degree of stimulus change relative to previously experienced

events of the same class. For example 2- to 3-month-old infants show

increased attention (approach) to moderately novel events relative to

highly novel and highly familiar events (Mussen, Conger, Kagan, &

Huston, 1990). Other variables which mediate approach versus avoidance

responding include individual personality characteristics or temperament (Kagan et al., 1984; Ruff, McCarton, Kurtzberg, & Vaughan, 1984; Sigman, 1976), the social context (Arend, Gove, & Sroufe, 1979; Clark-Stewart, 1978; Gunnar & Stone, 1984; Henderson, 1984b; Sroufe, Waters & Matas, 1974), degree of novelty of background stimuli (Mitchell, Kirschbaum & Perry, 1975; Sheldon, 1969), and interactions among personality characteristics, social context, and degree of stimulus novelty (Henderson, 1984a; Henderson & Moore, 1980; Saxe & Stollak, 1971).

Food Neophobia in Nonhuman Animals

The predominant response to novel food cues is withdrawal and avoidance, a phenomenon termed food or ingestional neophobia. Ingestional neophobia is defined as suppressed intake of a novel edible relative to that edible after it has become familiar through repeated exposure. Food neophobia has been observed in rats (e.g., Domjan, 1976), birds (e.g., Capretta, 1969), dogs (Maslow, 1937), guinea pigs (Warren & Pfaffmann, 1959), turtles (Burghardt & Hess, 1966), and fish (Mackay, 1974). For example rats tend to avoid a novel food, initially sampling the substance in small quantities (e.g., Franchina & Slank, 1988).

Sensory Cues Which Elicit Neophobia

Complex objects provide sensory stimulation to multiple modalities such as visual, olfactory, tactile, auditory and taste. Thus cues from one or more modality may be discrepant from previously experienced

stimuli. Presumably novel cues from any sensory modality may elicit

neophobia, and in general, the greater the number of novel cues present

the greater neophobia should be. Indeed organisms have been observed

to exhibit suppressed intake for edibles that are novel in taste cues

(e.g., Domjan, 1976; Domjan & Bowman, 1974; Domjan & Gillan, 1976;

Domjan & Gregg, 1976 [cited in Domjan, 1977a]; Franchina & Slank, 1988;

Hollinger & Roberts, 1929; Gentile, 1970; Nachman & Jones, 1974;

Navarick & Strouthes, 1969; Sheffield & Roby, 1950; Siegel, 1974;

Singh, 1974; Warren & Pfaffman, 1959), visual cues (e.g., Coppinger,

1969, 1970; Franchina, 1990; Morell & Turner, 1970; Wilcoxon, 1977),

and both taste and visual cues (e.g., Franchina & Slank, 1989;

Rabinowitch, 1968; Shettleworth, 1972). The focus of the present study

is on foods' visual cues; therefore, empirical evidence that novel

visual cues elicit neophobia is elaborated.

In the sequence of ingestional behavior, the visual appearance of

a food often represents the first stimulus encountered by an organism.

Thus a food's visual appearance might serve a telereceptive function by

signaling from a distance other likely characteristics of the food,

such as its taste and acceptability. Visual cues might therefore be

expected to have a potent effect on the initiation of ingestion, at

least in species with well developed visual systems such as avians and

humans.

Franchina and Slank (1989, Experiment 2) demonstrated the

telereceptive function of a visual cue (color) in domestic chicks.

Chicks received preexposure to red water or clear vinegar, and were

then tested for intake of red vinegar, red water or clear vinegar. Preexposure to red water yielded greater intakes of red vinegar than did preexposure to clear vinegar. Thus the presence of the familiar visual cue (red) attenuated neophobia to the novel taste more than the presence of a familiar taste (vinegar) attenuated neophobia to the novel visual cue. In other words, although the chicks presumably ingested sufficient quantities to detect the familiar taste, the familiar taste was minimally effective in overriding the avoidance-eliciting properties of the novel visual cue.

Similarly, Coppinger (1970) reports that birds actively reject and inhibit attack of novel butterflies, but that inhibition of attack is a function of the degree to which novel butterflies differ visually from previously experienced butterflies. Other data for avians indicate that chicks (Capretta & Bronstein, 1967; Shettleworth, 1972), gulls (Rabinowitch, 1968), and quail (Wilcoxon, 1977) consume less of a familiar food that is novel in color than of one that is familiar in color. Rats also show neophobic avoidance of a familiar food that is novel in "appearance", such as food in a novel container (Barnett, 1963; Braveman, 1978; Mitchell et al., 1975; Mitchell, Scott, & Williams, 1973), in a novel form (Kopp & Bourland, 1972 [cited in Mitchell et al., 1975]; Mitchell et al., 1975; Mitchell et al., 1973), or in a novel place (Barnett, 1963; Chance & Mead, 1955).

Franchina and Slank (1989, Experiment 1) assessed the effects of multiple sensory cues (taste and visual) on the display of neophobia in chicks. They found that chicks demonstrated greater suppression of

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intake (neophobia) for red vinegar than for clear vinegar or clear

water, indicating that, as proposed, the more numerous the novel

stimuli, the greater the display of neophobia. (See also Sheldon,

1969.)

Effects of Taste Familiarization on Neophobia

By definition, exposure to an object reduces its novelty and

increases familiarity. If the aspect of an object that evokes

avoidance is its novelty, then as familiarity increases, avoidance

responses should decline. Familiarization procedures should thus yield

increased approach and acceptance. Empirical evidence supports this

prediction. Attenuation of ingestional neophobia following stimulus

exposures has been observed in rats for saccharin (Domjan, 1976),

casein (Franchina & Slank, 1988), milk (Williams, 1968), coffee, and

vinegar (Siegel, 1974). Similarly, guinea pigs (e.g., Warren &

Pfaffmann, 1959) and rats (e.g., De Luca, Trovato, & Cioffi, 1981)

normally display suppressed intake of bitter tastes, but intake of

bitter can be enhanced if solely bitter-tasting substances are

available early in life. (See also Zajonc's [1968] and Hill's [1978]

review of the mere exposure effect.)

Although increased consumption of a food following stimulus

exposure could result from attenuated neophobia as suggested above,

alternatively, increased consumption could result from associative

processes irrespective of the attenuation of neophobia. That is,

following initial minimal intake of a novel food, reduced hunger or

thirst could accrue reinforcing properties to the edible, thereby

enhancing approach and subsequent intake (e.g., Revusky, 1967, 1968,

1974). However Siegel (1974) and Domjan (1976, Experiment 5)

demonstrated exposure effects in the absence of associative

conditioning. Specifically, Domjan (1976) exposed rats to a saccharin

solution either before or after access to food and water. Rats that

received food and water following saccharin exposure showed comparable

saccharin intakes at testing as did rats that received food and water

prior to saccharin exposure. This finding indicates that association

with hunger and thirst reduction is not necessary for exposure to novel

edibles to result in enhanced intake. Rather, according to Domjan

(1977a), increased consumption following exposure presumably reflects,

in part, habituation to the aversive properties of novelty.

Finally, familiarization with an edible reduces the edible's

ability to enter into an association with toxicosis, that is, to accrue

aversive properties (Lubow & Moore, 1959). Therefore conditioned taste

aversions occur less readily to familiar than to novel edibles,

suggesting that novel edibles are inherently more aversive than

familiar ones, even prior to the conditioning event.

Generalization Based on Novelty

Exposure to a novel stimulus not only attenuates neophobia to the

exposed stimulus, but attenuation transfers, or generalizes, to other

novel stimuli. Thus exposure to one novel-flavored solution reduces

neophobia for other novel flavors (Braveman & Jarvis, 1978; Capretta,

Petersik, & Stewart, 1975; Domjan & Gillan, 1976; Siegel, 1974). For

example exposure to a 2% saccharin solution increases subsequent

intakes of 1% and 3% saccharin in rats (Domjan & Gillan, 1976,

Experiment 2).

Effects of exposure to novelty transfer across sensory modalities

as well. Braveman (1978) reported that exposing rats to novel

environments facilitated ingestion of a novel taste, and that exposure

to novel tastes facilitated ingestion from a novel container.

Similarly, exposing animals to novel odors curtails taste neophobia

(Hennessy, Smotherman, & Levine, 1977). (See also Sheldon [1969]).

Stimulus generalization may occur more readily across some

stimulus dimensions than others. When chicks were exposed to an

initially novel visual cue (red water) or to an initially novel taste

(clear vinegar), testing with red vinegar revealed that the preexposed

(familiar) visual cue reduced neophobia to the novel taste more than

the familiar taste reduced neophobia to the novel visual cue (Franchina

& Slank, 1989). Domjan and Gillan (1976) reported that exposure to 1%

saccharin reduced neophobia to 3% saccharin, but that comparable

exposure to 3% saccharin did not reduce neophobia to 1% saccharin.

Nonetheless, finding transfer effects based on the shared

characteristic of novelty supports the notion that novelty is an

attribute of the food which is separable from the food's specific

characteristics such as the food's idiosyncratic taste, texture, or

visual cues (Braveman, 1978).

Negative Withdrawal Behaviors Elicited by Novelty

Not only do novel edibles elicit suppressed intake, novel objects

often elicit a repertoire of negative avoidant behaviors, suggesting

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that novelty may have aversive properties. These behaviors include active rejection, behavioral withdrawal, agitation, distress calls, and orofacial expressions suggestive of negative affect. For example Lorenz (1956, as cited in Zajonc, 1968) reports that young ravens presented with new objects react with escape responses, fly to an elevated perch, and stare at the object for hours. When blue jays are given novel butterflies to eat, they raise their crests, make alarm calls, retreat from the food, and frantically fly from side to side banging against the walls of the cage (Coppinger, 1970). Rats given a novel saccharin solution make repeated approach-withdrawal responses, rattle their drinking tubes and bite their cages. If the novel solution is infused directly into the rat's mouth, the rat may attempt to jump out of the cage (Domjan, 1976). Chicks seemingly also display escape behavior, jumping against the walls of the cage when presented with novel mealworms (Hogan, 1965). Displays of active, as opposed to passive avoidance, give credibility to the suggestion that novel edibles are aversive.

Food Neophobia in Children

The extent of research on ingestional neophobia in humans is minimal relative to that for other animals. Nonetheless, available data from human research generally parallel data obtained from infrahuman subjects: Ingestional neophobia, or suppressed intake, occurs for foods that are novel in visual and taste cues; familiarization procedures decrease ingestional neophobia;

generalization based on novelty may occur; and food neophobia is accompanied by negative-withdrawal behaviors indicative of aversion.

Sensory Cues Which Elicit Neophobia

Young children especially between 1 1/2 and 5 years of age, and some adults, show relatively high levels of ingestional neophobia, consuming less of novel substances than of familiar ones (e.g., Birch & Marlin, 1982; Birch et al., 1987; Hollinger & Roberts, 1929; Pliner, 1982; Smith & Ross, 1958). However research with humans and especially with children has generally failed to assess neophobia for the various sensory cues that foods afford. Rather, experimenters typically present participants with foods that are novel in both taste and appearance. However some data suggest that visual cues may mediate food acceptance in children and adults.

Walker et al. (1973) noted that small blemishes on food could cause complete food refusal in elementary school children, suggesting that changes in a food's color alone may evoke neophobia. Beauchamp and Moran (1984) noted that children who had not received preexposure to clear sugar water in the first 6 months of life drank relatively minimal amounts of sugar water at 2 years of age, but they did drink cherry Kool-aid (with which they were familiar). Because cherry Kool-aid is red-colored sugar water with additional flavorings, taste and visual cues are confounded. Nonetheless it is possible that children drank more of the sweet-tasting Kool-aid than of the sweet-tasting sugar water because the Kool-aid was presented with a familiar visual cue (red color), whereas the sugar water was presented

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with a novel visual cue (clear color). However the most compelling

data indicating that the color of a food mediates food acceptance comes

from research with adult humans. Specifically, research on

flavor-color associations in adults (e.g., Hall, 1958; Pangborn &

Hansen, 1963) indicates that for foods associated with specific colors,

acceptance depends on how closely the color of the presented food

approximates the expected or typical color (Guilford & Smith, 1959).

Other research indicates that children less than 5 years of age

categorize nonfood objects on the basis of color rather than form. But

between 5 and 9 years of age there is a developmental shift toward form

dominance such that children increasingly categorize on the basis of

form rather than color. (See Sharpe [1981] for a review.) Although

these data are based on nonfood objects, they raise the possibility

that food acceptance in preschool children may be more strongly

influenced by color than by form. Thus a food that is familiar in form

(e.g., round) but novel in color (e.g., round green potatoes) might be

responded to as a novel food object. In total, data on children's

categorization strategies and data on the effects of food cues on food

acceptance in children and adults suggest that humans, like lower

animals, may use visual cues telereceptively, and this usage may

thereby mediate approach-avoidance responding to familiar- and

novel-appearing foods.

Effects of Familiarization Procedures

In a longitudinal study, infants who were previously fed sugar

water by their mothers drank significantly more sucrose solution at 6

months and 2 years of age than did children not previously fed sugar
water (Beauchamp & Moran, 1982, 1984). Although the data are
correlational, enhanced consumption of the sucrose solution by children
previously fed sugar water likely indicates reduced neophobia caused by
early exposure to, and therefore familiarization with, sweetened water
(Beauchamp & Moran, 1982, 1984). (See also Moskowitz et al., 1975.)

Controlled laboratory studies confirm Beauchamp and Moran's (1982,
1984) conclusion that avoidance of novel foods declines with
familiarization. Birch and Marlin (1982) experimentally manipulated
the number of taste and visual exposures that 2- to 3-year-old children
had to each of five initially novel cheeses (Experiment 1) or novel
fruits (Experiment 2). Each child received 20 exposures to one food,
15 to a second food, 10 to a third, 5 to a fourth, and 2 (Experiment 1)
or 0 (Experiment 2) exposures to a fifth food. Following a 25- or
26-day exposure period, children were tested with choice trials of all
possible pairs of foods. Children reliably chose to eat additional
portions of the foods to which they had been exposed more frequently
(e.g., 20 exposures) than of foods to which less exposure occurred
(e.g., 5 exposures). Thus familiarization with a food's taste and
visual appearance facilitated oral acceptance of initially novel foods.
Moreover, the greater the exposure was, the greater was acceptance.
(See Pliner [1982] for similar findings with adults.) A subsequent
study revealed, however, that exposure to the <u>taste</u> of the novel food
was required to facilitate oral acceptance (Birch et al., 1987).
Visual exposure alone did not enhance oral acceptance of novel foods,

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although visual exposure did enhance visual preference (Birch et al., 1987).

Finally, Birch (1979a,b) found that food familiarity accounts for 20-42% of the variance in food acceptance patterns among 3- to 4-year-olds, indicating that familiarization with a food influences food acceptance. Walker et al. (1973) also noted a positive relationship between food familiarity and food preference.

Generalization Based on Novelty

Research with humans has not investigated whether the attenuation of neophobia to an initially novel food generalizes to other novel foods. However Birch (1981) demonstrated that enhanced preference for a food generalizes to similar foods for some children. Preschool children initially tasted eight foods, ranking them for preference. A food that was ranked as moderately preferred was identified as the target food for each child. After repeated exposure to the target food in a positive social-affective context (paired with adult attention), preference for the target food increased, as demonstrated in previous studies (e.g., Birch, Zimmerman, & Hind, 1980). However children who consistently used food categories when sorting the eight foods (e.g., nuts, fruits) showed enhanced preference for another food to which they had not been repeatedly exposed, but which was in the same food category as the target food. Thus exposure to the target food not only increased preference for that food, but generalized to enhance preference for a similar type of food. This finding raises the possibility that in children, the attenuation of neophobia to one food

item might generalize to other food items, as has been found for lower animals (e.g., Braveman & Jarvis, 1978; Capretta et al., 1975; Domjan & Gillan, 1976).

Negative Withdrawal Behaviors Elicited By Novelty

While initially exposing 2- to 3-year-olds to novel cheeses and fruits, Birch and Marlin (1982) reported that children displayed neophobia by hesitantly tasting the foods and frequently spitting them out rather than swallowing them. The finding of food expulsion suggests that the novel edibles had aversive qualities. However, the finding that familiarization procedures yielded oral acceptance suggests that the food's aversive qualities were not inherent to the food's specific attributes, such as its taste, odor or appearance, but that the aversiveness was inherent in the food's novelty -- the one food characteristic that changed with familiarization.

Also, novel foods more readily become the objects of conditioned food aversions than do familiar foods, suggesting that novel foods may be inherently more aversive. From their survey of 696 participants ranging in age from 6 to over 60, Garb and Stunkard (1974) concluded that 45% of conditioned food aversions involved novel foods. When aversion occurred following a meal of both novel and familiar foods, novel foods were the objects of aversion in all but one case. Aversions were also reportedly more enduring to novel than to familiar foods. These data suggest that novel foods may be inherently more aversive than familiar ones even prior to a conditioning event.

In summary, although research on ingestional neophobia in humans

is somewhat minimal, these findings with humans parallel those from animal studies. Humans generally show suppressed intake of novel foods relative to familiar ones, and humans show other behaviors indicative of avoidance and aversion, such as food expulsion and an increased number of food aversions. However avoidance behaviors can be reduced through familiarization procedures, procedures which affect only one characteristic of the food: its novelty. The positive effects of familiarization procedures suggest that it is the novel aspect of a food that has aversive properties. Moreover, active avoidance behaviors in response to novelty implicate negative affective responding in the organism.

Explanations For the Effects of Food Novelty on Behavior

Researchers have attempted to formulate a single concept to account for the diversity of findings related to food novelty, and to account for novelty's effects on behavior in general.

Learned safety. According to the learned safety explanation of neophobia, initial avoidance of a novel food is the result of an evolutionary, biologically adaptive mechanism which deters the organism from ingesting large quantities of potentially toxic substances (Barnett & Cowan, 1976). After an organism ingests a minimal quantity of a novel food without negative consequences, the organism learns that the edible is safe and consumption increases (Kalat & Rozin, 1973). However evidence suggests that familiar edibles are not comparable to other safety signals (e.g., Best, 1975; Kalat, 1977). For example Best

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(1975) found that although rats received safe exposure to a saline

solution (i.e., in the absence of negative consequences), the

subsequent presence of saline did not increase consumption of a

saccharin taste which had been marked as unsafe (i.e., exposure paired

with illness). Thus the "safe" saline taste failed to act as a safety

signal to enhance consumption of the "unsafe" saccharin taste.

Optimal arousal. Other theorists adopt a broader perspective in

that they attempt to account for both approach and avoidance behaviors

that novel food (and nonfood) objects elicit. These theorists have

suggested that organisms have an optimal or preferred level for novel

stimulation (Sheldon, 1969; Welker, 1961), for incongruity (Hunt,

1965), or for arousal (Berlyne, 1966): Suboptimal levels of

stimulation occasion approach while supraoptimal levels occasion

avoidance. According to this view, suprathreshold levels of

stimulation are aversive, and aversiveness is a negative affect which

evokes withdrawal and avoidance.

Domjan (1977a) supports a view of novelty effects based on the

optimal arousal hypothesis (e.g., Berlyne, 1960). Specifically,

according to the optimal arousal hypothesis, the first encounter with a

novel substance increases arousal above some preferred level. An

individual's preferred level of arousal likely reflects individual

differences in temperamental quality, such as reactivity (cf., Kagan,

Snidman, & Arcus, 1992). High states of arousal above the

preferred/optimal level presumably are aversive, which causes the

organism to avoid the arousal-inducing object, in this case, the novel

food. With repeated exposures to the novel object, the organism
habituates to the aversive/arousing properties of the stimulus, and in
the case of food objects, approach and consumption are enhanced
(Domjan, 1977a).

The arousal hypothesis yields at least two predictions for which
some supportive evidence exists (Domjan, 1977a). First, if arousal is
below an optimal level, organisms should prefer a slightly novel (and
arousing) edible to a familiar (and less arousing) one. Empirical
support comes from the finding that when presented with two moderately
familiar solutions, rats prefer the slightly more novel of the two;
that is, the one not most recently consumed (Holman, 1973; Morrison,
1974). Humans similarly eat more of a food which they have not
recently ingested as compared to one quite recently consumed (Cabanac,
1971; Rolls, Rolls, Rowe, & Sweeney, 1981). Second, if arousal is
already high and presumably above some optimal level, neophobia should
be enhanced. In support of this prediction, water-deprived rats, which
are assumed to be more aroused than nondeprived rats, display enhanced
neophobia toward novel edibles (Peck & Ader, 1974).

Summary. Although arousal may indeed mediate approach-avoidance
behavior toward novel stimuli, for the present investigation it will
suffice to propose that novelty has aversive properties which elicit
active avoidance, withdrawal, and escape. Empirical evidence of active
avoidance, presented above, includes rats attempting to jump out of
cages (Domjan, 1976), birds banging against cage walls (e.g., Hogan,
1965), alarm calls in birds (e.g., Coppinger, 1970) and humans spitting

out food (e.g., Birch & Marlin, 1982). These avoidance, withdrawal, and escape responses may implicate negative emotional responses in the organism. That is, according to a biphasic model of emotion (e.g., Lang, Bradley, & Cuthbert, 1990), emotions predispose organisms to respond either defensively -- with avoidance, escape and withdrawal -- or appetitively -- with approach, consumption, and attachment. All emotions and behaviors are viewed as falling along this appetitive-defensive dimension. According to this analysis, avoidance responses such as those toward novel foods reflect a negative affective state in the organism. This biphasic model of emotion is detailed following a brief overview of the concept of emotion.

Two-Dimensional Models of Emotion: Valence and Arousal

Some theorists (e.g., Ekman, Friesen, & Ellsworth, 1972; Izard, 1972; Plutchik, 1984) believe that a fundamental set of emotions (e.g., sadness, anger, joy) provides the building blocks for more complex blends of emotions. However there has not been consensus on the identification of specific fundamental emotions. Whether or not such fundamental emotions exist, researchers increasingly concur that emotions can be differentiated on the basis of two dimensions: a positive-negative valence dimension, and an arousal dimension.

Hebb (1949) was one of the first to propose that direction and vigor are the significant dimensions underlying behavior. Others have proposed similar two-dimensional models of motivated behavior and emotion (e.g., Davidson, 1984; Lang et al., 1990; Russell, 1980). In such models the first bipolar dimension (Hebb's direction) is typically referred to as an appetitive-aversive dimension (approach vs. withdrawal), as hedonic quality (pleasure vs. displeasure), or as affective valence (positive vs. negative). The second bipolar dimension (vigor) is typically referred to as arousal (high vs. low). Based on such a two-dimensional model, Lang and his colleagues (e.g., Lang et al., 1990) define emotion as action dispositions, or tendencies to behave in certain ways. The parameters of these behavioral tendencies are set by the two dimensions: arousal, the vigor of behavior, and valence, the direction of behavior (approach vs. withdrawal).

Empirical evidence of a two-dimensional model has been obtained with children (Russell & Ridgeway, 1983; see also Russell & Bullock, 1986) and with adults (Abelson & Sermat, 1962; Block, 1957; Bush, 1973; Cliff & Young, 1968; Dittman, 1972; Green & Cliff, 1975; Royal & Hays, 1959; Russell, 1980, 1983; Russell & Ridgeway, 1983; Schlosberg, 1952; Shepard, 1962). For example, people's knowledge about emotion is dichotomized as positive versus negative emotions (Mehrabian & Russell, 1974; Ortony, Clore, & Collins, 1988; Osgood, Suci, & Tannenbaum, 1957; Russell, 1980; Shaver, Schwartz, Kirson, & O'Connor, 1987; Tellegen, 1985), and a second significant portion of variance in people's knowledge of emotion is accounted for by arousal. Research suggests, however, that the valence dimension has primacy over the arousal dimension (e.g., Lang et al., 1990).

Affective Arousal and The Physiological Components of Emotion

Scientists continue to debate whether diverse emotions elicit an undifferentiated pattern of autonomic (ANS) and central nervous system (CNS) activity (e.g., Cannon, 1927; Schachter & Singer, 1962), or whether emotion-specific activation occurs. In the case of emotion-specific activation, discrete emotions are each accompanied by a specific pattern of physiological correlates (e.g., Ax, 1953; Ekman, Levenson, & Friesen, 1983). Zajonc combines the two prevailing views proposing that a single emotional state, such as fear, produces different patterns of ANS activity depending upon eliciting stimuli, cognitive appraisal, expressive gestures and instrumental behavior (Zajonc & McIntosh, 1992; Zajonc, Murphy, & Inglehart, 1989). For

example in response to a fear stimulus, freezing generates a different pattern of autonomic activity than does fleeing (e.g., Baccelli, Ellison, Mancia, Zanchetti, 1971). Zajonc (1988) thus argues that a stable physiological effect is likely to occur only for the valence parameter--that is for positive emotions versus negative emotions.

The specific physiological concomitants of happiness (positive valence) and sadness (negative valence) have been relatively little studied (Schwartz, Weinberger, & Singer, 1981). However Fox and Davidson's research (e.g., Davidson, 1992; Fox & Davidson, 1986, 1988) suggests that a physiological mechanism underlies the valence dimension of positive approach-related emotions and negative withdrawal-related emotions. Specifically, positive approach-related emotions are associated with relative activation of the left cerebral hemisphere and negative withdrawal-related emotions with right hemispheric activation. Other research indicates that sadness is associated with heart rate acceleration (e.g., Ekman, Levenson, & Friesen, 1983; Levenson, Carstensen, Friesen, & Ekman, 1991; Levenson, Ekman, & Friesen, 1990; Provost & Gouin-Decarie, 1979; Schwartz, Weinberger, & Singer, 1981; Waters, Bernard, & Buco, 1989), increased skin resistance (Levenson et al., 1990; Sternbach, 1962), increased systolic blood pressure, slower movement (Schwartz et al., 1981) and decreased muscle activity (Levenson et al., 1990). Happiness is associated with slight heart rate acceleration (e.g., Ekman et al., 1983; Levenson et al., 1990; Schwartz et al., 1981), faster movement (Schwartz et al., 1981) and greater muscle activity (Levenson et al., 1990). Distinct patterns of

facial electromyographic (EMG) activity discriminate individuals who imagine happy versus sad scenes (e.g., Schwartz, Fair, Salt, Mandel, & Klerman, 1976a,b).

Despite the above findings, the totality of research on the physiology of emotion is somewhat contradictory. For instance Obrist, Light and Hastrup (1982) conclude that cardiovascular events may not provide insight into affective processes, whereas Zajonc and McIntosh (1992) suggest that heart rate may be the best discriminator of emotions. Schwartz (1982) argues that weak and inconsistent findings result from failure to assess different levels of emotional behavior and failure to employ multivariate analyses. He argues that "no one response can serve as a single measure of a single emotion" (Schwartz, 1982, p. 90). It may be that in the absence of multivariate analyses and more advanced measurement techniques, researchers are not likely to discriminate among specific emotions based on physiological arousal (e.g., Polivy, 1981; Schwartz, 1982; Zajonc, 1988).

Affective Valence: Positive/approach versus Negative/withdrawal

Lang and his colleagues specifically define valence as an organism's disposition to behave either appetitively or defensively (Lang et al., 1990, p. 380). All emotions and behaviors are viewed as falling along this appetitive-defensive dimension: Emotions are either associated with appetitive behaviors of approach, consumption, and attachment, or with defensive behaviors of avoidance, escape and withdrawal (e.g., Fox & Davidson, 1986, 1988; see also Ahern & Schwartz, 1979).

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These two sets of behavior, approach and avoidance, are viewed as having reciprocal actions (Lang, Bradley, & Cuthbert, 1992). Depending upon the valence of an organism's ongoing emotional state, or the organism's disposition toward approach versus avoidance, subsequent behavior is differentially enhanced or inhibited. Approach behaviors are enhanced during positive emotional states and inhibited during negative emotional states; avoidance behaviors are inhibited during positive emotional states and enhanced during negative emotional states.

As an example, intraoral infusion of a sucrose solution elicits a salivary response. Salivation is a consummatory reflex, and thus a component of the appetitive-approach system. If a sucrose probe occurs during a positive affective state, there is a reflex-affect match. The salivary response should therefore be enhanced. If a sucrose probe occurs during a negative affective state, there is a reflex-affect mismatch, and the salivary response should be inhibited.

Empirical support for this biphasic model of emotion comes from research on the startle response, which is a protective-defensive reflex, and thus a component of the aversive-withdrawal system (Bradley, Cuthbert, & Lang, 1988; Bradley, Cuthbert, & Lang, 1990; Brown, Kalish, & Farber, 1951; Cook, Hawk, Davis, & Stevenson, 1991; Davis, 1989; Ross, 1961; Simons & Zelson, 1985; Vrana & Lang, 1990; Vrana, Spence, & Lang, 1988). For example in one study (Cook et al., 1991), an ongoing affective state (positive, negative, or neutral) was induced by instructing participants to form vivid images of emotional

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scenes. A loud burst of white noise was the probe stimulus which

elicited the defensive startle response. Startle magnitude, measured

as eyeblink magnitude in humans, was greater during negative affective

states than during positive ones. During neutral affective states,

startle magnitude was intermediate and did not differ significantly

from positive or negative affect conditions. High-arousal affect

imagery did not significantly enhance startle responses relative to

low-arousal imagery, suggesting that affective valence mediates startle

magnitude independent of arousal. Vrana and Lang (1990) also

demonstrated the affect-startle effect during fearful and neutral

imagery.

Vrana et al. (1988) and Bradley et al. (1988) induced ongoing

affective states in their participants by presenting them with

photographic slides that were previously rated on valence (pleasant,

neutral, unpleasant) and on arousal (excited-calm). Following an

acoustic startle probe, eyeblink magnitude increased significantly from

pleasant to neutral to unpleasant slides, again supporting the biphasic

model. Also, startle magnitude was unrelated to participants' interest

in or attention to slide content, participants' arousal levels, or to

probe modality; it was only related to affective valence (Bradley,

Cuthbert, & Lang, 1990).

The phenomenon of illness-induced neophobia was not specifically

designed to test the biphasic model of emotion, but it provides

supportive evidence. For example Domjan (1977b) injected rats with

either lithium-chloride or saline, and then presented rats with a novel

or familiar solution. When rats were still experiencing the nauseating effects of the lithium-chloride injection (an ongoing negative affective state), at the same time that the novel solution was presented (negative probe stimulus), intake of the novel solution was curtailed relative to consumption in the absence of concurrent illness (Domjan, 1977b). Intake of the familiar solution was not affected by the experience of illness. Thus a preexisting aversive state (illness) enhanced negative withdrawal responses to a novel stimulus.

Summary. If it is the case that the behaviors of withdrawal, avoidance, and escape are part of the defensive motivational system, then according to Lang and colleagues, avoidance behaviors which occur to novel food cues reflect negative emotional responding in the organism. Also according to Lang and colleagues, negative affect elicited by a food source (the probe stimulus) should interact with the organism's affective state at the moment of food presentation. Thus at least two sources of affect may influence initial food acceptance: affect elicited by a novel food source and the affective state of the organism at the moment of food presentation. If the child's affective state is negative, we might expect negative withdrawal responses to a novel food source (e.g., food refusal) to be augmented. If the child's affective state is positive, we might expect negative withdrawal responses to a novel food source to be diminished, and approach behaviors (e.g., acceptance) to be enhanced.

At present the relationship between emotions and eating is unclear, especially in children and for novel foods. In adults,

negative emotional states have yielded diminished acceptance of familiar foods for some participants, but enhanced acceptance for others (e.g., Frost, Goolkasian, Ely, & Blanchard, 1982; Herman & Polivy, 1975; Ruderman, 1985). Based on these data alone, children might show either increased or decreased acceptance of a familiar food under negative affect conditions. However a systematic assessment of these effects has not been conducted with children nor with novel foods. Although the existence of a relationship between emotional state and food acceptance in children is uncertain, data from correlational, retrospective, and some experimental studies suggest that a relationship might exist.

Emotion and Food Acceptance

Overview. Feeding typically occurs in a social-affective context such that social events contribute to the emotional atmosphere of eating. This emotional atmosphere may, in turn, mediate food acceptance. For example parents rarely present food devoid of affective connotation. Instead, parents typically respond to food acceptance with positive affect (praise and reward) and respond to food refusal with negative affect (coaxing, threats, and punishment; e.g., Dettwyler, 1989). The modeling of eating behavior may similarly induce a positive or negative affective context which differentially affects food acceptance in observers (e.g., Marinho, 1942). Dysfunctional family environments, including emotionally negative parent-child interactions, have been associated with high levels of food refusals,

food dislikes, and various eating disorders in children, including nonorganic failure to thrive syndrome, anorexia, bulimia, and obesity (e.g., Bruch, 1973). The child, too, brings a host of emotion-related personality characteristics to the feeding situation, such as high levels of anxiety, fearfulness, or other emotional problems which may impact food acceptance (e.g., Benjamin, 1942; Brandon, 1970; Davids & Lawton, 1961; Gough, 1946; Otis, 1984; Pelchat & Pliner, 1986; Smith, Powell, & Ross, 1955a,b; Smith & Ross, 1958; Wallen, 1945, 1948). Finally, data on hemispheric activation provide evidence for affective responding to a food's taste and familiarity (Fox & Davidson, 1986, 1988), further substantiating a relationship between emotion and eating.

Feeding Strategies

Although many mealtime events such as family discord and congeniality contribute to the emotional atmosphere of eating, perhaps most common and therefore influential to the eating behavior of children in the United States are feeding practices employed by parents. To encourage their children to accept novel or disliked foods, parents employ reward, praise, modeling, cajolery, punishment, threat and coercion (Birch, Marlin, & Rotter, 1984; Casey & Rozin, 1989; Dettwyler, 1989; Eppright et al., 1969; Kram & Owen, 1972; Olvera-Ezzell, Power, & Cousins, 1990). Food games and cajolery likely occasion a positive social-affective context, whereas punishment, threat, and coercion likely occasion a negative social-affective context.

Birch and colleagues have investigated the effects of various

feeding strategies on children's food preferences (e.g., Birch, 1987).

According to Birch (1987, 1990a), children perceive food rewards and

adult attention as emotionally positive, and they perceive external

controls on eating as emotionally negative. In one study, preschool

children were repeatedly presented with a familiar, neutral-preference

food in one of several contexts (Birch et al., 1980). Presenting the

food as a reward or paired with positive adult attention (positive

social-affective contexts) yielded increased preference for the food

for up to 6 weeks post-treatment. Presenting the food in children's

lockers or during snack periods (neutral social-affective contexts) did

not reliably enhance preference, thereby eliminating increased food

familiarity as the primary cause of enhanced preference. In addition,

data on immediate food acceptance during the training period suggested

a facilitative effect of positive contexts relative to neutral

contexts: In positive social-affective contexts, children accepted the

familiar food on approximately 96% of trials, compared with acceptance

on 86% of trials in neutral social-affective contexts.

Ethical considerations preclude experimental investigation of such

emotionally negative feeding strategies as coercion, threat and

punishment. However experimental investigations indicate that the

strategy of providing a reward for eating decreases preference for the

instrumentally consumed food, whether the reward is praise (Birch et

al., 1984), engagement in a play activity (Birch, Birch, Marlin, &

Kramer, 1982; Birch et al., 1984), or consumption of another food

(Mikula, 1989). Presumably, being required to eat in order to receive a reward elicits negative emotions associated with control, manipulation, and coercion, and this negative affect decreases subsequent preference for the target food.

Clinical data suggest that a vicious cycle may develop when feeding occurs in a negative social-affective context: The more that parents respond to food refusals with emotionally negative feeding strategies such as anger and coercion, the more the child refuses to accept food (Hewitt & Aldrich, 1946). For example when mothers of 65 infants were advised to stop forcing food and to remove uneaten food without comment (among other suggestions), 91% of mothers reported that their children's appetites improved (Hewitt & Aldrich, 1946). These data support the hypothesis that negative social-affective contexts reduce food acceptance, but that shifting to a positive social-affective context enhances food acceptance.

Birch suggests that feeding strategies create a positive or negative social-affective context which, through associative conditioning, influences the development of food preferences. According to Birch, food cues such as appearance or taste become associated with the child's perception of the affective context (Birch, 1987), or with the affect generated (presumably in the child) by the social context (Birch, 1990a). If the child's perceived or generated affect is positive, then positive affect is paired with the food and subsequent preference and acceptance increase. If the perceived or generated affect is negative, negative affect is paired with the food

and preference and acceptance decline. If Birch's hypothesis is correct, positive and negative emotional states should serve as CSs+ and CSs- to promote and inhibit oral acceptance, respectively. Moreover, Birch's (1990a) analysis suggests that <u>any emotionally laden event</u>--in, around, or preceding the feeding episode--could potentially generate a commensurate emotion in the child, and it may be this emotional state of the child that mediates food acceptance.

<u>Emotionally Negative Parent-Child Interactions and Aberrant Eating</u>

The effect of shifting from a negative to positive social-affective context on food acceptance is illustrated in cases of nonorganic failure-to-thrive syndrome (NFTT)--a pediatric disorder primarily afflicting infants before 18 months of age. Eating behaviors of NFTT infants include disinterest in food, food refusal, anorexia, vomiting and rumination (e.g., Larson, Ayllon, & Barrett, 1987; Ramsay & Zelazo, 1988). During feeding, mothers of NFTT infants are often overly intrusive or disengaged, offering food efficiently but mechanically, and behaving in such a way that the infant suffers from a lack of response-contingent stimulation. For example mothers often reprimand and ridicule their infants during feeding, talking negatively, frequently, and following the infant's undesirable behaviors. They may also arbitrarily remove toys (Iwata, Riordan, Wohl, & Finney, 1982; Ramey, Starr, Pallas, Whitten, & Reed, 1975). In total, feeding is embedded in an aversive, emotionally negative environment (Oates, Peacock, & Forrest, 1985; Whaley & Wong, 1983; Whitten, Pettit, & Fischhoff, 1969).

Treatment programs for NFTT infants strive to counteract emotionally negative interaction patterns during feeding by creating a positive social-affective atmosphere. Following acceptance of food, the child may receive verbal praise, smiling, stroking, rocking, eye contact and toy presentations; punishment for food refusal may include time-out procedures and toy removal (e.g., Ayllon, Haughton, & Osmond, 1964; Iwata et al., 1982; Larson et al., 1987; Ramsay & Zelazo, 1988; Wolf, Birnbrauer & Williams, 1970). Music has also been used to create a positive affective context and as a stimulus cue for eating (e.g., Larson et al., 1987; Ramsay & Zelazo, 1988). These behavioral treatments, designed to create a positive emotional context, successfully increase food acceptance among NFTT infants (e.g., Larson et al., 1987).

Other clinical reports are suggestive of a relationship between emotionally negative family interactions, especially during mealtime, and high rates of food refusal. Davids and Lawton (1961) found that 10- to 12-year-old boys undergoing treatment for emotional disturbances reported significantly more food dislikes and refusals than did a group of nondisturbed boys. The authors note that the case histories of the disturbed boys "provide ample evidence of early feeding conflicts" (Davids & Lawton, 1961, p. 313). A dysfunctional family environment, high in conflict, control, and organization and low in stability, cohesion, and communication (e.g., Hertzler & Vaughan, 1979; Kintner, Boss, & Johnson, 1981) is prevalent among families of anorexic, bulimic and obese children (e.g., Birch, Marlin, Kramer, & Peyer, 1981; Bruch,

1973; Hecker, Martin, & Martin, 1986; Humphrey, 1987, 1988, 1989).
Other researchers have identified significant relationships among
child-rearing practices on the one hand, and nutrient intakes and
growth patterns on the other (e.g., Baldwin, 1944; Sims & Morris, 1974;
Wakefield & Merrow, 1967). For example Olson, Pringle and Schoenwetter
(1976) reported that the emotional valence of parental feedback to
preschool children during a learning game was significantly related to
the number of vegetables and other foods that their children liked.
These findings raise the possibility that the more dysfunctional and
emotionally negative the family environment is, the more likely are
food refusals, aversions and eating disorders.

Hemispheric Activation as Indicative of Affective Responding to Food

Oral acceptance evokes observable facial expressions and
corresponding patterns of hemispheric activation which are indicative
of affective responding. For example presentations of citric acid
solutions to newborn infants elicit facial expressions of disgust and
right hemispheric activation, both of which are indicative of negative
affect (Fox & Davidson, 1986). Presentations of sucrose solutions
elicit facial expressions of interest and left hemispheric activation,
two indicators of positive affect (Fox & Davidson, 1986). These data
confirm that affect-related physiological responses occur to taste
stimuli in newborns.

In another study, infants displayed more left hemispheric
activation (which is associated with positive affect) in response to a
familiar stimulus (their mother), and more right hemispheric activation

(which associated with negative affect) in response to a novel stimulus (a stranger; Fox & Davidson, 1988). These data confirm differential, physiologically based affective responding to familiar versus novel stimuli. (See also Ahern & Schwartz, 1985.)

Summary

Much of the reviewed data are correlational, retrospective, self-report, or involve clinical samples, thereby providing only suggestive although consistent evidence for a relationship between emotional state and food acceptance. In more controlled experimental studies, such as those on feeding strategies and nonorganic failure to thrive syndrome, emotional factors have been confounded with social, cognitive and physical factors. That is, although manipulating eating contingencies and the context of food presentation potentially alters the child's affective state, various social, cognitive, or physical elements of the child, of social others, or of the feeding context may also be altered (e.g., Birch et al., 1980; Larson et al., 1987). Moreover, no study has obtained direct measures of the child's emotional state, and only some studies have obtained actual measures of food acceptance.

Birch's (1990a) analysis suggests that the social-affective context may generate a commensurate emotion in the child, and this emotional state may mediate food acceptance. Thus the critical element may be the child's experience of affect rather than the affective valence of events outside the child. If so, the child's veritable affective state should mediate food acceptance.

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A valid test of this proposal requires that direct measures of the child's affective state be obtained. In this study, reminiscence procedures were used to manipulate the child's affective state prior to food presentation, and assessments of the child's emotional state were made prior to and during food presentation. Mood-induction procedures, including the reminiscence procedure, are subsequently reviewed.

Mood-Induction Procedures

Researchers have induced emotional states in humans by presenting them with threat of shock (e.g., Hodges & Spielberger, 1966), threatening mental arithmetic (e.g., Blair, Glover, Greenfield, & Roddie, 1959), emotional films (e.g., Averill, 1969; Sternbach, 1962), experimenter attack (e.g., Atkinson & Polivy, 1976), a directed facial action task in which participants are instructed to move facial muscles to create emotional expressions (e.g., Levenson et al., 1991; Levenson et al., 1990), reading emotionally laden self-referential statements (Velton, 1968), success/failure experiences (e.g., Fry, 1977), receipt of unexpected gifts (e.g., Isen & Levin, 1972), and reminiscence of emotional events and other visual imagery techniques (e.g., Levenson et al., 1991). The latter four techniques (the Velton, success/failure experiences, unexpected gifts, and reminiscence procedures) have been employed most frequently (Moore, 1985).

Most mood-induction procedures (e.g., threat of shock, arithmetic, experimenter attack, and the directed facial action task) are unethical or developmentally inappropriate for use with preschoolers. Among the

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most commonly used techniques, the Velton (Velton, 1968) is
developmentally inappropriate because it requires reading 50 statements
aloud. Success/failure procedures and receipt of an unexpected gift
may be appropriate for young children, but their effectiveness in
inducing emotion is uncertain. In success/failure procedures,
participants receive success or failure feedback regarding task
performance, and in the unexpected gift procedure, participants receive
an unexpected gift such as a cookie. These techniques have been
employed with adults (Berkowitz & Connor, 1966; Isen, 1970; Isen,
Clark, & Schwartz, 1976; Isen & Levin, 1972) and children (Fry, 1977;
Isen, Horn, & Rosenhan, 1973; Mischel, Coates, & Raskoff, 1968; Staub,
1968, cited in Moore, Underwood, & Rosenhan, 1973) and they have
yielded significant effects on the dependent variables. Researchers
speculate that the affective component of success, failure, or receipt
of a gift is responsible for the obtained effects, but other factors
such as a sense of competence or expectations for future success,
failure, or gifts may affect results (e.g., Isen, 1970). In addition,
no manipulation check of induced affect has been employed following the
use of these procedures. On the other hand, the reminiscence procedure
and other visual imagery techniques most directly manipulate affect,
are developmentally appropriate for children, and their validity has
been assessed with a variety of manipulation checks.

Reminiscence Procedures and Visual Imagery

In the reminiscence procedure (or relived emotions task),
participants recall the sensations and feelings associated with a prior

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emotional experience (e.g., Levenson et al., 1991; Schwartz et al., 1981). Visual imagery tasks are similar except that the experimenter, rather than the participant, provides descriptions of emotional experiences on which participants concentrate. These procedures have been used to induce emotions in adults (e.g., Bauer & Craighead, 1979; Cook, Hawk, Davis, & Stevenson, 1991; Ekman, Levenson, & Friesen, 1983; Levenson et al., 1991; Levenson et al., 1990; Roberts & Weerts, 1982; Schwartz et al., 1981; Underwood, Froming, & Moore, 1980) and in children (e.g., Bugental & Moore, 1979; Fry, 1975; Masters, Barden, & Ford, 1979; Masters & Furman, 1976; Mischel, Ebbesen, & Zeiss, 1972; Moore, Clyburn, & Underwood, 1976; Moore et al., 1973; Nasby & Yando, 1982; Ridgeway & Waters, 1987; Rosenhan, Underwood, & Moore, 1974; Underwood, Moore, & Rosenhan, 1973; Also see Moore [1985] for a review).

The ability of these procedures to induce emotion is conceptually logical if emotion is conceived of as an integrative state that is coherent across response systems (Davidson & Cacioppo, 1992, p. 21). Given such coherence, reciprocal relationships should exist among the components of emotion, such that an emotional response in one system evokes emotion-related responses in another. Thus affect-laden thoughts, including memories of previous emotional experiences, should act as eliciting stimuli capable of producing physiological states, behavioral expressions, and subjective experiences of emotion. Relative to emotional states elicited by actual events, the reminiscence procedure presumably elicits a mildly intense,

semi-transient emotional state (Masters et al., 1979).

The reminiscence procedure has been successfully employed with children ranging from 3 to 11 years of age. It has been employed specifically with 3- to 5-year-old preschoolers by Masters et al. (1979), Masters and Furman (1976), Moore et al. (1976), and Ridgeway and Water (1987). In experimental conditions, children have been asked to describe and concentrate for 30 s on events that make them feel happy, sad, calm, mad, or excited. In neutral affect or control conditions, children have been asked to count slowly for 30 s (e.g., Moore et al., 1976), to describe and think about emotionally neutral events (e.g., Nasby & Yando, 1982), or to read instructions for and assemble a jigsaw puzzle (e.g., Fry, 1975).

Most of the thoughts generated by preschool children during reminiscence procedures represent social experiences with parents, teachers and peers (Masters et al., 1979). Typical affective experiences reported by 4-year-olds include, for positive affect, going on vacation, and for negative affect, helping to clean the house (Masters et al., 1979). Occasionally children recall highly distressing events in which case the experimenter redirects the child to think of something else (Moore et al., 1973). Underwood et al. (1973) reported that in the negative affect condition, girls showed a slight tendency to generate depressive episodes whereas boys tended to generate angry episodes.

In summary, the reminiscence procedure is nonintrusive, meets ethical standards for research with children, and is developmentally

appropriate for young children. It is therefore the most frequently employed procedure for experimentally inducing emotions in children.

Effects of Mood Induction on Behavior

Data indicate that mood-induction procedures have a substantial and wide range of effects on behavior in children and adults. Empirical evidence indicates that humans selectively attend to stimuli which are emotionally similar to their current mood (e.g., Bower, 1981; Easterbrook, 1959; Isen, Shalker, Clark, & Karp, 1978; Izard, Wehmer, Livsey, & Jennings, 1965; MacLeod, Mathews, & Tata, 1986; Mathews & Macleod, 1986; Mischel, Ebbesen, & Zeiss, 1973; Nasby & Yando, 1982). For example Nasby and Yando (1982) used reminiscence procedures to induce children into neutral, happy, sad, or angry moods prior to encoding a word list. Relative to children in neutral moods, those in a happy mood recalled more positive adjectives, and those in sad or angry moods recalled fewer positive adjectives. Angry moods facilitated recall of highly negative words. Bower (1981) obtained similar results in adults.

When Moore et al. (1976) used the reminiscence procedure to induce positive, negative and neutral moods in preschool children, they found that children in a positive mood tended to choose large but delayed rewards, whereas children in negative moods tended to choose smaller, more immediate rewards. The authors attribute failure to delay gratification among children in a negative mood to a tendency to seek reinforcers that might terminate the negative mood state. (See also Rosenhan et al., [1974] and Underwood et al., [1973].) Also using

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reminiscence procedures, children induced into negative moods donated less money to other children (i.e., were less altruistic), and children induced into positive moods donated more money, relative to children induced into neutral moods (Moore et al., 1973; Rosenhan et al., 1974).

Masters and Furman (1976) used reminiscence procedures to induce positive, negative or neutral moods in preschool children and subsequently administered the Minnesota Expectancy for Serendipity Scale (MESS). MESS scores indicated that children induced into a positive mood had more positive expectancies than did children induced into neutral or negative moods.

In summary, the reminiscence procedure has differentiated children on a variety of social and cognitive variables. Children who have been experimentally induced into a positive mood have been found to selectively encode and retrieve positively valent information (Nasby & Yando, 1982), to be better able to delay gratification (Moore et al., 1976; Mischel, Ebbesen, & Zeiss, 1972), to be more altruistic in their sharing with others (Barden, Garber, Duncan, & Master, 1981; Moore et al., 1973; Rosenhan et al., 1974), to have more positive expectations for the future (Masters & Furman, 1976), to persist longer at tasks (Masters & Santrock, 1976; Santrock, 1976), and to perform better on learning tasks (Masters et al., 1979). Negative moods generally have the opposite effects.

The consistent significant differences between positive, negative and neutral affect conditions following reminiscence procedures with children attest to the validity of the procedure and to the mediating

role of affect in human behavior. Additional validating evidence for the reminiscence procedure (and for similar visual imagery techniques) is subsequently reviewed.

Validating Evidence for the Reminiscence Procedure and Visual Imagery

Early studies using reminiscence procedures in children (Moore et al., 1973; Underwood et al., 1973; Rosenhan et al., 1974; Moore et al., 1976; Nasby & Yando, 1982) failed to perform manipulation checks, yet significant results were obtained. Studies of adults and more recent studies with children have provided manipulation checks.

Adults. Underwood et al. (1980) administered reminiscence procedures to college students, and then asked them to complete a modified version of the Mood Adjective Checklist (Nowlis, 1965). Participants in the sad condition reported being significantly sadder than did neutral affect controls; participants in the happy condition reported being happier than neutral affect controls, although this latter difference was not significant.

Vrana and Lang (1990) assessed heart rate during processing and imagery of affect-laden sentences. Processing sentences with fearful content yielded greater heart rate increases than did processing neutral sentences. The greatest effect occurred when participants were instructed to vividly imagine the content of the sentence.

Cook et al. (1991) found that mean heart rate was significantly higher during negative affect imagery (sadness, fear and anger) than during positive affect imagery (joy and relaxation), and that mean heart rate and skin conductance levels were significantly higher during

high arousal imagery (joy, fear and anger) than during low arousal

imagery (sadness and relaxation).

Using the reminiscence procedure, Schwartz et al. (1981) found no

reliable differences in cardiovascular activity (heart rate, diastolic

and systolic blood pressure) between sad and happy imagery conditions.

However, affective imagery induced patterns of cardiovascular change

which discriminated some participants.

To summarize the physiological data, affective imagery is

sufficiently potent to induce some physiological changes. Weak or

inconsistent findings are consistent with the literature on the

physiological components of emotion (Schwartz, 1982). Schwartz (1982)

suggests that weak and inconsistent findings are due, in part, to a

failure to assess patterns of subjective experience, to assess

different levels of emotional behavior, and to employ multivariate

analyses.

Children. Masters et al. (1979) used reminiscence procedures to

induce positive, negative and neutral affective states in 4-year-old

children. Their procedures differed from most in that affective

valence was orthogonally combined with tempo/arousal (active versus

passive), and children did not vocalize their self-generated affective

thought until completion of the experimental session. As manipulation

checks, children's thoughts and facial expressions were analyzed for

affect. Thoughts generated in the positive affect condition were rated

as significantly happier than those in the neutral affect condition,

than were those in the negative affect condition. The reverse pattern

of findings was obtained for ratings of sadness. Facial expressions were rated according to Ekman (Ekman, Friesen, & Ellsworth, 1971; Ekman et al., 1972). Faces following positive affect induction were rated as reliably more happy, and reliably less sad, than faces following neutral and negative affect induction. Facial expressions across positive, negative and neutral conditions did not differ on ratings of anger, disgust, surprise or pain, providing discriminant validity for the affect-induction procedures. Children in the neutral affect conditions were rated as showing somewhat more fear than in other conditions, though these fear ratings were low. Masters et al. (1979) also separately analyzed the impact of affect and tempo induction on speed and accuracy of learning, and found that although both had a robust effect on learning, affect had the primary effect while tempo played a secondary role.

Ridgeway and Waters (1987) obtained equivocal results with heart rate measures, but other measures of affect clearly differentiated their affect-induction groups. Preschool children used reminiscence procedures designed to generate feelings of excited, calm, or sad. Analysis of the second 20 s of the thought-generation phase indicated that excited induction produced significantly greater maximum heart rate responses and more variability of heart rate activity than did calm induction. Heart rate returned to baseline levels within the first 10 s of the concentration phase, but subsequently reaccelerated during a paper-and-pencil persistence task.

Children's expressed affect during the thought-generation phase of

the Ridgeway and Waters (1987) study was also assessed by independent raters. Children in the excited condition were rated as expressing significantly more pleasure than those in the calm condition. Children in the calm condition were rated as significantly more aroused than those in the sad condition. In addition, parents were asked to rate how the child would feel in the situation that the child had generated. Parents rated the thoughts produced in the calm induction condition as generating significantly more pleasure relative to those produced in the sad induction condition, and they rated thoughts produced in the excited condition as significantly more arousing than those in the calm condition, than those in the sad condition.

Bugental and Moore (1979) analyzed the voice quality of first, third and fifth graders' statements made during happy and sad affect-induction procedures. Baseline voice quality was covaried, and the verbal content of statements was filtered out. Children were rated as sounding happier in the happy induction condition and sadder in the sad induction condition, relative to each other.

As in the data for adults, these findings suggest that the reminiscence procedure is sufficiently potent to induce affect-related changes in children. The rapid return of heart rate to baseline levels in the Ridgeway and Waters' (1987) study, however, might be taken to suggest that mood induction is most successful if children are asked to periodically vocalize their thoughts during the concentration period. Although this conclusion contradicts the findings of Masters et al. (1979), it seems reasonable that given preschool children's relative

cognitive immaturity, they may not fully attend to their emotion-inducing thoughts unless constantly reminded to do so. For example, other researchers give children intermittent eye contact during the concentration period to prevent children from thinking of things other than the emotion-inducing thought (e.g., Moore et al., 1973; Underwood et al., 1973).

Particularly noteworthy is the finding that 4-year-olds generated thoughts that were deemed by adults, blind to experimental conditions and hypotheses, to coincide with the child's affect condition (Masters et al., 1979; Ridgeway & Waters, 1987). Thus preschoolers' comprehension of emotional labels and of eliciting situations corresponded to that of their adult culture. Other empirical evidence confirms that 2- to 4-year-old children understand situational antecedents of emotion, behavioral expressions of emotion, and the lexicon of emotion appropriate to their culture (e.g., Michalson & Lewis, 1985). Further, the emotion labels of happiness (positive) and sadness (negative) are the first to be learned by children (Michalson & Lewis, 1985). In total, research consistently confirms that the reminiscence procedure is developmentally appropriate and an effective means of inducing mood states in preschool children age 3 to 5 years old.

THEORETICAL RATIONALE AND HYPOTHESES

Theoretical Rationale

Central to the theoretical approach of the present investigation is the notion that emotion involves a disposition to behave in either a positive, approach-related manner or in a negative, withdrawal-related manner and that all behavior falls along this approach-avoidance continuum (e.g., Fox & Davidson, 1986, 1988; Lang et al., 1990). The consummatory response of oral acceptance is part of the appetitive-approach motivational system and is therefore a positive affective behavior (e.g., Lang et al., 1990). Food rejection, a defensive-withdrawal response, is part of the aversive-avoidant motivational system and is therefore a negative affective behavior. Because familiar foods generally evoke consummatory behaviors of approach and oral acceptance, familiar foods presumably evoke positive affective responding. Because novel foods generally evoke ingestional neophobia characterized by avoidance, withdrawal and escape (e.g., Coppinger, 1970; Domjan, 1976; Franchina & Slank, 1988), novel foods presumably evoke negative affective responding.

According to the biphasic model of emotion and supporting data, an organism's current affective state mediates responding to specific stimuli: Ongoing positive affective states augment approach and other positive behaviors, and inhibit withdrawal and negative affective behaviors. Ongoing negative affective states augment withdrawal and negative behaviors, and inhibit approach and positive affective

behaviors. If food acceptance and food neophobia represent positive and negative affective behaviors respectively, then according to the biphasic model of emotion, the strength of these behaviors should be influenced by the affective state of the organism at the moment of food presentation. If an organism is in a positive affective state at the moment of food presentation, approach behavior and food acceptance should be augmented, and neophobia and food rejection diminished. If an organism is in a negative affective state at the moment of food presentation, approach behavior and food acceptance should be inhibited, and neophobia and food rejection augmented.

Birch (1990a) has similarly hypothesized that a child's affective state mediates food acceptance. To test Birch's hypothesis, the child's affective state should be experimentally manipulated and assessed prior to and during food presentation. To date, no such study has systematically manipulated or measured affective state independent of social, cognitive and contextual variables. The purpose of this study was to evaluate Birch's hypothesis and the biphasic model of emotion as it applies to food acceptance. Specifically, a reminiscence mood-induction procedure was employed, which was designed to yield a positive, negative, or neutral mood prior to the presentation of either a novel- or familiar-appearing food. There were two sources of affect which could mediate the response to food: the child's affective state at the moment of food presentation, and the affective state instigated by the familiarity of the food source.

To induce mood states, children were asked to think of things that

either make them happy (positive mood), sad (negative mood) or they were asked to count (neutral mood). Following these mood-induction (MI) procedures, children received a food that was either familiar or novel in appearance. The child's response was measured as latency to touch the food, latency to take five bites of food, amount eaten, rate of eating, and degree of contact with the food.

These measures can be grouped into two categories which reflect two-stages of ingestive behavior: <u>initial acceptance</u> (latency to touch the food; latency to first bite) and <u>continued acceptance</u> (latency to bites two through five; amount eaten; and rate of eating). The distinction between these two categories is that initial acceptance occurs prior to the first bite and therefore reflects, in part, the influence of the food's visual cues such as color. Visual cues signal a food's likely physical properties (e.g., taste) and therefore the presumed acceptability of the food. Therefore prior to the first bite the child has no veridical knowledge of the food's taste, only expectations of taste based on telereceptive cues. Continued acceptance occurs after the first bite and therefore reflects the child's subjective experience of the ingested characteristics of the food. Thus the child's subjective experience of the food's taste, texture, and temperature could mediate measures of continued acceptance. If expected sensory characteristics (based on telereceptive cues such as color), and experienced sensory characteristics (based on ingestion) are highly similar, measures of initial and continued acceptance might yield similar effects. If expected and experienced characteristics are

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highly discrepant, the measures might yield differential effects.

Hypotheses

Existing data and theory provide the foundation for the two main effect hypotheses. It is less certain how variables might interact. Therefore main effect hypotheses are offered first followed by speculation of how the two variables might interact.

Hypothesis 1: Main Effect of Food Appearance. Research indicates that novel-appearing foods typically evoke withdrawal whereas familiar foods evoke acceptance. Therefore, a main effect of food appearance was expected. Specifically:

*   The familiar-appearance condition should yield a shorter

     latency to touch the food, shorter latency to take five bites

     of food, faster rate of eating, greater amount of food eaten,

     and greater degree of contact with the food, relative to that

     for the novel-appearance condition.

Hypothesis 2: Main Effect of MI Condition. If affective states reflect behavioral dispositions which augment affect-congruent behavior and inhibit affect-incongruent behavior, then positive affect should augment food acceptance and negative affect should reduce food acceptance, relative to neutral affect. Thus a main effect of MI condition was expected. Specifically:

*   Participants in the positive MI condition should display

faster latency to touch the food, faster latency to take five

bites of food, faster rate of eating, greater amount of food

eaten, and greater degree of contact with the food than those

in the neutral MI condition, who should respond faster and

eat more than those in the negative MI condition.

Hypothesis 3: Interaction Between Food Appearance and MI

Condition. Although mood was expected to impact on food acceptance

across novel and familiar food conditions, an interaction between the

variables of food appearance and mood could result.

Behavioral withdrawal and negative affect are part of the

defensive motivational system (i.e., a behavior-affect match). Thus

negative affect should significantly augment withdrawal behaviors to

novel foods. Because approach behaviors are rarely displayed toward a

new food, positive affect may only minimally enhance approach behaviors

toward novel foods. Therefore in the novel-appearance condition,

differences in food acceptance might be greater between the negative

mood and neutral mood conditions than between neutral and positive mood

conditions.

Behavioral approach and positive affect are part of the appetitive

motivational system. Thus positive affect should enhance approach

behaviors toward familiar foods. Because familiar foods do not

typically evoke negative withdrawal behavior, negative affect may only

minimally inhibit acceptance of familiar foods. Therefore in the

familiar-appearance condition, differences in food acceptance might be

greater between positive mood and neutral mood conditions than between neutral and negative mood conditions. Specifically:

* In the novel-appearance condition, differences in latency to touch the food, latency to take five bites, rate of eating, amount eaten, and degree of contact with the food should be greater between negative and neutral MI conditions than between neutral and positive MI conditions. In the familiar-appearance condition, differences in these measures should be greater between positive and neutral MI conditions than between neutral and negative MI conditions.

Hypothesis 4: Initial Versus Continued Acceptance. At the stage of initial acceptance the child has no veridical knowledge of the food's physical properties such as taste, texture and temperature. Thus initial acceptance behaviors should be mediated primarily by the food's appearance (familiar vs. novel) and the child's emotional state (negative vs. neutral vs. positive). However following the first bite, continued acceptance may be mediated by these two factors as well as by the food's physical properties. Because novel and familiar foods in this experiment differed only in appearance (having nearly identical taste and texture), one might expect no differences between novel- and familiar-appearance groups on measures of continued acceptance. However because of the inhibitory effect of novel foods on food acceptance (e.g., Birch & Marlin, 1982), the novel-appearing food might continue to deter acceptance despite the similarity in taste and

textural cues between the two appearance groups. Specifically:

*   The results of continued acceptance (latency to bites two

     through five, rate of eating, and amount eaten) were expected

     to show effects similar to those of initial acceptance

     (latency to touch the food and latency to first bite).

METHOD

Participants

Participants ($\underline{N}$ = 82) were recruited from 6 day-care centers, all under the same management in southwestern PA. One center was a Head Start program, one contained Head Start and non-Head Start classrooms, and the remaining four contained only non-Head Start classrooms. Thus middle and lower income children were represented.

Participants ranged in age from 36 to 71 months, with a mean age of 54.7 months ($\underline{SD}$ = 8.88). There were 39 females and 43 males; 73 were Caucasian and 9 African American. An attempt was made to equate experimental groups on gender, age, and parental reports of their child's acceptance of new foods. Within these considerations, participants were randomly assigned to groups of a 3 Mood-Induction Condition (negative vs. neutral vs. positive) x 2 Food Appearance (novel vs. familiar) factorial design. For negative, neutral and positive MI conditions, sample sizes in the familiar-appearance condition were 14, 13, and 13; and in the novel-appearance condition, 15, 15, and 12, respectively.

Materials

Eating history. Parents signed an informed consent form and completed an eating history for their child (Appendix A). The eating history indicated the child's frequency of exposure to and preference for boiled potatoes, pasta, applesauce, and canned corn, potatoes, pears, pineapples, and yellow beans. Parents also indicated their child's general appetite level, acceptance of new foods, food allergies

and aversions, and color blindness. Some parents failed to complete all questions yielding some missing data.

Target food. Each child received one of two target foods: either canned corn or pasta. The target food was offered either as it typically appears (familiar-appearance condition) or as colored green (novel-appearance condition). In all cases parents rated the child's liking for the target food as likes or accepts and indicated that the food was served either frequently or moderately frequently. Specifically, on a scale from 1 (rejects) to 3 (likes), mean liking for the target foods combined was 2.88 (SD = 0.33). On a scale from 1 (never served) to 4 (frequently served), mean frequency of the food being served was 3.56 (SD = 0.60). Therefore corn and pasta were selected as target foods because they were reported to be well liked, frequently served, and were presumably familiar to participants. They were also selected because they can be eaten as finger foods which children generally prefer (Staples, 1932) and because their pale color is readily alterable with food coloring.

Food preparation. To prepare the corn, the contents of a 16 oz can of Libby's Whole Kernel Sweet Corn was placed into a sauce pan on the stove. For the novel-appearance condition, 4 tablespoons of McCormick green food coloring were added to the pan. The corn was brought to the boiling point and then removed from the heating element and allowed to stand for 20 min. The corn was then drained of its liquid and allowed to continue to drain for 10 min.

For the pasta, 1 c of San Giorgio Ditalini-36 macaroni was placed

in a sauce pan with 4 c of water. For the novel-appearance condition, 3 tablespoons of McCormick green food coloring were added. The contents of the pan were brought to a boil and continued to boil for 12 min. The pasta was drained and 1 tablespoon of Blue Bonnet margarine was stirred into the pasta.

Following preparation procedures, the food was immediately weighed in serving sizes of 97-100 g, in plastic containers, on a digital Cardinal Detecto scale model number AP-4K with a 3999 g x 1 g capacity. A tight fitting lid was secured on the container and the container and contents were stored in the refrigerator overnight. The next day the container and contents were heated in a microwave oven for 1 min, then placed into a thermal insulated bag and transported to the experimental site. Food was lukewarm at serving. Foods were prepared the night before serving with an approximate time lapse of 12 hr between food preparation and food presentation.

Several considerations led to the determination of green and yellow/white as colors for the novel- and familiar-appearing foods, respectively. First, the colors blue and red elicit intense physiological/emotional responses (e.g., Choungourian, 1968; Gerard, 1958; Hevner, 1935; Jacobs & Hustmyer, 1974; Wilson, 1966) and seemed best avoided. Green and yellow elicit more moderate physiological responses and do not differ significantly from each other in GSR elicitation (Jacobs & Hustmyer, 1974). Second, although green-colored corn and pasta are novel-appearing food items, green-colored foods per se are quite common (e.g., string beans, peas, lettuce, broccoli, and

spinach). Blue, pink and violet are relatively uncommon food colors (Birren, 1956). Thus foods presented with these latter colors might elicit strong neophobia which would preclude intake and eliminate assessment of the effects of mood on food acceptance.

Procedure

Prior to testing, the experimenter attended each day-care center for a minimum of 4 hr per day for 2 weeks in order to meet staff, distribute forms for parents, and become familiar with children and classroom routines. Classrooms contained approximately 8 to 15 children. Morning routines consisted of free play and structured group activities, some of which occurred outdoors, and the timing of which varied from day-to-day. Lunch was served at a standard time for each classroom, but between classrooms lunch time varied between 11:30 and 1:00 pm.

Children were tested prior to lunch, between 10:00 am and 12:30 pm, either during free play or one of the structured activities. Only children whose parents returned the completed informed consent and child's eating history were invited to help the experimenter "learn about children for a school project." Three children indicated that they did not want to participate, two of whom acquiesced at a later time. Two children who agreed to participate asked to return to the classroom before completion of experimental procedures, and two failed to respond to the experimenter's questions. Data of these four children were not included in the results.

Children who indicated a willingness to participate were escorted

to a private room within the center. In all but one day-care center

the child sat at a child-size table in a child-size chair. In all

cases the child sat across from or adjacent to the experimenter, and a

video camera stood on a tripod approximately 5 to 7 ft in front of the

child. Following a 5-min conversation, the child was asked if it was

okay to take the child's picture with the video camera. Once

permission was granted, videotaping and the experimental session (i.e.,

mood-induction procedures) began.

Mood-induction procedure. MI procedures were modified from Moore

et al. (1973, pp. 100-101; see Appendix B). Briefly, during the

thought-generation phase of positive and negative MI procedures,

children were asked to name two things that make them happy or sad,

respectively, and then to choose the one thought that makes them most

happy/sad. In the concentration phase, children were asked to

concentrate on that thought for 45 s. In the neutral MI condition,

children were asked to count slowly from 1 to 10, and then to do so

again using their fingers. The experimenter counted with the child.

Food presentation. Immediately following MI procedures the

experimenter retrieved a previously concealed container of target food

from a nearby bag. The experimenter placed the open container on the

table in front of the child and said: "The other thing that I am

trying to learn about children are the kinds of things they like to

eat. I have some food here; if you would like some you may use your

fingers and eat as much as you like." If the child asked "What is it?"

the experimenter responded "I thought that you could tell me; you may

use your fingers and eat as much as you like."

Following each 40-s lapse in eating, regardless of whether the child touched the food, one of five food prompts was offered in the following order: (a) Would you like to taste some (more)? (b) Would you like to try a (another) taste? (c) Here, I am going to taste some. [The experimenter took one bite.] Now would you like some (more)? (d) I would like to have one more taste then you can eat as much as you like. [The experimenter took one bite.] (e) Are you finished? If the child responded "No" the experimenter stated "Okay go ahead". The final question was repeated following each subsequent 40-s lapse in eating until the child responded "Yes", at which point food presentation ended. Food presentation times ranged from approximately 3 min and 20 s to 15 min. When food presentation ended, the child was asked to name the food and three things that make him or her happy.

Manipulation Checks

Thoughts generated during MI procedures. Participants' two verbal statements produced during the thought-generation phase of negative and positive MI procedures were hand printed on index cards. Two independent judges (college females), blind to experimental hypotheses and participants' groups, rated the emotional valence and intensity of the thoughts on a single 7-point scale (1 = very negative; 7 = very positive). (See Appendix C.) Interrater reliability coefficients for Thoughts 1 and 2 were r = .72 and .82 respectively, ps < .0002.

Behavioral expressions of affect: Training procedures. The same two judges were trained to rate behavioral expressions of emotion.

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Judges were first asked to identify the emotion expressed in photographs of adult faces obtained from Appendix II of Unmasking the face (Ekman & Friesen, 1975). (See Appendix D.) The two judges correctly identified the emotional expression of 96% and 94% of the faces on their first attempt, indicating that they were proficient in recognizing six basic emotions in posed, still photographs of adult faces.

Judges then viewed an edited videotape of pilot participants presented in the absence of the video's audio component. The videotape contained 18 45-s segments of four pilot participants presented during MI procedures and food presentation. During two separate viewings of the tape, judges individually rated expressed affect on two forms (Form A and B) in a counterbalanced order. (See Appendix E.) For each video segment, judges rated expressed affect approximately every 5 s by marking one of seven categories which, on Form A, varied in intensity of affective valence (e.g., very positive, very negative), and on Form B represented seven discrete emotions (e.g., happiness, surprise, fear). After rating each segment in 5-s intervals, judges immediately reviewed the segment in its entirety to produce a single global rating of the child's overall expression of emotion. This overall rating was made on a 7-point scale (1 = very negative; 7 = very positive) for both Forms A and B.

Subsequent discussion revealed that Form A was easier to use than was Form B, and that an overall rating of emotion was easier to produce than were 5-s interval ratings. Thus Form A was adopted for subsequent

use, though only the global 7-point rating was used in data analysis.

However further review of the pilot ratings revealed that judges' ratings tended to cluster in the middle of the 7-point scale. Judges frequently marked the neutral and slightly positive categories (ratings of 4 and 5) and tended to refrain from marking the extreme ends of the scale (very negative, negative, very positive and positive). The third phase of training was designed to address the judges' failure to use the full range of the scale.

In a group training session with the experimenter, judges viewed the pilot videotape for a third time. The videotape was periodically stopped and facial and bodily expressions of emotion were examined and discussed. Exemplars of very negative, very positive, and neutral expressions of emotion were identified, thereby providing judges with a reference for the emotion categories of the rating scale. Other information regarding children's expressed affect was provided, along with examples from the videotape. Judges were informed that when children spoke or were spoken to they often showed expressions of concentration because language production and comprehension are difficult tasks for young children. They were also informed that participants frequently displayed neutral facial expressions while eating. Thus if a child smiled two or three times but otherwise had a concentrative or neutral expression while talking, the smiles were likely indicative of overall positive affect. As examples, judges were shown video clips of children who displayed several overt emotional expressions, but who also displayed concentrative or neutral

expressions while eating, talking, or listening. Judges were thus

instructed to interpret emotional expressions (frowns, smiles) within

the context of other behaviors (talking, listening, eating). However

judges were also informed that their task was to weigh the frequency

and intensity of expressions when judging overall expressed affect, and

to thereby produce a rating they believed to be indicative of how the

child was feeling, in general, throughout that video clip.

To evaluate the efficacy of group training procedures, the group

viewed three video segments and individually rated expressed affect on

the 7-point scale. For each segment, the greatest difference among

ratings was 1 point.

Behavioral expressions of affect: Rating participants. To assess

the efficacy of MI procedures, judges viewed videotapes of all

participants, void of the audio component, and rated behavioral

expressions of affect on a 7-point scale (1 = very negative; 7 = very

positive). (See Appendix F.) Tapes had been edited so that for each

participant there were four to six 45-s segments. The first segment

(Trial 1) presented participants during the thought-generation phase of

MI procedures (negative and positive affect) or during counting

(neutral affect). Trial 2 presented participants during the

thought-concentration phase of MI (negative and positive affect only).

Trials 3-5 presented the first 3 min of food presentation,

respectively. Trial 6 presented the last minute of food presentation

for participants who ate more than 5 g of food.

Interrater reliabilities for ratings of expressed affect were

assessed with Pearson's r correlations. Correlation coefficients for Trials 1-6 were r = .92, .81, .83, .74, .77 and .68 respectively, all ps < .0002. Correlation coefficients may have decreased across trials due to variability in the expression of, and difficulty in judging, emotional displays while participants ate. Nonetheless, correlation coefficients, especially for Trials 1-3, suggest that training procedures were effective.

Dependent Variables

Initial acceptance. Measures of initial acceptance were latency (s) to touch the food and latency (s) to first bite. Latency measures were scored from videotapes. The measure of latency to touch the food commenced at food placement and ended when the child's hand contacted the food. The measure of latency to first bite commenced at food placement and ended when the child's lips or teeth closed on or around the food. If a child failed to touch the food or to take one bite, latency was scored as the time between food prompts (40 s).

Continued acceptance. Measures of continued acceptance were latencies (s) to Bites 2-5, amount eaten (g), and rate of eating (g/s). Measures of latency to Bites 2-5 began with the onset of the preceding bite (lips or teeth closed on or around the food) and ended when the child inserted additional food into the mouth, and lips or teeth subsequently closed on or around that food. If a child failed to take Bites 2, 3, 4 or 5, latency was scored as the time between food prompts (40 s). Amount eaten was measured as the difference between pre- and post-weights (g) of the container of food. Prior to obtaining this

difference score, all food remaining on the table, chair and floor following food presentation was returned to the container. Eating rate (g/s) was calculated as amount eaten divided by seconds of eating time; eating time was calculated from first bite to final visible chewing motion.

Degree of acceptance. The measure of degree of acceptance represented the highest level of contact that a child had with the food in which 1 = no physical contact, 2 = touch, 3 = smell, 4 = brought food to mouth such that food touched lip or tongue, 5 = bite and spit (mouth closed on or around the food which was subsequently expelled) and 6 = eat (Rozin et al., 1986).

Identification of the target food. Upon completion of the experimental session, participants were asked to identify the target food. It was possible that correct versus incorrect identification of the target food would affect food acceptance measures.

Analyses

Tests of analysis of variance (ANOVA) were 2 x 3 (Appearance of Food x MI Condition) unless stated otherwise. Results of ANOVAs and means for main effects are presented in Appendix G. Post-hoc analyses were conducted with Duncan's Multiple Range Test (DMRT). Statistical tests were one-tailed with an alpha level of .05. Thus unlisted p values were > .05.

RESULTS

Eating History

In order to assess group differences on potentially confounding variables due to participants' prior history with food and eating, parental responses on the eating history were compared across groups. Table H1 (see Appendix H) shows mean parental ratings of their child's liking the target food and frequency of serving the target food. A 2 x 3 ANOVA of these data in which appearance and MI condition were dummy variables revealed no reliable effects for any factor. (See Tables G1-G2.) There also were no reliable differences in parental ratings of the child's appetite, acceptance of new foods, or age. (See Tables G3-G5.) Thus groups were similar to each other on measures of eating history at the outset of the experiment.

Manipulation Checks

Thoughts generated during negative and positive MI procedures. Judges' ratings of the emotional content of thoughts generated during MI procedures were averaged together. Table H2 shows mean ratings of emotion for Thoughts 1 and 2 generated during negative and positive MI procedures. Thoughts generated in the positive MI condition were rated as more positive than were thoughts generated in the negative MI condition, $t(52) = 12.78$ and 13.56 for Thoughts 1 and 2, respectively, $p < .0002$. These results indicate that children generated thoughts that were coincident with their MI instructions as judged by independent raters.

Behavioral expressions of affect. The two judges' ratings of

behavioral expressions of affect were averaged together for Trials 1-6. Trials 1 and 2 occurred during MI procedures, prior to the presentation of food. Specifically, Trial 1 was the thought-generation phase of MI procedures (negative and positive moods) or the counting phase (neutral mood), and Trial 2 was the thought-concentration phase of MI procedures. Because the neutral MI condition did not generate thoughts, there was no concentration phase (Trial 2) for the neutral condition. Trials 3-5 represent the first 3 min of food presentation, respectively. Trial 6 represents the last minute of food presentation for participants who ate more than 5 g of food.

Table H3 shows mean ratings of expressed affect across Trials 1-6 for negative, neutral, and positive MI conditions. Mean ratings generally ranged between 4.0 (neutral) and 5.0 (slightly positive). Ratings were analyzed with six one-way ANOVAs. Only ANOVA of Trial 5 revealed a significant effect of MI condition, F (2, 79) = 5.51, p < .05. (See Table G10.) During the third minute of food presentation only, participants in the positive MI condition were rated as expressing significantly more positive affect than were those in the neutral and negative MI conditions, which did not differ significantly from each other (Duncan's Multiple Range Test; DMRT). ANOVA of Trials 1-4 and Trial 6 revealed no significant differences among negative, neutral, and positive MI conditions. (See Tables G6-G9 and G11.) Thus judges perceived no differences across MI conditions in participants' behavioral expressions of affect during MI procedures, during the first 2 min of food presentation, or during the last minute of food

presentation.

Table H4 shows percent agreement between participants' MI condition and judges' ratings of expressed affect. Ratings were considered to agree with MI condition if they were 1.0 - 3.75 (very to slightly negative) for the negative MI condition, 4.0 - 4.75 (neutral) for the neutral MI condition, and 5.0 - 7.0 (slightly to very positive) for the positive MI condition. Percent agreement generally ranged between 30% and 50% and was somewhat lower for the negative, than for the neutral, than for the positive MI condition.

Results of manipulation checks for MI procedures suggest that although children generated thoughts that were coincident with their MI conditions, concentrating on those thoughts may not have reliably induced mood. On the other hand, it is possible that concentrating on the thoughts induced the appropriate mood state but failed to produce visible differences in behavioral expressions of affect. Therefore, whether failure to obtain differences in judges' ratings of expressed affect corresponds with a failure to obtain effects of MI on measures of food acceptance remains to be seen.

Food Acceptance Measures

Initial acceptance. Table H5 shows mean latency to touch the target food for negative, neutral, and positive MI conditions and for familiar- and novel-appearance groups. For the novel-appearance condition, latency to first touch was slower in the negative, than in the neutral, than in the positive MI condition, and opposite that in the familiar-appearance condition. ANOVA of the data of Table H5

revealed no reliable effects for any factor. (See Table G12.)

Table H6 shows mean latency to first bite across MI and appearance conditions. Latency to first bite was longer in the novel-appearance condition than in the familiar-appearance condition, with no apparent systematic effect of MI condition. ANOVA of the data of Table H6 revealed no reliable effects for any factor. (See Table G13.)

Continued acceptance. Figure H1 shows mean latency to Bites 2-5 across MI and appearance conditions. Latencies were generally longer in the novel-appearance condition than in the familiar-appearance condition. Latencies varied unsystematically across MI conditions and across bites. A repeated measures ANOVA of the data of Figure H1 revealed no reliable effects or interactions. (See Table G14.)

Figure H2 shows mean amount eaten across MI and appearance conditions. Participants ate more in the familiar-appearance condition than in the novel-appearance condition across all MI groups. However MI had differential effects across appearance groups: In the familiar-appearance condition, participants ate more in the positive MI condition than in neutral and negative MI conditions, whereas in the novel-appearance condition, participants ate less in the positive MI condition than in neutral and negative MI conditions. ANOVA of these data revealed an effect for appearance of the food, F (1, 76) = 8.30, p < .005, and not for MI or the interaction. (See Table G15.)

Table H7 shows mean grams eaten per second across MI and appearance conditions. Participants ate faster in the familiar-appearance condition than in the novel-appearance condition.

ANOVA yielded a reliable effect for appearance of the food, F (1, 76) = 12.16, p < .001, and not for MI or the interaction. (See Table G16.)

Degree of Contact

Approximately 88% of participants (n = 72) ate at least one bite of food. One participant touched mouth to food, and nine made no contact with the food. Slightly more participants made no contact in the novel-appearance condition (14.2%; n = 6) than in the familiar-appearance condition (7.5%; n = 3). Degree of contact was not reliably related to food appearance, χ^2(2, N = 82) = 2.01; to MI condition, χ^2(4, N = 82) = 2.80; or to type of target food, χ^2(2, N = 82) = 3.67.

Identification of the Target Food

Because the child's identification of the food could influence responding, at the end of the experimental session participants were asked to identify the food. For children who received corn as the target food, the following were scored as correct identifications: corn, green corn, and corn on the cob. Incorrect responses for green corn were: peas (n = 2), pears (n = 1), green beans (n = 1), don't know (n = 4) and no answer (n = 4). For pasta, correct responses were: noodles, macaroni, macaroni and cheese, spaghetti, and spaghettios. Incorrect responses for green pasta were: green beans (n = 2), green Cheerios (n = 1), green nachos (n = 1) and don't know (n = 2).

No participant identified the target food incorrectly in the familiar-appearance condition. In the novel-appearance condition, 40.5% incorrectly identified the food. A chi-square analysis revealed

a significant difference in correct identifications between novel- and familiar-appearance conditions, $\chi^2(1, \underline{N} = 82) = 20.42$, $\underline{p} < .00001$. Correct identification was not related to MI condition, $\chi^2(2, \underline{N} = 82) = 0.55$, or to type of food, $\chi^2(1, \underline{N} = 82) = 0.29$.

It was possible that identification affected the measures of food acceptance. Because incorrect identifications only occurred in the novel-appearance condition, analyses were conducted for that condition alone. There were no significant differences between those who did and did not correctly identify the target food for amount eaten, $\underline{t}(40) = 1.05$, $\underline{p} < .15$, grams eaten per second, $\underline{t}(40) = -0.07$, $\underline{p} < .47$, latency to touch the food, $\underline{t}(40) = -1.24$, $\underline{p} < .11$, and latency to first bite, $\underline{t}(40) = -0.91$, $\underline{p} < .18$. Therefore, although participants ate reliably less and ate reliably more slowly in the novel- than in the familiar-appearance condition, these effects were seemingly unrelated to participants' inability to identify the food.

Summary

Hypothesis 1 predicted that children would display less acceptance of the novel-appearing food than of the familiar-appearing food. Results from amount eaten and rate of eating supported Hypothesis 1: Children who received a novel-colored food ate significantly less, and ate significantly more slowly, than did children who received the same food in its familiar appearance. Children were also significantly more likely to misidentify the novel-appearing food than the familiar-appearing food. These data support previous research on neophobia. The findings also indicate that food novelty was

effectively manipulated in the present study.

Hypothesis 2 predicted a main effect for MI condition, and Hypothesis 3 predicted an interaction between MI condition and food appearance. These hypotheses were not supported.

Failure to obtain reliable effects of MI condition raises the possibility that MI procedures were not efficacious. The efficacy of MI procedures was evaluated by examining judges' ratings of expressed affect. Mean ratings of expressed affect varied little across MI conditions and generally ranged between neutral and slightly positive. (See Table H3.) ANOVA of the rating data for Trials 1-6 yielded a significant effect of MI condition for Trial 5 only. Thus judges perceived no group differences in expressed affect during MI procedures, during the first 2 min of food presentation, and during the last minute of food presentation. In addition, percent agreement between MI condition and judges' ratings revealed that the two disagreed more frequently than they agreed. (See Table H4.) Thus manipulation checks failed to verify that mood was reliably manipulated.

Results of manipulation checks for MI procedures suggest that mood was not effectively manipulated by means of experimental procedures. However group assignment could plausibly be made on the basis of judges' ratings of expressed affect. Because judges' ratings on Trials 1-6 were significantly correlated with amount eaten (r = .64, .50, .39, .47, .40, and .27, respectively, all ps < .0002 except Trial 6, p < .03), it was possible that ratings of expressed affect were reliably

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related to other measures of food acceptance. Trial 1 showed the

highest interjudgmental reliability (r = .92) and coincided with the

onset of MI procedures. In addition, ratings of Trial 1 were

significantly correlated with ratings on all other trials (r = .71,

.63, .67, .54, and .56, for Trials 2-6, all ps < .0002) suggesting that

Trial 1 may be a reasonable representation of mood during the

experimental session. Therefore, participants were reassigned to mood

groups based on judges' ratings of expressed affect for Trial 1.

Specifically, participants with a rating on Trial 1 of 1.0 - 3.75

(very to slightly negative) were reassigned to the negative mood group,

those with a rating of 4.0 - 4.75 (neutral) to the neutral mood group,

and those with a rating of 5.0 - 7.0 (slightly to very positive) to the

positive mood group. These numerical divisions were selected based on

the verbal labels of the rating scale and in an attempt to minimize

unequal group sizes.

The percentage of participants who remained in their same affect

condition following reassignment from the negative (n = 29), neutral (n

= 28), and positive (n = 25) MI conditions was 38% (n = 11), 43% (n =

12), and 64% (n = 16), respectively. Overall, of the total 82

participants, more were reassigned to the positive mood group (46%; n =

38) than to the neutral (28%; n = 23) and negative (26%; n = 21) mood

groups, yielding a somewhat uneven distribution of participants across

groups. Specifically, sample sizes in the familiar-appearance

condition for negative, neutral and positive mood groups were 10, 11,

and 19, and in the novel-appearance condition were 11, 12, and 19,

respectively.

Table H8 shows mean ratings of expressed affect across Trials 1-6 for reassigned mood groups. (For comparison with the original data, see Table H3). To evaluate whether reassignment based on Trial 1 yielded consistent group differences in expressed affect, ratings of Trials 1-6 for the reassigned groups were analyzed with one-way ANOVAs. (See Tables G17-G22.) For Trials 1-5, the positive mood group was rated as expressing significantly more positive affect than was the neutral mood group, which was rated as significantly more positive than the negative mood group (DMRT). For Trial 6, the positive mood group differed significantly from neutral and negative mood groups, which did not differ significantly from each other (DMRT). Thus using Trial 1 as the criterion for reassignment yielded consistent group differences in behavioral expressions of affect throughout the experimental session.

Using ratings of expressed affect on Trial 1 as the definition of mood, analyses were repeated for the major dependent variables and for parental responses on the child's eating history.

Reanalysis

Eating History

ANOVAs (2 Appearance x 3 Mood) on the data of eating history for reassigned groups indicated no reliable differences for child's liking the target food, frequency of serving the target food, appetite, acceptance of new foods, and age. (See Tables G23-G27.) Thus the data yielded the same conclusions as those for the original randomly

assigned groups. That is, groups remained similar to each other on measures of eating history following reassignment.

Food Acceptance Measures

Initial acceptance. Table H9 shows mean latency to touch the food across mood and appearance conditions. ANOVA of these data revealed a significant effect of mood, F (2, 76) = 20.58, p < .0001, and no effects for appearance or the interaction. (See Table G28.) The negative mood group took significantly longer to touch the food than did neutral and positive mood groups, which did not significantly differ from each other (DMRT). (For comparison with the original data, see Table H5.)

Table H10 shows mean latency to first bite across mood and appearance conditions. ANOVA of these data revealed a significant effect of mood, F (2, 76) = 10.85, p < .0001, and no effects for appearance or the interaction. (See Table G29.) The negative mood group took significantly longer to take the first bite than did the neutral and positive mood groups, which did not significantly differ from each other (DMRT). (For comparison with the original data, see Table H6.)

Continued acceptance. Figure H3 shows mean latency to Bites 2-5 across mood and appearance conditions. A repeated measures ANOVA revealed reliable effects for appearance, F (1, 76) = 5.30, p < .02, and for mood, F (2, 76) = 19.81, p < .0005, and no effects for the interactions. (See Table G30.) Latencies were significantly longer in the novel-appearance condition (M = 80.90; SD = 53.20) than in the

familiar-appearance condition ($\underline{M}$ = 62.52; $\underline{SD}$ = 47.78). The negative mood group also had significantly longer latencies to Bites 2-5 ($\underline{M}$ = 121.62; $\underline{SD}$ = 49.97) than did the neutral mood group ($\underline{M}$ = 55.43; $\underline{SD}$ = 40.77) and the positive mood group ($\underline{M}$ = 54.47; $\underline{SD}$ = 38.83), which did not significantly differ from each other (DMRT). (For comparison with the original data, see Figure H1.)

Figure H4 shows mean amount eaten across mood and appearance conditions. Participants ate more in the familiar- than in the novel-appearance condition, and they ate more in the positive mood group, than in the neutral mood group, than in the negative mood group. ANOVA yielded reliable effects for appearance, $\underline{F}$ (1, 76) = 11.03, $\underline{p}$ < .001, and for mood, $\underline{F}$ (2, 76) = 34.43, $\underline{p}$ < .0001, and no effect for the interaction. (See Table G31.) Participants in the positive mood group ate reliably more than those in the neutral mood group, who ate reliably more than those in the negative mood group (DMRT). (For comparison with the original data, see Figure H2.)

Table H11 shows mean grams eaten per second across mood and appearance conditions. Participants ate faster in the familiar-appearance condition than in the novel-appearance condition. ANOVA of these data yielded a reliable effect of appearance, $\underline{F}$ (1, 76] = 15.06, $\underline{p}$ < .0001, and no effects for mood or the interaction. (See Table G32.) (For comparison with the original data, see Table H7.)

Relationship Between Parental Ratings and Amount Eaten

Parental ratings of child's appetite and amount eaten were significantly correlated in the neutral mood group ($\underline{r}$ = .50, $\underline{p}$ < .007)

but not in negative ($\underline{r}$ = .13, $\underline{p}$ < .22) or positive ($\underline{r}$ = .12, $\underline{p}$ < .31) mood groups. Presumably, the significant relationship between appetite and amount eaten that was observed in the neutral mood group was disrupted by emotional factors in negative and positive mood groups. If so, finding differential correlations across mood groups further supports the hypothesis that mood mediates responding to food.

In addition, parental rating of child's acceptance of new food was significantly correlated with amount eaten in the novel-appearance condition ($\underline{r}$ = .30, $\underline{p}$ < .03) but not in the familiar-appearance condition ($\underline{r}$ = -.01, $\underline{p}$ < .48). Thus the lower the child's rated acceptance of new food, the less eaten of a novel-appearing food but not of a familiar-appearing food. These correlations for acceptance of new food occurred for the original data and for the reassigned data.

Overall, the correlations suggest that parental ratings of children's eating habits are reasonably valid and may be used to predict and to control for individual differences in children's eating behaviors in experimental research.

<u>Summary</u>

Results of the data of the reassigned groups yielded significant effects of mood on latency to touch the food, latency to first bite, latency to Bites 2-5, and amount eaten. These results differed from the original analyses which failed to yield reliable effects of MI condition on any dependent variable. Results of the reanalysis also differed in that the reanalysis revealed a significant effect of appearance on latency to Bites 2-5. Other results were consistent

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across the two sets of analyses: Significant effects of appearance on

amount eaten and rate of eating were obtained in analyses of both

original MI conditions and reassigned mood groups.

Overview

The original results of this experiment showed that children who received a novel-appearing food ate significantly less, and ate significantly more slowly, than did children who received the same food in its familiar appearance. Children also misidentified the target food significantly more when it was novel in appearance than when it was familiar in appearance. There were no reliable effects of appearance on any latency measures or on degree of food acceptance. There were no effects for MI condition or for the interaction between MI condition and food appearance for any dependent variable.

Manipulation checks indicated that MI procedures did not reliably induce mood states. Therefore participants were reassigned to mood groups based on judges' ratings of expressed affect on Trial 1. Results for the reassigned groups indicated that children ate less, and more slowly, in the novel-appearance condition than in the familiar-appearance condition, as obtained in the original analyses. However results of the reassigned groups further indicated that children who received the novel-appearing food specifically took Bites 2-5 more slowly than did children who received the same food in its familiar appearance.

Analyses for reassigned groups also revealed significant effects of mood. Children in the negative mood group were reliably slower to touch the food, to begin eating (Bite 1), and to continue eating (Bites

2-5) than were children in the neutral and positive mood groups. The negative mood group also ate significantly less than the neutral mood group, who ate significantly less than the positive mood group. There were no effects of mood on rate of eating or on degree of food contact. Results support some but not all of the experimental hypotheses.

Hypothesis 1

Results for amount eaten and rate of eating support Hypothesis 1: Children who received a novel-colored food ate significantly less, and ate significantly more slowly, than did children who received the same food in its familiar appearance. These results are consistent with data for nonhumans which indicate suppressed intake for edibles that are novel in taste cues (e.g., Coppinger, 1969, 1970; Franchina, 1990; Morell & Turner, 1970; Wilcoxon, 1977), and novel in both taste and visual cues (e.g., Franchina & Slank, 1989; Rabinowitch, 1968; Shettleworth, 1972). Children and some adults have also been shown to consume less of novel substances than of familiar ones (e.g., Birch & Marlin, 1982; Birch et al., 1987; Hollinger & Roberts, 1929; Pliner, 1982; Smith & Ross, 1958; Walker et al., 1973). However research with children has not separated the effects of novel taste cues from the effects of novel visual cues (e.g., Beauchamp & Moran, 1984; Birch & Marlin, 1982). The present study provides the first experimental evidence that the presence of a novel visual cue alone reduces amount eaten and rate of eating in children, even when the food has a familiar taste.

Although amount eaten and rate of eating showed significant effects of food appearance, there were no effects of appearance on measures of initial acceptance (latency to touch the food; latency to first bite). Finding effects of appearance on continued but not initial acceptance may at first appear inconsistent with the telereceptive function of food cues. Presumably, telereceptive cues in the familiar-appearance condition should have signaled food familiarity, thereby promoting initial acceptance. Telereceptive cues in the novel-appearance condition should have signaled food novelty, thereby deterring initial acceptance.

Perhaps the novel-appearing food did not deter initial acceptance because participants misread the appearance of the food, failing to immediately recognize appearance as novel for that food. Based on telereceptive cues, they may have thought the green-colored food was peas, for example, and so did not hesitate to touch and taste the food relative to those who received the familiar-appearing food. This idea is consistent with finding no significant difference between novel- and familiar-appearance conditions in the degree of contact with the food. That is, both groups were equally likely to take at least one bite of food (85.8% and 92.5% for novel- and familiar-appearance conditions respectively), possibly because both groups expected the taste of a familiar food.

However after several bites, participants in the novel-appearance condition may have perceived a discrepancy between the taste of the food that was expected based on its appearance, and the taste of the

food that was actually experienced. This discrepancy may have then inhibited continued acceptance. Research on learned color-flavor associations in humans indicates that a learned association between color and taste (e.g., yellow-lemon) leads to expectations of taste based on the telereceptive cue of color. Expected taste can then stimulate or inhibit eating (e.g., Guilford & Smith, 1959; Walker et al., 1973). Moreover once eating begins, color-flavor associations alter subjective taste perceptions. For example humans provide higher preference ratings for the taste of foods that are appropriately colored relative to the same foods that are inappropriately colored (Hall, 1958). One reason color-flavor associations may alter taste perceptions is because of the discrepancy between expected and actual taste. Therefore in the present study, despite similarity in taste for novel- and familiar-appearing foods, the telereceptive function of the novel color may have caused a discrepancy between expected taste, based on color-flavor associations, and experienced taste. This discrepancy may have led to lower hedonic evaluations of the food (e.g., Hall, 1958), which subsequently deterred continued intake.

In addition, after several bites of food, the discrepancy between expected and actually experienced taste may have led participants in the novel-appearance condition to identify the food as one they had not previously experienced, that is, as novel. The perceived novelty of the food may have then deterred continued acceptance because of the aversive properties of novelty, despite the food's familiar taste, form, texture, and smell. Franchina and Slank (1989, Experiment 2)

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similarly demonstrated that a novel visual cue (red color) inhibited

intake in domestic chicks despite the presence of a familiar taste

(vinegar). In both that and the present study, participants <u>presumably</u>

ingested sufficient quantities of the novel-appearing food to detect

the familiar taste, yet the familiar taste was ineffective in

overriding the avoidance-eliciting property of the novel visual cue, as

indicated by suppressed intake.

On the other hand, the present data indicated that some

participants did indeed detect the familiar taste and/or other familiar

aspects of the novel-appearing food. More than half of participants

(59.5%) correctly identified the novel-appearing food at the end of the

experimental session. However these participants did not differ

significantly in amount eaten or rate of eating from those who

misidentified the food. These data suggest that the mere presence of

the novel color was sufficient to induce ingestional neophobia, even

among participants who recognized the food's familiar characteristics,

such as taste, form, texture, or smell, and correctly identified the

food. Thus these data indicate that a food's color is a potent

stimulus in the regulation of children's eating behavior.

Hypothesis 2

Hypothesis 2 predicted that children in the negative MI condition

would display less food acceptance than would those in the neutral MI

condition, who would display less food acceptance than those in the

positive MI condition. Original analyses failed to obtain effects of

MI condition on any measure. However results from the reassigned

groups revealed that children in the negative mood group were

significantly slower to touch the food, to taste the food (Bite 1), and

to continue eating (Bites 2-5), and that they ate reliably less, than

children in neutral and positive mood groups. Thus negative moods

deterred eating behavior, inhibiting both initial and continued contact

with the food. On the other hand positive moods facilitated eating

behavior: The positive mood group ate reliably more than did the

neutral mood group, who ate reliably more than the negative mood group.

Thus negative moods suppressed intake and positive moods enhanced

intake, relative to neutral moods.

These results represent the first experimental evidence that

negative emotions suppress eating and that positive emotions augment

eating in children. Prior clinical and experimental research has

provided only suggestive evidence that emotional state mediates eating

behavior in children. For example Hewitt and Aldrich's (1946) data

suggest that the more parents respond to food refusals with negative

emotions, the more children refuse food, but when parents eliminate

negative emotional responding, food acceptance improves. Davids and

Lawton (1961) reported evidence of early parent-child feeding conflicts

and frequent food refusals among a group of emotionally disturbed boys.

Other data indicate that family environments high in hostility,

belittling, rejection, and marital distress are associated with high

levels of food refusal, food dislikes, and eating disorders in children

(e.g., Attie & Brooks-Gunn, 1989; Birch et al. 1981; Bruch, 1973;

Hecker et al., 1986; Humphrey, 1987, 1988, 1989; Miller,

McCluskey-Fawcett, & Irving, 1993). Adult bulimics report negative

experiences specifically during childhood mealtimes (Miller et al.,

1993). Although these and other clinical data are clearly consistent

with the present findings, clinical data are often correlational,

retrospective, and based on self-report.

Experimental research has similarly provided only suggestive

evidence that the emotional context of food presentation mediates food

acceptance. In nonorganic failure-to-thrive syndrome, characterized by

food refusal and anorexia, mothers often engage in emotionally negative

feeding behaviors. However treatment programs designed to create

emotionally positive contexts result in increased food acceptance

(e.g., Ayllon et al., 1964; Iwata et al., 1982; Larson et al., 1987;

Ramsay & Zelazo, 1988; Wolf et al., 1970). In addition, presenting

food as a reward or paired with positive attention increases food

preference (Birch et al., 1980), whereas providing rewards for eating

decreases food preference (Birch et al., 1982; Birch et al., 1984;

Mikula, 1989). Birch (1987, 1990a) attributes these increases and

decreases in food preference to the food having been presented in

positive and negative social-affective contexts, respectively.

Although Birch's interpretation is consistent with the present

results, experimental research, and most clinical research, has failed

to obtain direct measures of the child's emotional state or of the

emotional context, and many studies have failed to obtain measures of

actual eating behavior (e.g., Birch et al., 1980, 1982, 1984; Davids &

Lawton, 1961; Hewitt & Aldrich, 1946; Larson et al., 1987; Mikula, 1989; Miller et al., 1993). Also in prior research, social and emotional factors have been confounded during food presentation (e.g., Birch et al., 1980, 1982, 1984; Davids & Lawton, 1961; Hewitt & Aldrich, 1946; Larson et al., 1987; Mikula, 1989; Miller et al., 1993; Ramsay & Zelazo, 1988). Therefore it is not evident from prior reports whether negative experiences specific to mealtime, such as marital distress, a hostile environment, or specific feeding strategies, play a causal role in the development of frequent food refusals and aberrant eating behavior. In particular, the role of the child's emotional state has not been clear.

The present study obtained behavioral assessments of the child's emotional state prior to and during food presentation, and obtained behavioral measures of food acceptance. Consequently, while previous data generally fail to indicate what specific aspect of the feeding context contributes to food refusal, the present study yields data that are consistent with earlier findings, yet contributes to the literature by identifying the child's emotional state as one aspect of the feeding context that mediates food refusal and acceptance.

However in the present experiment, the effect of mood on food acceptance was obtained only after children were reassigned to mood groups based on judges' ratings of behaviorally expressed affect. Because assignment to mood groups was not random, significant differences in food acceptance could reflect the effect of variables other than mood per se. Potentially the most critical confounding

variable is that of group differences in dispositional responding to novelty and mood quality. For example, uninhibited or easy temperamental children tend to approach and explore novel stimuli--adapting quickly to new foods, people, and situations, and displaying frequent positive moods. Inhibited children or those with difficult or slow-to-warm-up temperaments tend to withdraw from or adapt slowly to new stimuli--exhibiting decreased vocalizations and physical activity, and displaying frequent negative moods (e.g., Garcia-Coll, Kagan, & Reznick, 1984; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Kagan, Reznick, & Snidman, 1988; Thomas & Chess, 1977; Thomas, Chess, & Birch, 1970).

Plausibly, the present study may have contained stimuli with which some children were relatively unfamiliar (e.g., testing room, video camera). If behaviorally inhibited children displayed withdrawal and decreased physical activity in response to potentially unfamiliar stimuli, they may have received negative ratings of expressed affect and assignment to the negative mood group. If behaviorally uninhibited children responded to unfamiliar stimuli in an outgoing, sociable manner, they may have received positive ratings of expressed affect and assignment to the positive mood group. If so, inhibited, difficult, or slow-to-warm up children might be overrepresented in the negative mood group, and uninhibited, easy temperamental children might be overrepresented in the positive mood group.

If group reassignment were confounded with dispositional responding to novelty, the effect of mood on food acceptance could

reflect group differences in the display of approach versus avoidance behavior, rather than the effect of mood per se. However this confounding seems unlikely for the following reasons: An interaction between mood group and food appearance did not occur; there were no group differences in parental ratings of child's acceptance of new food or in ratings of general appetite; smiling and degree of inhibition have been found to be unrelated; easy temperamental children are high in rhythmicity; children were disproportionately assigned to mood groups from MI conditions; and participants were familiar with the experimental context.

Because children with withdrawing dispositions tend to reject new foods but not familiar ones, if behaviorally withdrawing children were reassigned to the negative mood group, an interaction between mood group and food appearance should have occurred. That is, the difference in acceptance between novel- and familiar-appearance conditions should be greater in the negative mood group than in neutral and positive mood groups. Similarly, had confounding occurred, ratings of child's acceptance of new foods should indicate reliably lower acceptance of new food in the negative mood group than in neutral and positive mood groups. One might expect similar group differences in parental ratings of child's general appetite.

Contrary to the above expectations, analyses failed to yield an interaction between mood group and food appearance for any dependent variable. There were also no reliable group differences for ratings of child's acceptance of new foods or for child's general appetite.

(Tables G25-G26.) Similarly, there were no group differences for parental ratings of child's liking the target food or frequency of serving the target food. (Tables G23-G24.) Therefore the effect of mood on food acceptance is not likely attributable to group differences in dispositional responding to new or familiar foods, to general appetite, to reduced appetite due to unfamiliar circumstances, or to liking for or familiarity with the target food. In support of using parental ratings to repudiate the likelihood of a confound, correlations between parental ratings and amount eaten suggested that parental ratings provided a valid index of children's eating behaviors.

Other data further suggest that it is unlikely that group reassignment and disposition were confounded. For example degree of inhibition has been found to be unrelated to smiling in one-on-one interactions with a female experimenter (Kagan et al., 1984). This finding questions the likelihood that children differing in degree of inhibition were systematically reassigned to mood groups. Also, easy temperamental children are rhythmic in biological function, eating approximately the same quantity of food at the same time each day (Thomas et al., 1970). Because food was offered at an irregular time in the present study (between breakfast and lunch), if easy temperamental children were overrepresented in the positive mood group, the positive mood group should have shown less food acceptance relative to neutral and negative mood groups.

Children with extreme approach versus avoidance dispositions constitute a relatively small proportion of the population

(approximately 10-15%; Kagan et al., 1984; Thomas & Chess, 1977; Thomas et al., 1970). However a continuum of less extreme individual differences might be presumed to exist. If so, because assignment to the original MI conditions was random, children differing in approach-avoidance behaviors would be equally distributed across MI conditions. Thus if confounding had occurred, each reassigned mood group should be comprised of approximately one third (33%) of participants from each of the negative, neutral, and positive MI conditions, respectively. However, 42% of the reassigned positive mood group had originally been assigned to the positive MI condition, and 52% of each of the negative and neutral mood groups had been originally assigned to those MI conditions. These percentages suggest that MI procedures may have been effective for nearly half of all participants, in which case reassignment for these participants was not likely related to dispositional traits.

Finally, participants were relatively familiar with the experimental context. For example children were generally familiar with one-on-one testing with adults, the room in which the experiment occurred, discussions of emotions, requests to count, the video camera, and the experimenter. Because children were familiar with the experimental context, children who typically display initial withdrawal from novel stimuli would not likely have displayed withdrawal in this situation. Given this, dispositionally withdrawing children would not likely, as a group, have received negative ratings of expressed affect and assignment to the negative mood group.

In sum, the effects of mood on food acceptance obtained in this study are not likely due to confounding between reassigned mood group and dispositional responding to novelty. However another potential concern is the validity of behavioral assessments of emotion. Emotion is frequently described as consisting of three primary components: overt behavior, subjective experience, and physiological processes (e.g., Lang, 1978). Judges of emotion must thus rely on skeletal-motoric responses (e.g. facial expressions and gestures) to infer the subject's internal, subjective state (e.g., Schwartz, 1982). However visually observable behaviors often do not correspond with or even accompany subjective and physiological components of emotion (e.g., Tassinary & Cacioppo, 1992). For example when Graham (1980) attempted to use Ekman and Friesen's (1978) facial action coding system, observable facial expressions were too infrequent to analyze, even though subjects' verbal responses indicated differential responding. Subsequently, Cacioppo, Petty, Losch, and Kim (1986) noted that despite a lack of perceptible facial expressions in their subjects, electromyography (EMG) indicated the presence of facial muscle action potentials. Moreover, EMG activity varied with the valence and intensity of participants' reported subjective emotional experience.

The absence of observable facial expressions in these studies (e.g., Cacioppo et al., 1986; Graham, 1980) might suggest that physiological processes underlie and are more closely related to the subjective experience of emotion than to perceptible behavioral

expressions. However given the multiple determinants of emotion, a consistent one-to-one correspondence between EMG activity and subjective emotional experience is not likely (e.g., Tassinary & Cacioppo, 1991). For example Fridlund (1991) found that during the viewing of a videotape, EMG activity varied as the social context varied, although subjective reports of emotion did not change.

Some data have in fact supported a stronger connection between physiological and behavioral components of emotion than between physiological and subjective components. Most notably, Schwartz, Weinberger and Singer (1981) found that physiological measures of emotion (e.g. heart rate and blood pressure) were better correlated with observers' judgments of emotion than with subjects' self-reported emotion. Schwartz (1982) suggests that cardiovascular and skeletal-motor behavior are more strongly connected with each other than they are connected with neuropsychological processes involved in the subjective experience of emotion. That is, because the individual is not limited to subjectively experiencing or labeling emotion on the basis of bodily cues alone, the subjective experience of emotion is more readily dissociated from cardiovascular and skeletal-motor behavior than these two processes are dissociated from each other. On the other hand, outside observers presumably attend to overall patterns of overt behavior. Thus observer ratings are more likely to coincide with underlying cardiovascular patterns than are subjects' self-reports.

Finally, research suggests that for experimentally induced and

naturally occurring emotions, subjects commonly report experiencing

multiple emotions (e.g., Polivy, 1981; Schwartz, 1982). In addition,

whereas some subjects report the subjective experience of two discrete

emotions, others report three or four emotions (e.g., Polivy, 1981).

In total, the assessment of emotion is complicated by findings which

indicate that the primary components of emotion (behavioral,

subjective, and physiological) are themselves comprised of distinct and

often uncorrelated elements, and that behaviors across the three

primary components are similarly not highly related. At this time, it

is seemingly inappropriate to assert that one measure of emotion is

better, or more valid, than another. Schwartz (1982) offers a systems

approach to the study of emotion, recommending that researchers obtain

multiple measures of emotion which reflect the various components, and

then analyzing the resulting patterns. In research specifically

designed to enhance knowledge and understanding of emotion per se, the

value of this approach cannot be disputed. However research often

necessitates a more efficient, albeit limited, but practical approach

to emotion assessment. Given the present research findings, such as

those of Schwartz et al. (1981) and others which suggest a reasonable

correspondence between observer judgments and physiological indices of

emotion, behavioral ratings of independent judges may be deemed a valid

representation of the subject's emotional state.

Although studies indicate that mood-induction procedures and

naturally occurring events typically yield multiple emotions (e.g.,

Polivy, 1981; Schwartz, 1982), Polivy suggests that in experimental

paradigms with appropriate manipulations checks (e.g., judges' ratings; self-report) it may be reasonable to conclude that positive (or negative) emotion affected the subject's behavior--with the specifically induced emotion perhaps deemed to have the stronger or primary effect. Consistent with Polivy's suggestion, the present study utilized ratings of independent judges to draw conclusions regarding the effects of positive and negative emotions on eating behavior. The findings and conclusions drawn are consistent with prior clinical and experimental research regarding the relationship between emotion and eating. Moreover, the present results are consistent with prior data that support a biphasic model of emotion (Bradley et al., 1988; Bradley et al., 1990; Brown et al., 1951; Cook et al., 1991; Davis, 1989; Ross, 1961; Simons & Zelson, 1985; Vrana & Lang, 1990; Vrana et al., 1988). According to this corpus of research, approach behaviors are enhanced during positive emotional states and inhibited during negative states, whereas avoidance behaviors are enhanced during negative emotional states and inhibited during positive states (Lang et al., 1992). Thus the current finding that negative mood suppressed food acceptance, as demonstrated by longer latencies to touch, taste, and take five bites of food, is consistent with prior research indicating that negative affect augments avoidance behavior (e.g., Cook et al., 1991). In particular, the present finding that amount of food eaten increased significantly from negative to neutral to positive moods is consistent with similar findings of a linear relationship between affective valence on the one hand, and the augmentation and inhibition of

approach-avoidance behaviors on the other (e.g., Bradely et al., 1988; Vrana et al., 1988).

Despite consistency in findings between this and prior research, empirical evidence for the biphasic model has been based on research measuring eyeblink magnitude in humans, in response to an acoustic. startle probe, while participants experienced an ongoing affective state. That is, prior support has been based on the finding that affective state mediates a defensive reflex that has been elicited by an aversive stimulus. The present study thus extends this prior research by demonstrating that affective state also mediates appetitive behavior, and mediates behaviors that are not reflexive but that are voluntarily controlled.

Hypothesis 3

Hypothesis 3 predicted an interaction between food appearance and mood. Specifically, it was hypothesized that in the novel-appearance condition, differences in food acceptance would be greater between negative and neutral MI conditions than between positive and neutral MI conditions. In the familiar-appearance condition, it was hypothesized that differences would be greater between positive and neutral MI conditions than between negative and neutral MI conditions.

Results yielded no interaction between appearance and mood for any dependent variable, in both original analyses and analysis of the reassigned groups. Failure to find differential effects of mood on acceptance of a familiar- versus novel-appearing food may be related to

the particular parameters of the variables employed in this study.

However it may be that mood mediates responding in a similar way for

foods that are presented in a variety of novel colors (e.g. pink, blue,

purple), and for foods that are novel versus familiar in other sensory

characteristics such as form, texture, or taste.

Hypothesis 4

Hypothesis 4 predicted that measures of initial food acceptance

(latency to touch the food; latency to take the first bite) and

measures of continued acceptance (latency to Bites 2-5; amount eaten;

and rate of eating) would yield similar effects of the independent

variables. Results provided mixed support for this hypothesis.

Appearance had no reliable effect on initial acceptance. However

appearance reliably affected two measures of continued acceptance in

the original analyses, and three measures of continued acceptance in

the reanalysis. Finding effects of appearance on continued but not

initial acceptance is initially counterintuitive and a detailed

explanation is offered in the discussion of Hypothesis 1. Briefly,

prior to the first bite children may have misidentified the

novel-appearing food, thus failing to recognize the food's novel

appearance. If so, novel color would not be expected to affect initial

acceptance. However after tasting the food children may have become

cognizant of the food's novelty, which then deterred continued

acceptance.

Hypothesis 4 received stronger support from the effects of mood

than from the effects of appearance. That is, in analyses of the reassigned data, mood reliably affected two measures of initial acceptance and two measures of continued acceptance. Thus mood affected both initial and continued acceptance, whereas appearance affected only continued acceptance.

Overall, differential findings for initial versus continued acceptance indicate that observed effects depend on when food acceptance is assessed within the sequence of ingestive behaviors. Moreover, the differential effects of mood and appearance on the specific dependent measures of this study indicate the value of obtaining diverse measures of eating behavior. For example appearance affected overall rate of eating but had no reliable effect on latency measures. Conversely, mood reliably affected all latency measures but had no effect on overall rate of eating. Only the dependent variable of amount eaten showed reliable effects of both appearance and mood. Thus an informative and detailed description of the eating process can be constructed by obtaining diverse, multiple measures of food acceptance throughout the sequence of ingestive behaviors.

Support for the hypothesis that emotional state mediates eating behavior in children was obtained by assessing behavioral expressions of affect prior to and during food presentation. To strengthen present conclusions, this study should be replicated with research employing alternate indices of emotional state. Although controversy exists over which physiological measures are optimum, and even whether emotional states can be differentiated with physiological measures (e.g., Obrist et al., 1982; Schwartz, 1982; Zajonc & McIntosh, 1992), potential measures include hemispheric activation, heart rate, skin resistance, blood pressure and physical movement. Regardless of the specific measures employed, obtaining multiple physiological and behavioral assessments of emotion should allow for further confirmation of the effects of emotion on children's eating behavior.

Given the lack of efficacy of reminiscence procedures in the present study, further verification of their usefulness with preschool children ought to be sought. Reminiscence procedures have been used to induce mood in preschoolers with moderate frequency, yet relatively minimal research has assessed their effectiveness. Bugental and Moore (1979) found that analyzing the voice quality of statements made during reminiscence procedures differentiated happy and sad affect-induction conditions among first, third, and fifth graders. Ridgeway and Waters (1987) obtained equivocal results with their measures of heart rate in a sample of preschool children. Following the lead of these

researchers, the voice quality of statements made by preschoolers during reminiscence procedures might be analyzed, and additional physiological measures obtained. The outcome of this research should be identification of the most effective procedures for inducing emotion in preschoolers. The reminiscence procedure is a developmentally appropriate and benign procedure for inducing affective states in children, and therefore represents a potentially useful tool for researchers studying the effects of emotion on children's behavior.

The effects of emotion on eating behavior also may be further clarified by implementing within subjects research designs. Greater control over individual differences, such as eating habits, mood quality, or dispositional responding to novelty, would be attained by utilizing the same participants in different mood groups and by presenting participants with both novel and familiar foods.

The finding that the presence of a novel color did not inhibit initial tasting but inhibited subsequent intake suggests that children may have misidentified the food and thus anticipated a taste that was different from the experienced taste. Further research is needed to determine the bases for children's visual identifications of foods, whether visual appearance indeed elicits expectations of the food's other properties, the role that expectations might play in mediating initial acceptance, and whether a discrepancy between expected and experienced taste mediates continued food acceptance.

Results also indicated that the presence of a single novel visual cue is sufficient to inhibit eating, despite the presence of numerous

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familiar food cues. What is not known is whether similar effects would be obtained for other novel visual cues (e.g. form), or for novel nonvisual cues such as smell, texture, or taste. Similarly, it is not known how novel food cues might combine to affect food acceptance. For example some children may be more accepting of a food that is novel in both taste and visual cues than of a food that is novel in only one physical property, particularly if children hold expectations regarding how the novelty/familiarity of a food's physical properties ought to covary.

Finally, failure to obtain an interaction between food novelty and mood for any dependent variable is inconsistent with the biphasic model of emotion, and with the proposal that novel foods have aversive properties that potentially elicit negative affective responding. Possibly, the expected interaction might occur if children in negative emotional states were presented with a food that was novel in taste cues.

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APPENDIX A

Informed Consent Form and Eating History

Dear Parent(s) or Guardian,

I am an instructor of Developmental Psychology at Saint Vincent College, Latrobe, PA, and am completing my dissertation requirements at Virginia Polytechnic Institute and State University. I would appreciate your permission to include your child in a project I am working on regarding eating behavior in children. I am especially interested in how parents can get their children to taste a new food.

Most parents know the frustration of trying to get their children to eat new foods. Many strategies that parents use to encourage eating may actually have the opposite effect. For example, rewarding a child for eating a food may <u>decrease</u> the child's subsequent preference for that food. On the other hand, children can be encouraged to try new foods by offering the food in a positive social atmosphere.

If you want your child to participate in this project, please sign the permission form and complete the short survey of your child's eating history, which are attached. Children who return the completed forms will be invited to play a "food and memory game" with me during regular school hours. In the game, the child will first be asked to count, or to remember things that either make the child happy or sad. Children typically report such sad events as "Santa coming without leaving presents" or "falling off my bike". If a child mentions an event that may be too distressing, I will respond in a gentle, comforting manner and direct the child to think of something else. Next the child will be offered food to eat, which will be one of the

nutritious foods listed on the attached eating history. All children

will be free to refuse food; food will not be forced upon any child.

The child will be videotaped during the session. No one will see these

tapes except myself and research assistants. After data collection,

the tapes will be erased.

Even if you give permission for your child to participate, your

child has the right to choose not to participate or to cease

participation at any time. Only trained professionals will interact

with your child, and the strictest of ethical guidelines will be

adhered to. My previous experience is that children greatly enjoy

these games and love the special attention that they receive.

Whether or not you choose to allow your child to participate, if

you have any questions regarding this project, or regarding feeding

strategies, feeding problems, and the development of healthy food

preferences, I am happy to discuss them with you. I can be reached at

Saint Vincent College: 539-9761, extension 133, or at home: 836-5784.

 This project has been approved by the Human Subjects Committees and

Institutional Review Boards at Saint Vincent College and VA Tech.

Please return the attached permission form and your child's eating

history to your child's day-care teacher as soon as possible. Detach

this letter and keep it for future reference. Thank you for your help

and cooperation.   Sincerely,

                                                Kristine Slank, M.S.

                                                Developmental Psychology

I hereby give permission for my child to participate in the project on eating behavior in children. I understand that my child may refuse to participate or may cease participation at any time. Information about my child's participation will be kept confidential. This project has been approved by the Human Subjects Committees and Institutional Review Boards at Saint Vincent College, Latrobe, PA and at Virginia Polytechnic Institute and State University, Blacksburg, VA. Information about this project may be obtained from Kristine Slank (539-9761, 836-5784), Fr. Mark Gruber (539-9761), or Dr. Joseph Franchina (703-231-5664).

Parent's Signature: _____   Date: _____

Child's Name: _____   Birthdate: _____

Days and Time (morning/afternoon) that your child attends the center:

Your completion of this questionnaire will help me identify

which foods your child generally likes and has had previous

exposure to. For each of the foods listed below, please

indicate your child's experience with that food according to

the following designations.

LIKES = my child generally accepts the food without hesitation and

appears to enjoy the food.

ACCEPTS = my child doesn't appear to have a strong liking for the food

but will often accept it, sometimes with some coaxing.

REJECTS = my child usually rejects the food, refusing to eat it.

FREQUENTLY SERVED = this food is served about once per week or more.

MODERATELY FREQUENTLY SERVED = this food is served at least once per

month

RARELY SERVED = this food has been served only one to ten times.

NEVER SERVED = my child has never been served this food.

For each food, check all categories that apply. Feel free to add

comments about your child's responses to these and other foods.

CANNED CORN   Likes ___   Frequently Served ___

                     Accepts ___   Moderately Frequently Served ___

                     Rejects ___   Rarely Served ___

                                        Never Served ___

CANNED PINEAPPLES   Likes ___   Frequently Served _____

                     Accepts ___   Moderately Frequently Served ___

                     Rejects ___   Rarely Served ___

                                        Never Served ___

CANNED PEARS   Likes ___   Frequently Served ___

                     Accepts ___   Moderately Frequently Served ___

                     Rejects ___   Rarely Served ___

                                        Never Served ___

CANNED POTATOES   Likes ___   Frequently Served ___

                         Accepts___   Moderately Frequently Served___

                         Rejects ___   Rarely Served ___

                                         Never Served ___

BOILED POTATOES   Likes ___   Frequently Served ___

                         Accepts ___   Moderately Frequently Served___

                         Rejects ___   Rarely Served ___

                                         Never Served ___

YELLOW BEANS   Likes ___   Frequently Served __

                         Accepts ___   Moderately Frequently Served___

                         Rejects ___   Rarely Served ___

                                         Never Served ___

PASTA   Likes ___   Frequently Served ___

(plain or buttered)   Accepts ___   Moderately Frequently Served___

                         Rejects _____   Rarely Served ___

                                         Never Served ___

APPLESAUCE   Likes ___   Frequently Served ___

                                 Accepts ___   Moderately Frequently Served___

                                 Rejects ___   Rarely Served ___

                                                       Never Served ___

How would you describe your child's appetite?

                                 Almost Always Good _____

                                 Usually Good _____

                                 Average _____

                                 Usually Poor _____

                                 Almost Always Poor _____

Additional Comments:

How would you describe your child's response to NEW foods?

                                 Almost Always Accepts _____

                                 Usually Accepts _____

                                 Sometimes Accepts _____

                                 Usually Refuses _____

                                 Almost Always Refuses _____

Additional Comments:

Is your child known to be allergic to any foods?   Yes ____   No ____

If yes, what foods:

Does your child have any food aversions (foods that he or she refuses

to eat)?   Yes ____   No ____

If yes, what foods:

Is your child known to be allergic to food coloring? Yes ____   No ___

Is your child known to be color blind?   Yes ____   No ___

APPENDIX B

Mood-Induction Procedures

Mood-induction procedures were modified from previous authors (e.g., Moore et al., 1973).

Mood Induction: Introduction

One of the things that I am trying learn about children like yourself are the kinds of things that make children happy and sad. Some things make us feel very very happy, some things make us feel very very sad, and some things make us feel just okay.

Positive and Negative Affect: Thought-Generation Phase

I was wondering if you could tell me two things that make you feel happy/sad. What is something that makes you feel really happy/sad? That's right, [event 1] makes you feel happy/sad. What is something else that makes you feel happy/sad? That's right, [event 2] makes you feel really happy/sad too. So far you've told me that [event 1] makes you happy/sad and that [event 2] makes you happy/sad. Which one makes you the happiest/saddest, makes you feel most happy/sad? Okay, [event] makes you feel most happy/sad.

Positive and Negative Affect: Concentration Phase

I'd like you to play a thinking game with me right now and use your imagination. Our imagination really works for us sometimes, doesn't it? I would like you to think about how happy/sad you feel when [event].

The experimenter chose the event that the participant said was most happy/sad. The experimenter then started a stopwatch and provided

verbal prompts to concentrate on the event approximately every 10 s for a total of 45 s.

Just keep thinking about how happy/sad you feel when [event]. Are you still thinking about how happy/sad you feel when [event]? Okay, just keep thinking about it; you feel really happy/sad when [event].

If a child failed to respond to the experimenter's request for an affect-related event, the experimenter offered first one event, and then a second event if necessary. Experimenter-suggested positive events were going to a birthday party, and getting presents. Experimenter-suggested negative events were falling down and hurting yourself, and when your mother or father yell at you.

Neutral Affect

One thing that makes us feel just okay is counting. I was wondering if you would count with me, very slowly, from 1 to 10. [Experimenter and child counted slowly from 1 to 10.] Okay, that is how we count slowly from 1 to 10, and counting slowly from 1 to 10 makes us feel just okay inside. Do you feel just okay inside? Let's try that again, this time counting very slowly from 1 to 10 using our fingers. [Experimenter and child counted from 1 to 10 using their fingers.] Okay, that is how we count very slowly from 1 to 10 using our fingers, and counting slowly from 1 to 10 using our fingers makes us feel just okay. Do you feel just okay inside? Not really happy, not really sad, but just okay? All right.

Throughout neutral affect-induction procedures the context remained emotionally neutral: Children were neither praised for counting (e.g. "Okay") nor were they pressured to count accurately. In previous research the counting procedure yielded effects similar to a no-treatment control group in which participants were instructed to sit quietly for 30 s. However the counting procedure controls for verbalization, cognitive effort, and interaction with the experimenter (Moore et al., 1973).

APPENDIX C

Instructions for Rating Thoughts Generated

in Negative and Positive Mood-Induction Conditions

Written on the index cards are comments from preschool-age children about the events and people in their lives. For each index card, please rate the intensity of affect that you think the child was experiencing at the time that the comment was made. Use your best guess or judgment. However, keep in mind that these are expressions of emotions as seen through a young child's eyes; what may seem moderately trivial or mundane to you may likely be experienced with greater intensity by a young child. Use the following scale:

```
   1          2           3          4          5          6          7
   I----------I-----------I----------I----------I----------I----------I
  very    moderately   slightly   neutral    slightly   moderately    very
negative   negative    negative               positive   positive   positive
```

The subject number is written in the upper left-hand corner of each card. There are two index cards for each subject, as denoted by the 1 and 2 next to the subject number. On the attached recording sheet, record the subject number (SN) and your ratings for index cards 1 and 2.

Recording Sheet

SN   Rating 1   Rating 2   Rater:_____

APPENDIX D

Instructions for Identifying Emotions in

Posed Photographs of Adult Faces*

Shuffle the cards of faces found in this packet. Then look at each face card, one by one, and choose one or two of the emotion terms listed below that you think best describes the emotion expressed in that face. List your judgments on a sheet of paper, along with the number printed on the back of each face card.

Emotion Terms

Surprise

Fear

Disgust

Contempt

Anger

Happiness

Sadness

Neutral

After you have judged each face card, check your judgments against the answer sheet (second page of the enclosed handout). Mark any judgments that are incorrect, and record the correct answer next to your judgment. For emotion blends, if you have indicated one of the two emotions, consider your judgment correct, but still record the correct blend next to your answer.

Examine your incorrect judgments. Are there any patterns? For example, did you primarily miss one or two specific emotions? Go back

through the pile and reexamine those face cards for which you had incorrect judgments, trying to identify the correct emotion as it was listed on the answer sheet.

Divide the number of face cards that you judged correctly by 54 to determine the percent correct. If the percent correct is less than 80%, shuffle the face cards and repeat the process. Do not repeat a third time.

* Photographs and modified instructions are from Ekman, P., & Friesen, W. V. (1975). Unmasking the face. Englewood Cliffs, NJ: Prentice-Hall.

APPENDIX E

Instructions for Rating Behavioral Expressions of

Affect in Pilot Videotapes of Children

Instructions for Rating Pilot Videotapes: Form A

You will see video clips of four children. For each child, there
will be three to six video clips or trials, with each trial lasting
approximately 45 seconds. There will be a pause between each trial
indicating that a new trial is about to begin. Also, prior to each new
subject you will see and hear the subject number (e.g., "Pilot subject
number 1").

Your task is to rate the emotional expression of the child in each
video clip, <u>utilizing both facial and bodily cues exhibited by the</u>
<u>child</u>. You will rate emotional expression using the form provided.

The four children that you will see on this tape are pilot
subjects. They are being used for the purpose of piloting the rating
scale and for piloting the procedures for rating emotional expressions.
Please jot down any notes regarding how the procedures and/or rating
scale might be modified in order to make the task easier and/or more
reliable, and indicate any difficulties that you may have.

On the form that is provided, record the subject number (e.g., "P
1"), the rater (your initials), and the trial number (starting with
trial number 1). For each new subject, start a new rating form. For
each video clip or trial, place a slash mark next to the category on
the form that best describes the emotional expression of the child.
<u>Continue to make a slash mark for approximately every 5 seconds of the</u>
<u>video clip</u>.

At the end of the clip, rewind the tape to the beginning of that clip. Watch the clip again, in its entirety, and then make a global rating of the child's overall expression of emotion as it best describes the child's emotion during the entirety of that video clip. You may view the video clip as many times as you feel is necessary in order to make an accurate rating of overall expression. This overall rating of emotion will be made by circling the appropriate number on a 7-point rating scale (ranging from very negative to very positive).

The overall rating of expressed emotion that you will make on the 7-point scale may or may not be consistent with your previous slash marks. It is not important that the two sets of ratings be correlated. In making your overall rating on the 7-point scale, although you may rely on both your prior slash marks and your overall perception of emotion as you view the clip in its entirety, if the two conflict, rely more on your perception of the overall expression of emotion rather than on your prior slash marks.

After rating the overall expression of emotion on the 7-point scale, go back and tally your slashes for each emotion category.

Once you begin to view a new video clip or trial, do not go back and review previously viewed video clips, and do not change your ratings for previous trials. To the best of your ability, rate each video clip independent from all others. That is, do not allow your rating of one video clip to influence your rating of any subsequent video clip.

Note that you may find this a difficult task at first. At times
the child may appear to be expressionless, may be turned away from the
camera, may have his or her hands over the face, or be talking rapidly.
However with practice, the task should become easier. Most important,
note that there are no right or wrong answers. Rather, your judgments
should be based on emotional expressions <u>as you perceive them</u>. You
must, however, take the task seriously, making every effort to follow
the instructions outlined above and producing judgments that are
accurate <u>based on your perceptions</u>.

<u>GUIDELINES FOR INTERPRETING EMOTION CATEGORIES</u>

NEUTRAL: Any time that the child's expression suggests neither a
   positive or negative affective quality, the neutral category should
   be marked.

SLIGHTLY POSITIVE/SLIGHTLY NEGATIVE: Reserve these categories for those
   emotional expressions that suggest only the slightest hint of a
   positive or negative affective expression. For these categories,
   the emotional expression may be very subtle and hardly discernible.

POSITIVE/NEGATIVE: A mark in one of these categories would indicate
   that a positive or negative affective quality is definitely
   discernible.

VERY POSITIVE/VERY NEGATIVE: A mark in one of these categories
   indicates that the expression of emotion is moderately to strongly
   present.

Form A

Subject # _____

Trial # _____   Rater _____

          Neutral _____

Slightly Neg. _____   Slightly Pos. _____

Negative _____   Positive _____

Very Neg. _____   Very Pos. _____

Rate the predominant quality of emotion expressed in this video clip:

1   2   3   4   5   6   7

+----------+----------+----------+----------+----------+----------+

Very   Negative Slightly   Neutral   Slightly   Positive   Very

Negative   Neg.   Pos.   Positive

Instructions for Rating Pilot Videotapes: Form B

    You will see video clips of four children. For each child, there

will be three to six video clips or trials, with each trial lasting

approximately 45 seconds. There will be a pause between each trial

indicating that a new trial is about to begin. Also, prior to each new

subject you will see and hear the subject number (e.g., "Pilot subject

number 1").

    Your task is to rate the emotional expression of the child in each

video clip, utilizing both facial and bodily cues exhibited by the

child. You will rate emotional expression using the form provided.

    The four children that you will see on this tape are pilot

subjects. They are being used for the purpose of piloting the rating

scale and for piloting the procedures for rating emotional expressions.

 Please jot down any notes regarding how the procedures and/or rating

scale might be modified in order to make the task easier and/or more

reliable, and indicate any difficulties that you may have.

    On the form that is provided, record the subject number (e.g., "P

1"), the rater (your initials), and the trial number (starting with

trial number 1). For each new subject, start a new rating form. For

each video clip or trial, whenever you see one of the emotional

expressions which is listed on the rating sheet, check that emotion (or

use a slash mark). At times, the expression of a particular emotion

may seem very mild or subtle; nonetheless, if you think that you

perceive even a slight expression of an emotion, then that emotion category should be checked. If an emotional expression continues to be maintained by the child, continue to check that emotion category once for every 5 second interval. You may also check 2 or more categories at a time. For example, if a child is smiling and demonstrating interest, you should check both the categories of happiness and interest. If a child is looking both sad and fearful, both of those categories should be checked.

You may review any individual video clip or trial as many times as you feel is necessary in order to make accurate ratings. However, once you begin to view a new video clip/trial, do not go back and review previously viewed video clips, and do not change your ratings for previous trials. To the best of your ability, rate each video clip independent from all others. That is, do not allow your rating of one video clip to influence your rating of any subsequent video clip.

After providing a check or slash mark for each expressed emotion within a given video clip, rewind the tape to the beginning of that clip. Watch the clip again, in its entirety, and then make a global rating of the child's overall expression of emotion as it best describes the child's emotion during the entirety of that video clip. You may view the video clip as many times as you feel is necessary in order to make an accurate rating of overall expression. This overall rating of emotion will be made by circling the appropriate number on a 7-point rating scale (ranging from very negative to very positive).

The overall rating of expressed emotion that you will make on the 7-point scale may or may not be consistent with your previous check marks for individual expressions of emotion. It is not important that the two sets of ratings be correlated. In making your overall rating on the 7-point scale, although you may rely on both your previous check marks and your perception of overall emotion as you view the clip in its entirety, if the two conflict, <u>rely more on your perception of the overall expression of emotion</u> rather than on your prior check marks.

After rating the overall expression of emotion on the 7-point scale, go back and tally your check marks/slashes for each emotion category.

Note that you may find this a difficult task at first. At times the child may appear to be expressionless, may be turned away from the camera, may have his or her hands over the face, or be talking rapidly. However, with practice, the task should become easier. Most importantly, note that there are no right or wrong answers. Rather, your judgments should be based on emotional expressions <u>as you perceive them</u>. You must, however, take the task seriously, making every effort to follow the instructions outlined above and producing judgments that are accurate <u>based on your perceptions</u>.

Form B

HAPPINESS _____

SURPRISE _____

FEAR _____

SADNESS _____

ANGER _____

DISGUST _____

INTEREST _____

Rate the predominant quality of emotion expressed in the video clip:

1	2	3	4	5	6	7

+----------+----------+----------+----------+----------+----------+

Very	Moderately	Slightly	Neutral	Slightly	Moderately	Very
Negative	Neg.	Neg.		Pos.	Pos.	Positive

APPENDIX F

Instructions for Rating Behavioral Expressions of

Affect in Videotapes of Children

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Instructions for Rating Behavioral Expressions of Emotion

You will be viewing video clips of children, each clip being approximately 45 seconds long. Video clips will be presented in the absence of the tape's audio component. In most cases there will be 6 video clips for each child; for some children there will be only 4 or 5 video clips. Following all video clips for a given child, a new subject number will appear on the screen, indicating that the subsequent video clips pertain to the next subject and that you should begin a new rating sheet.

Your task is to judge the emotional expression of the child in each video clip, utilizing both facial and bodily cues exhibited by the child. That is, for each trial (or video clip), place a slash mark next to the category on the form that best describes the emotional expression of the child at that moment. Continue to make a slash mark for approximately every 5 seconds of the video clip.

At the end of the clip, rewind the tape to the beginning of that clip. Watch the clip again, in its entirety, and then make a global rating of the child's <u>overall expression</u> of emotion as it best describes the emotion during the entirety of the video clip. This overall rating of emotion will be made by circling the appropriate number on a 7-point rating scale ranging from very negative to very positive. You may also make a rating by marking between two numbers on the 7-point scale (e.g., 1.5, 2.5, 3.5, etc.). You may view the video

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clip as many times as you feel is necessary in order to make an accurate rating of overall expression of emotion. However, once you begin to view a new video clip, do not go back and review previously viewed video clips, and do not change your ratings for previous clips. To the best of your ability, rate each video clip independent from all others. That is, do not allow your rating of one video clip to influence your rating of any subsequent video clip.

The overall rating of expressed emotion that you will make on the 7-point scale may or may not be consistent with your previous slash marks. It is not important that the two sets of ratings be correlated. In making your overall rating on the 7-point scale, although you may rely on both your prior slash marks and your overall perception of emotion as you view the clip in its entirety, if the two conflict, <u>rely more on your perception of the overall expression of emotion</u> rather than on your prior slash marks. After rating the overall expression of emotion on the 7-point scale, go back and tally your slashes for each emotion category.

There are no right or wrong answers. Rather, your judgments should be based on emotional expressions <u>as you perceive them</u>. However, you should make every effort to follow the instructions outlined above, and to produce judgments that are accurate based on your perceptions.

Trial # _____   Rater _____

Neutral _____

Slightly Neg. _____   Slightly Pos. _____

Negative _____   Positive _____

Very Neg. _____   Very Pos. _____

Rate the predominant quality of emotion expressed in this video clip:

1   2   3   4   5   6   7

+----------+-----------+----------+-----------+----------+------------+

Very   Negative   Slightly   Neutral   Slightly   Positive   Very

Negative   Neg.   Pos.   Positive

APPENDIX G

ANOVA Tables and Means for Main Effects

Table G1

Analysis of Variance for Parental Ratings of Child's Liking the Target

Food

Source	df	SS	F
Mood Induction (MI)	2	0.07	< 1
Negative $\underline{M}$ = 2.90			
Neutral $\underline{M}$ = 2.89			
Positive $\underline{M}$ = 2.83			
Appearance (AP)	1	0.07	< 1
Familiar $\underline{M}$ = 2.84			
Novel $\underline{M}$ = 2.90			
MI x AP	2	0.32	1.44
Error	74	8.27	

Table G2

Analysis of Variance for Frequency of Serving the Target Food

Source	df	SS	F
Mood Induction (MI)	2	0.25	< 1
Negative M = 3.63			
Neutral M = 3.52			
Positive M = 3.50			
Appearance (AP)	1	0.64	1.73
Familiar M = 3.45			
Novel M = 3.65			
MI x AP	2	0.50	< 1
Error	64	23.86	

Table G3

Analysis of Variance for Parental Ratings of Child's Appetite

Source	df	SS	F
Mood Induction (MI)	2	0.10	< 1
Negative $\underline{M}$ = 3.72			
Neutral $\underline{M}$ = 3.68			
Positive $\underline{M}$ = 3.79			
Appearance (AP)	1	2.12	1.85
Familiar $\underline{M}$ = 3.90			
Novel $\underline{M}$ = 3.57			
MI x AP	2	2.11	< 1
Error	75	85.63	

Table G4

Analysis of Variance for Parental Ratings of Child's Acceptance of New

Foods

Source	df	SS	F
Mood Induction (MI)	2	0.32	< 1
Negative $\underline{M}$ = 3.38			
Neutral $\underline{M}$ = 3.39			
Positive $\underline{M}$ = 3.25			
Appearance (AP)	1	0.01	< 1
Familiar $\underline{M}$ = 3.36			
Novel $\underline{M}$ = 3.33			
MI x AP	2	0.55	< 1
Error	75	69.44	

Table G5

Analysis of Variance for Age (mo)

Source	df	SS	F
Mood Induction (MI)	2	260.33	1.67
Negative $\underline{M}$ = 54.83			
Neutral $\underline{M}$ = 52.68			
Positive $\underline{M}$ = 57.04			
Appearance (AP)	1	40.25	< 1
Familiar $\underline{M}$ = 54.22			
Novel $\underline{M}$ = 55.29			
MI x AP	2	192.87	1.24
Error	76	5919.94	

Table G6

Analysis of Variance for Ratings of Expressed Affect for Trial 1

Source	df	SS	F
Mood Induction (MI)	2	5.88	2.38
Negative $\underline{M}$ = 4.43			
Neutral $\underline{M}$ = 4.58			
Positive $\underline{M}$ = 5.07			
Error	79	103.44	

Table G7

Analysis of Variance for Ratings of Expressed Affect for Trial 2

Source	df	SS	F
Mood Induction (MI)	1	2.69	2.50
Negative $\underline{M}$ = 4.72			
Positive $\underline{M}$ = 5.18			
Error	51	57.67	

Table G8

Analysis of Variance for Ratings of Expressed Affect for Trial 3

Source	df	SS	F
Mood Induction (MI)	2	5.59	2.02
Negative $\underline{M}$ = 4.25			
Neutral $\underline{M}$ = 4.38			
Positive $\underline{M}$ = 4.87			
Error	79	109.45	

Table G9

Analysis of Variance for Ratings of Expressed Affect for Trial 4

Source	df	SS	F
Mood Induction (MI)	2	6.17	2.91
Negative $M = 4.11$			
Neutral $M = 4.01$			
Positive $M = 4.65$			
Error	79	83.63	

Table G10

Analysis of Variance for Ratings of Expressed Affect for Trial 5

Source	df	SS	F
Mood Induction (MI)	2	11.41	5.51*
Negative $\underline{M}$ = 4.19			
Neutral $\underline{M}$ = 4.11			
Positive $\underline{M}$ = 4.96			
Error	79	81.87	

*p < .006.

Table G11

Analysis of Variance for Ratings of Expressed Affect for Trial 6

Source	df	SS	F
Mood Induction (MI)	2	4.96	< 1
Negative $\underline{M}$ = 4.37			
Neutral $\underline{M}$ = 4.41			
Positive $\underline{M}$ = 4.98			
Error	63	66.66	

Table G12

Analysis of Variance for Latency (s) to Touch the Target Food

Source	df	SS	F
Mood Induction (MI)	2	65.86	< 1
Negative M = 12.62			
Neutral M = 10.93			
Positive M = 10.56			
Appearance (AP)	1	5.25	< 1
Familiar M = 11.02			
Novel M = 11.79			
MI x AP	2	276.71	< 1
Error	76	17173.07	

Table G13

Analysis of Variance for Latency (s) to First Bite

Source	df	SS	F
Mood Induction (MI)	2	32.40	< 1
Negative $\underline{M}$ = 14.90			
Neutral $\underline{M}$ = 16.18			
Positive $\underline{M}$ = 16.24			
Appearance (AP)	1	476.32	2.01
Familiar $\underline{M}$ = 13.25			
Novel $\underline{M}$ = 18.12			
MI x AP	2	62.05	< 1
Error	76	17998.27	

Table G14

Analysis of Variance for Latency (s) to Bites 2-5

Source	df	SS	F
Mood Induction (MI)	2	841.88	< 1
Negative $\underline{M}$ = 65.93			
Neutral $\underline{M}$ = 70.39			
Positive $\underline{M}$ = 80.64			
Appearance (AP)	1	1771.52	2.69
Familiar $\underline{M}$ = 62.52			
Novel $\underline{M}$ = 80.90			
MI x AP	2	373.76	< 1
Error	76	50055.54	
Bite (B)	3	17.55	< 1
Bite 2 $\underline{M}$ = 18.15			
Bite 3 $\underline{M}$ = 17.94			
Bite 4 $\underline{M}$ = 18.21			
Bite 5 $\underline{M}$ = 17.65			
B x MI	6	352.85	< 1
B x AP	3	113.96	< 1
B x MI x AP	6	837.79	2.05
Error	228	15512.23	

Table G15

Analysis of Variance for Amount (g) Eaten

Source	df	SS	F
Mood Induction (MI)	2	34.52	< 1
Negative $\underline{M}$ = 34.72			
Neutral $\underline{M}$ = 35.89			
Positive $\underline{M}$ = 35.68			
Appearance (AP)	1	7938.44	8.30*
Familiar $\underline{M}$ = 45.10			
Novel $\underline{M}$ = 26.19			
MI x AP	2	3429.94	1.79
Error	76	72663.03	

*$\underline{p}$ < .005.

Table G16

Analysis of Variance for Grams Eaten per Second

Source	df	SS	F
Mood Induction (MI)	2	0.001	< 1
Negative $\underline{M}$ = 0.081			
Neutral $\underline{M}$ = 0.087			
Positive $\underline{M}$ = 0.080			
Appearance (AP)	1	0.059	12.16*
Familiar $\underline{M}$ = 0.110			
Novel $\underline{M}$ = 0.056			
MI x AP	2	0.002	< 1
Error	76	0.372	

*$\underline{p}$ < .001.

Table G17

Analysis of Variance for Ratings of Expressed Affect for Trial 1 Based

on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	83.11	161.52*
Negative $\underline{M}$ = 3.26			
Neutral $\underline{M}$ = 4.31			
Positive $\underline{M}$ = 5.68			
Error	79	20.32	

*$\underline{p}$ < .00005.

Table G18

Analysis of Variance for Ratings of Expressed Affect for Trial 2 Based
on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	33.68	35.10*
Negative M = 3.73			
Neutral M = 4.87			
Positive M = 5.59			
Error	52	23.99	

*p < .00005.

Table G19

Analysis of Variance for Ratings of Expressed Affect for Trial 3 Based

on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	45.50	25.84*
Negative $\underline{M}$ = 3.30			
Neutral $\underline{M}$ = 4.50			
Positive $\underline{M}$ = 5.13			
Error	79	69.54	

*$\underline{p}$ < .00005.

Table G20

Analysis of Variance for Ratings of Expressed Affect for Trial 4 Based
on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	41.37	33.74*
Negative $\underline{M}$ = 3.07			
Neutral $\underline{M}$ = 4.37			
Positive $\underline{M}$ = 4.81			
Error	79	48.43	

*$\underline{p}$ < .00005.

Table G21

Analysis of Variance for Ratings of Expressed Affect for Trial 5 Based

on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	35.28	24.02*
Negative $\underline{M}$ = 3.44			
Neutral $\underline{M}$ = 4.21			
Positive $\underline{M}$ = 5.03			
Error	79	58.00	

*$\underline{p}$ < .00005.

Table G22

Analysis of Variance for Ratings of Expressed Affect for Trial 6 Based

on Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	19.42	11.36*
Negative $\underline{M}$ = 3.60			
Neutral $\underline{M}$ = 4.24			
Positive $\underline{M}$ = 5.02			
Error	67	57.26	

*$\underline{p}$ < .0001.

Table G23

Analysis of Variance for Liking for the Target Food for Reassigned Mood
Groups

Source	df	SS	F
Mood (M)	2	0.10	< 1
Negative $\underline{M}$ = 2.90			
Neutral $\underline{M}$ = 2.83			
Positive $\underline{M}$ = 2.89			
Appearance (A)	1	0.03	< 1
Familiar $\underline{M}$ = 2.84			
Novel $\underline{M}$ = 2.90			
M x A	2	0.41	1.86
Error	74	8.18	

Table G24

Analysis of Variance for Frequency of Serving the Target Food for

Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	0.07	< 1
Negative $\underline{M}$ = 3.58			
Neutral $\underline{M}$ = 3.60			
Positive $\underline{M}$ = 3.52			
Appearance (A)	1	0.47	1.24
Familiar $\underline{M}$ = 3.45			
Novel $\underline{M}$ = 3.65			
M x A	2	0.15	< 1
Error	64	24.40	

Table G25

Analysis of Variance for Parental Ratings of Child's Appetite for

Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	1.86	< 1
Negative $\underline{M}$ = 3.65			
Neutral $\underline{M}$ = 3.96			
Positive $\underline{M}$ = 3.63			
Appearance (A)	1	2.92	2.65
Familiar $\underline{M}$ = 3.90			
Novel $\underline{M}$ = 3.57			
M x A	2	3.32	1.50
Error	75	82.85	

Table G26

Analysis of Variance for Parental Ratings of Child's Acceptance of New

Foods for Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	0.76	< 1
$\quad$ Negative $\underline{M}$ = 3.20			
$\quad$ Neutral $\underline{M}$ = 3.30			
$\quad$ Positive $\underline{M}$ = 3.45			
Appearance (A)	1	0.34	< 1
$\quad$ Familiar $\underline{M}$ = 3.36			
$\quad$ Novel $\underline{M}$ = 3.33			
M x A	2	4.74	2.75
Error	75	64.72	

Table G27

Analysis of Variance for Age (mo) for Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	56.80	< 1
Negative $\underline{M}$ = 56.05			
Neutral $\underline{M}$ = 54.96			
Positive $\underline{M}$ = 53.95			
Appearance (A)	1	66.45	< 1
Familiar $\underline{M}$ = 54.22			
Novel $\underline{M}$ = 55.29			
M x A	2	269.77	1.70
Error	76	6042.50	

Table G28

Analysis of Variance for Latency (s) to Touch the Target Food for

Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	6031.68	20.58*
Negative $\underline{M}$ = 25.90			
Neutral $\underline{M}$ = 4.48			
Positive $\underline{M}$ = 7.61			
Appearance (A)	1	48.40	< 1
Familiar $\underline{M}$ = 11.02			
Novel $\underline{M}$ = 11.79			
M x A	2	315.37	1.08
Error	76	11138.45	

*$\underline{p}$ < .0005.

Table G29

Analysis of Variance for Latency (s) to First Bite for Reassigned Mood

Groups

Source	df	SS	F
Mood (M)	2	3910.21	10.85*
Negative $\underline{M}$ = 27.52			
Neutral $\underline{M}$ = 11.48			
Positive $\underline{M}$ = 11.82			
Appearance (A)	1	616.35	3.42
Familiar $\underline{M}$ = 13.25			
Novel $\underline{M}$ = 18.12			
M x A	2	522.50	1.45
Error	76	13690.13	

*$\underline{p}$ < .0005.

Table G30

Analysis of Variance for Latency (s) to Bites 2-5 for Reassigned Mood

Groups

Source	df	SS	F
Mood (M)	2	17030.42	19.81**
Negative $\underline{M}$ = 121.62			
Neutral $\underline{M}$ = 55.43			
Positive $\underline{M}$ = 54.47			
Appearance (A)	1	2279.38	5.30*
Familiar $\underline{M}$ = 62.52			
Novel $\underline{M}$ = 80.90			
M x A	2	1330.16	1.55
Error	76	32663.85	
Bite (B)	3	6.73	< 1
Bite 2 $\underline{M}$ = 18.15			
Bite 3 $\underline{M}$ = 17.94			
Bite 4 $\underline{M}$ = 18.21			
Bite 5 $\underline{M}$ = 17.65			
B x M	6	607.85	1.46
B x A	3	35.25	< 1
B x M x A	6	236.81	< 1
Error	228	15862.64	

**p < .0005. *$\underline{p}$ < .02.

Table G31

Analysis of Variance for Amount (g) Eaten for Reassigned Mood Groups

Source	df	SS	F
Mood (M)	2	35620.45	34.43**
Negative $\underline{M}$ = 5.24			
Neutral $\underline{M}$ = 29.13			
Positive $\underline{M}$ = 55.89			
Appearance (A)	1	5708.85	11.03*
Familiar $\underline{M}$ = 45.10			
Novel $\underline{M}$ = 26.19			
M x A	2	756.19	1.46
Error	76	517.34	

*$\underline{p}$ < .001. **$\underline{p}$ < .0005.

Table G32

Analysis of Variance for Grams Eaten per Second for Reassigned Mood

Groups

Source	df	SS	F
Mood (M)	2	0.001	< 1
Negative $\underline{M}$ = 0.076			
Neutral $\underline{M}$ = 0.083			
Positive $\underline{M}$ = 0.086			
Appearance (A)	1	0.071	15.06*
Familiar $\underline{M}$ = 0.110			
Novel $\underline{M}$ = 0.056			
M x A	2	0.017	1.81
Error	76	0.357	

*$\underline{p}$ < .0005.

APPENDIX H

Tables and Figures

Table H1

Means (SDs) of Parental Reports for Liking and Frequency of Serving The

Target Food

	Familiar Appearance			Novel Appearance		
	Mood-Induction Condition					
	Negative	Neutral	Positive	Negative	Neutral	Positive
Liking	2.93	2.77	2.82	2.87	3.00	2.83
	(0.27)	(0.44)	(0.40)	(0.35)	(0.00)	(0.39)
Frequency	3.46	3.55	3.33	3.79	3.50	3.64
	(0.52)	(0.69)	(1.00)	(0.43)	(0.52)	(0.50)

Table H2

Judges' Mean (SD) Ratings of the Emotional Content of Thoughts

Generated During Mood-Induction Procedures

	Mood-Induction Condition	
	Negative	Positive
Thought 1	2.24	5.06
	(0.82)	(0.79)
Thought 2	2.45	5.48
	(0.70)	(0.88)

Note: 1 = very negative; 7 = very positive.

Table H3

Mean (SD) Ratings of Expressed Affect for Trials 1-6

	Mood-Induction Condition		
Trial	Negative	Neutral	Positive
Trial 1	4.43	4.58	5.07
(Thought Generation)	(1.25)	(0.98	(1.08)
Trial 2	4.72		5.18
(Thought Concentration)	(1.16)	*	(0.87)
Trial 3	4.25	4.38	4.87
(Min 1 of Food Presentation)	(1.35)	(1.07)	(1.07)
Trial 4	4.11	4.01	4.65
(Min 2 of Food Presentation)	(1.19)	(0.83)	(1.02)
Trial 5	4.19	4.11	4.96
(Min 3 of Food Presentation)	(1.20)	(0.91)	(0.89)
Trial 6	4.37	4.41	4.99
(Last Min of Food Presentation)	(1.25)	(0.79)	(0.99)

Note: 1 = very negative; 7 = very positive.

Table H4

Percent Agreement Between Mood-Induction (MI) Condition and Judges'

Ratings of Expressed Affect for Trials 1-6

| | | | Trial | | | |
MI Condition	1	2	3	4	5	6
Negative	37.9	24.1	34.5	34.5	31.0	37.5
Neutral	39.3	*	46.4	53.6	46.4	30.4
Positive	60.0	75.0	48.0	36.0	52.0	47.8

Table H5

Mean (SD) Latency in Seconds to Touch the Target Food

	Mood-Induction Condition		
Food Appearance	Negative	Neutral	Positive
Familiar	10.14	10.38	12.61
	(11.36)	(16.90)	(16.53)
Novel	14.93	11.40	8.33
	(17.26)	(14.69)	(12.05)

Table H6

Mean (SD) Latency in Seconds to First Bite

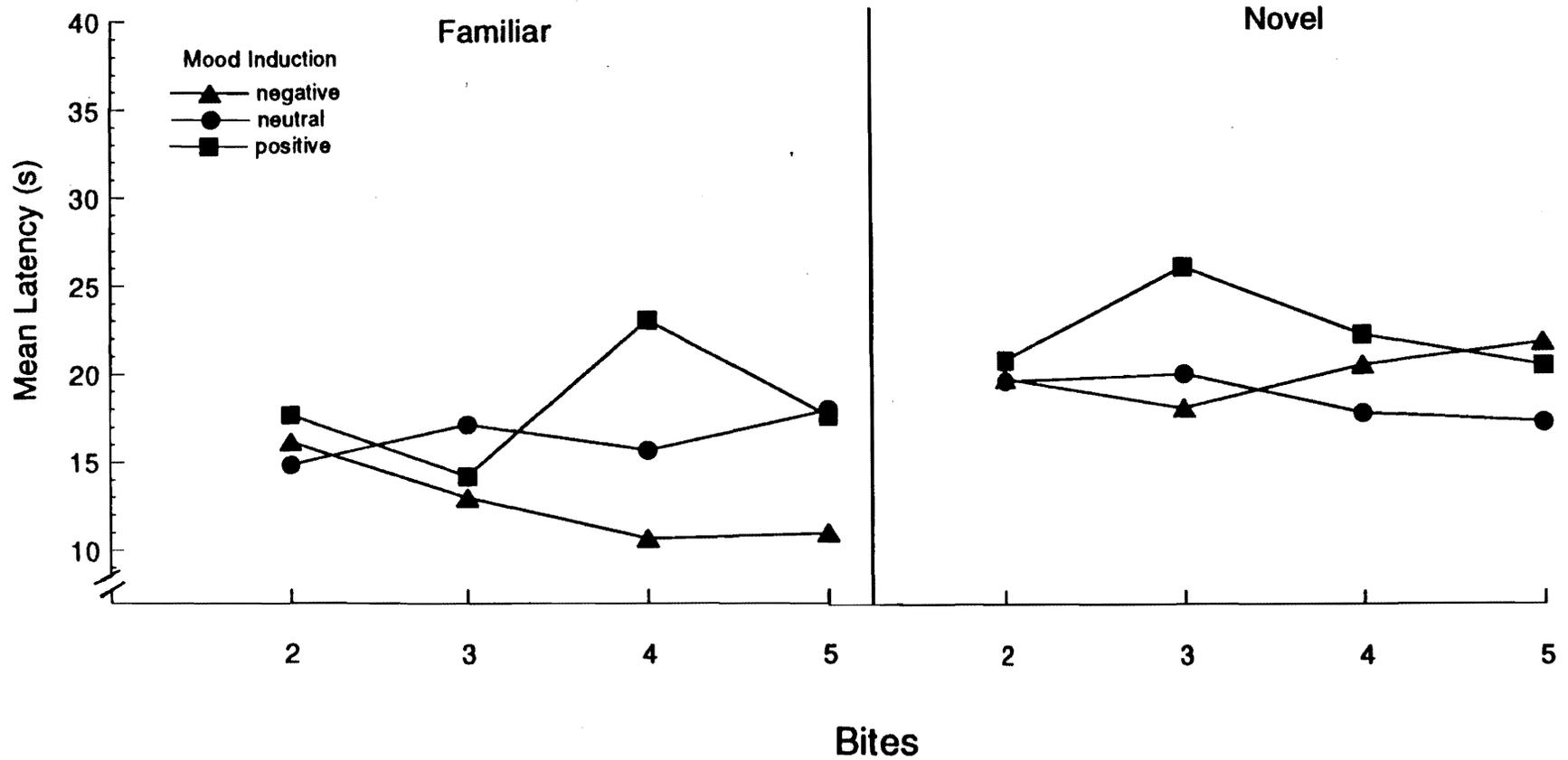| Food Appearance	Mood-Induction Condition		
	Negative	Neutral	Positive
Familiar	12.71	12.31	14.77
	(10.90)	(15.88)	(16.17)
Novel	16.93	19.53	17.83
	(15.93)	(17.50)	(14.97)

Figure H1. Mean latency (s) to Bites 2-5 in familiar- and novel-appearance conditions as a function of mood-induction condition.
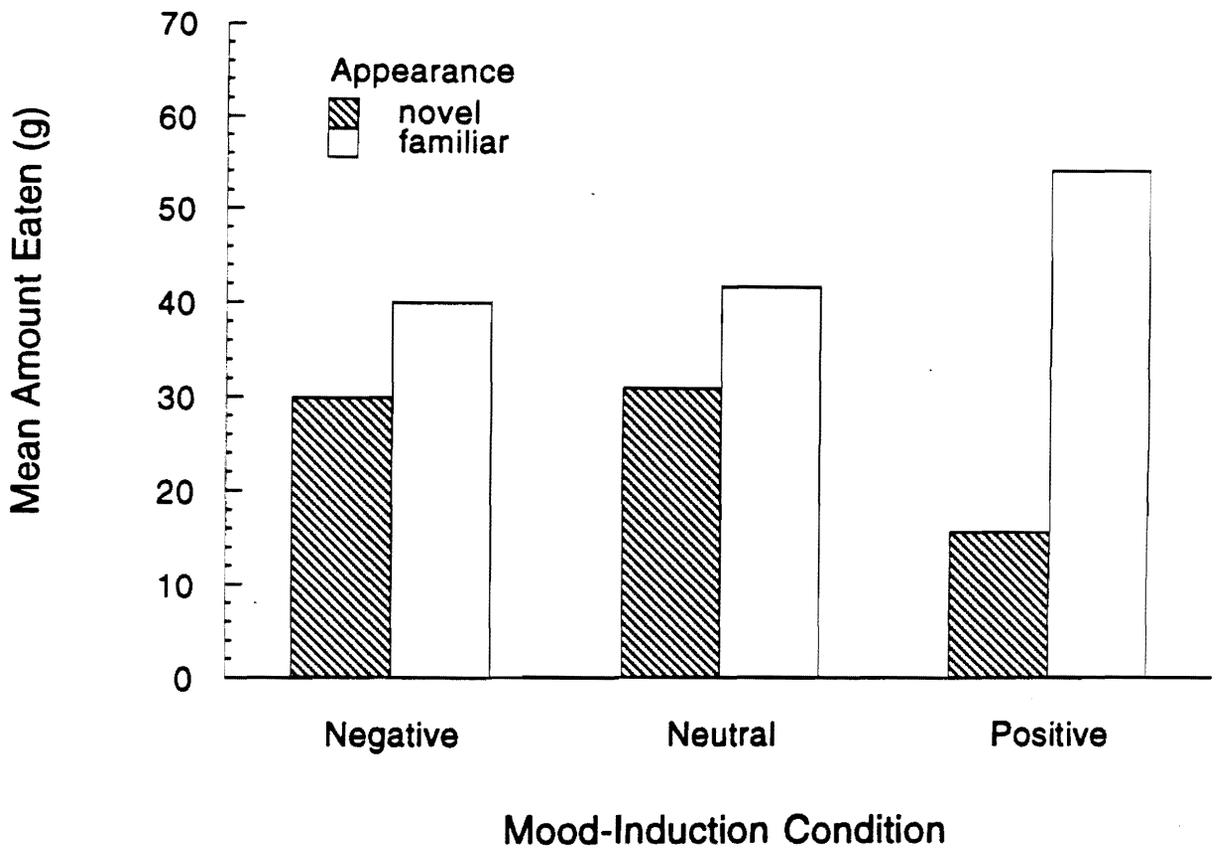
Figure H2. Mean amount of food eaten in novel- and familiar-appearance conditions
as a function of negative, neutral, and positive mood-induction conditions.

Table H7

Mean (SD) Amount Eaten per Second (q/s)

	Mood-Induction Condition		
Food Appearance	Negative	Neutral	Positive
Familiar	0.108	0.110	0.111
	(0.117)	(0.080)	(0.072)
Novel	0.055	0.066	0.046
	(0.035)	(0.043)	(0.034)

Table H8

Mean (SD) Ratings of Expressed Affect for Trials 1-6 for Reassigned

Groups

		Mood	
Trial	Negative	Neutral	Positive
Trial 1	3.26	4.31	5.68
(Thought Generation)	(0.36)	(0.41)	(0.61)
Trial 2	3.73	4.87	5.59
(Thought Concentration)	(0.76)	(0.78)	(0.62)
Trial 3	3.30	4.50	5.13
(Min 1 of Food Presentation)	(1.15)	(0.81)	(0.88)
Trial 4	3.07	4.37	4.81
(Min 2 of Food Presentation)	(0.87)	(0.71)	(0.77)
Trial 5	3.44	4.21	5.03
(Min 3 of Food Presentation)	(1.02)	(0.68)	(0.85)
Trial 6	3.60	4.24	5.02
(Last Min of Food Presentation)	(0.89)	(0.89)	(0.95)

Note: 1 = very negative; 7 = very positive.

Table H9

Mean (SD) Latency in Seconds to Touch the Target Food for Reassigned

Groups

	Mood		
Food Appearance	Negative	Neutral	Positive
Familiar	23.90	2.09	9.42
	(17.46)	(1.76)	(13.07)
Novel	27.73	6.67	5.79
	(16.47)	(8.74)	(9.82)

Table H10

Mean (SD) Latency in Seconds to First Bite for Reassigned Groups

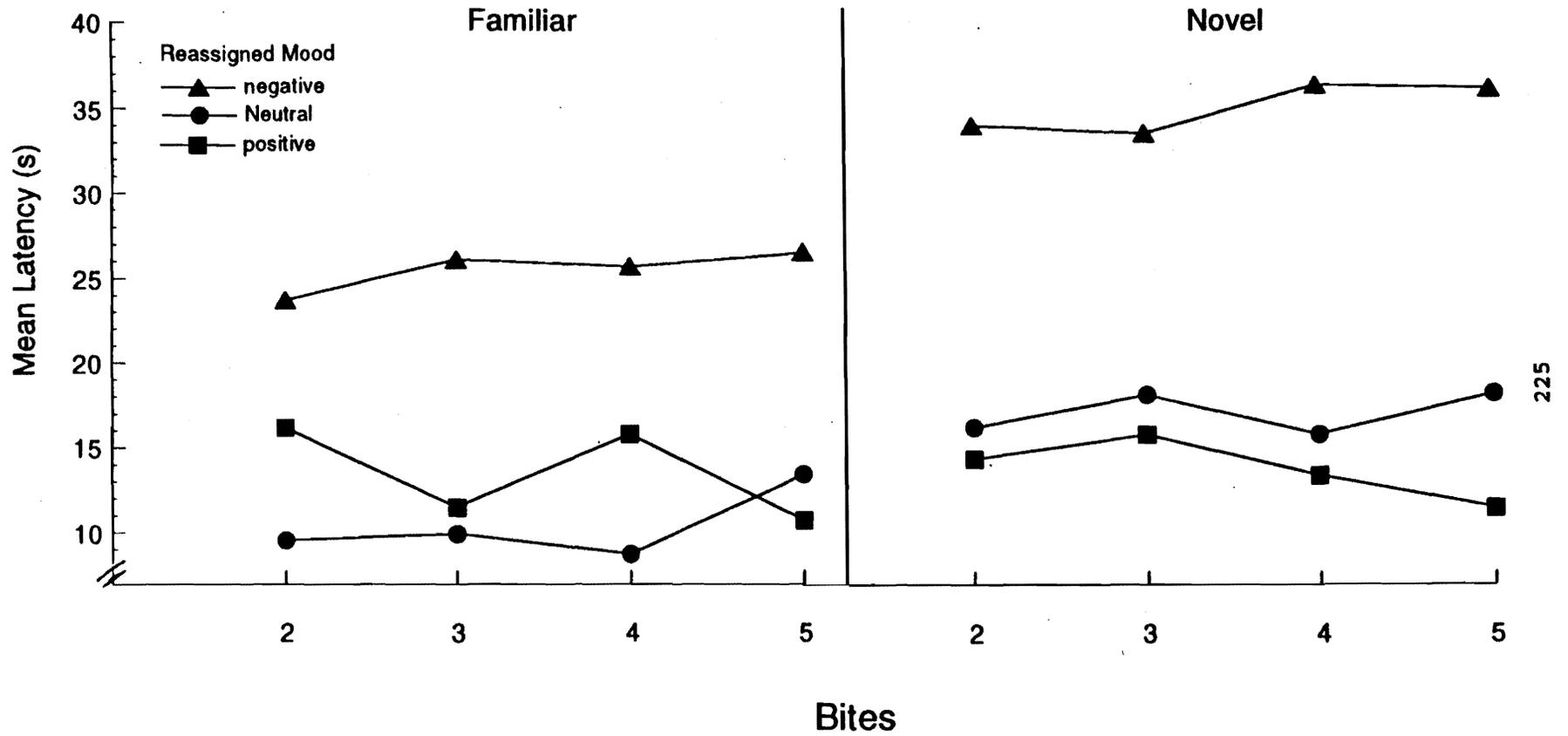|	Mood		
Food Appearance	Negative	Neutral	Positive
Familiar	25.10	5.09	11.74
	(16.23)	(2.55)	(13.20)
Novel	29.73	17.33	11.89
	(15.48)	(14.32)	(13.88)

Figure H3. Mean latency (s) to Bites 2-5 in familiar- and novel-appearance conditions as a function of reassigned mood groups.
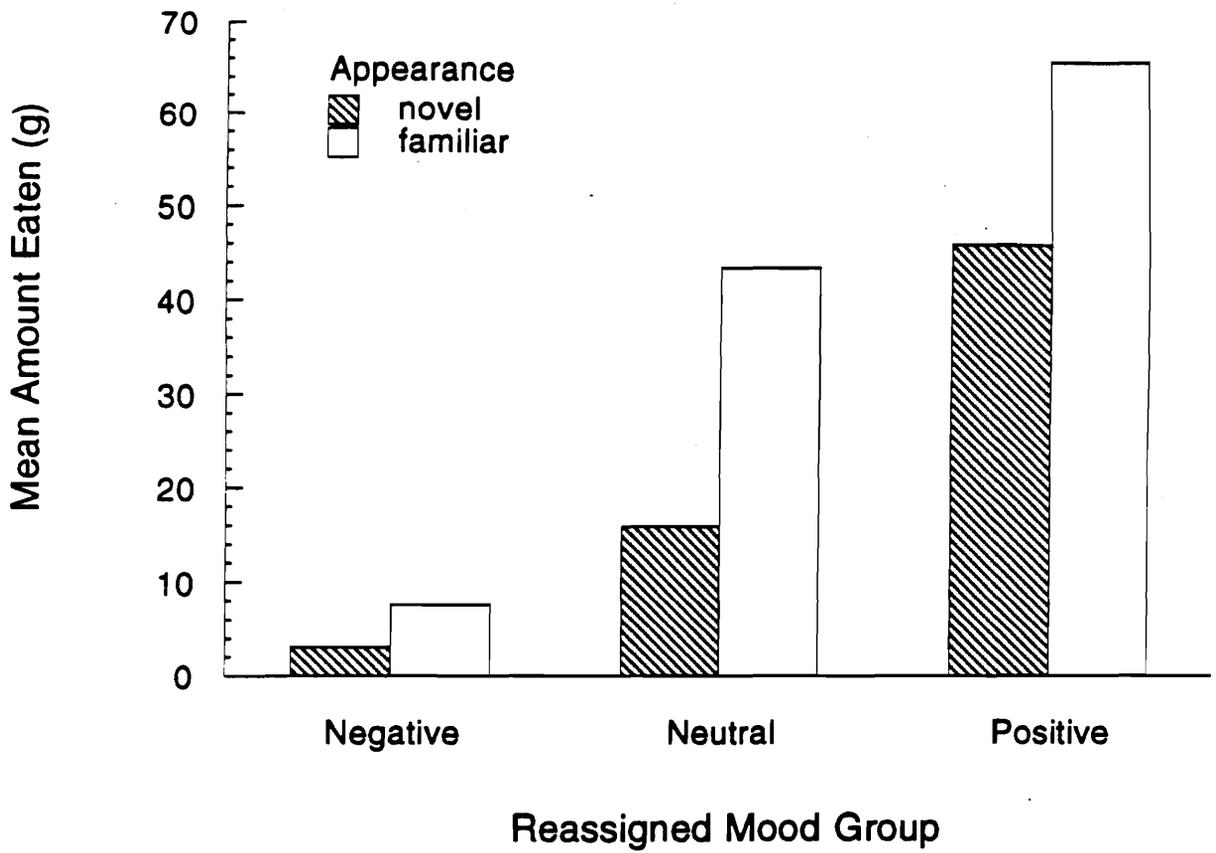
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Figure H4. Mean amount of food eaten in novel- and familiar-appearance conditions as a function of reassigned mood groups.

Table H11

Mean (SD) Amount Eaten per Second (g/s) for Reassigned Groups

	Mood		
Food Appearance	Negative	Neutral	Positive
Familiar	0.124	0.119	0.097
	(0.161)	(0.064)	(0.046)
Novel	0.033	0.051	0.074
	(0.042)	(0.027)	(0.034)

VITA

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EDUCATION

Ph.D.   Virginia Polytechnic Institute and State University,
                  Developmental Psychology
                  Awarded: May, 1997
                  Title: Effects of Emotional State and Food Novelty
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M.S.   Virginia Polytechnic Institute and State University,
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                  Awarded: May, 1987
                  Title: Effects of Priming, Food Palatability, and
                          Calorie Information on Appetite in Restrained
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B.A.   Berea College, Berea KY
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COURSES TAUGHT

Introduction to Psychology   Learning
Child Development   Personality
Adolescent Development   Motivation and Emotion
Social Psychology   Developmental Laboratory
Research Seminar I & II   Social Laboratory
Learning, Memory & Cognitive Processes   Conditioning Laboratory
Introductory Psychology Discussion & Laboratory

TEACHING HISTORY

1995-1997   Saint Vincent College, Assistant Professor

1991-1995   Saint Vincent College, Instructor

1989-1991   Saint Mary's College, Instructor

1987-1989   Virginia Polytechnic Institute & State University,
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1984-1987   Virginia Polytechnic Institute & State University,
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PROFESSIONAL EXPERIENCE

Student Advising   Academic, Career, Psychology Club 1992-1993, Graduate School

Student Supervision   Research Theses, Liberal Arts Theses, Literary Review Papers, Teaching Practicums, Independent Studies, Field Experience, Preschool Laboratory Experience

Research Associate   Subject populations: College students, preschool children, chickens, rats. Director of graduate and undergraduate students in programmatic research.

Faculty Work/Administration   Faculty Committee Chair and Member. Administrator (1988-1989) and Assistant Administrator (1986-1988) of Introductory Psychology Program involving 4 faculty, 20 graduate teaching assistants, 1000 undergraduates, test construction, administration & grading, and departmental experiment extra-credit program.

PROFESSIONAL AFFILIATIONS

American Psychological Association
American Psychological Society
American Association of Applied and Preventive Psychology
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WORKSHOPS ATTENDED

Teaching:
    Effective Questioning & Discussion; Effective Lecturing, SVC (1994)
    Effective Lecture Techniques & Cooperative Learning, SVC (1993)
    Learning & Teaching Styles, SVC (1992)
    Teaching Workshop: Institute for New Faculty, Pittsburgh, PA (1991)

Advising:
    Campus Mentor Training Program, SVC (1993)
    Advising Workshop, SVC (1992)

Writing
    Interdisciplinary Writing Workshop, SVC (1993, 1995)

PUBLICATIONS

Franchina, J. J., & Slank, K. L. (1989). Role of telereceptive and
    interoceptive (taste) cues in ingestional neophobia in chicks
    (Gallus domesticus). Behavioral and Neural Biology, 52, 116-122.

Franchina, J. J., & Slank, K. L. (1988). Salience and the effects of
    CS preexposure on aversion conditioning. Behavioral and Neural
    Biology, 50, 367-373.

Franchina, J. J., & Slank, K. L. (1988). Effects of deprivation on
    salivary flow in the apparent absence of food stimuli. Appetite,
    10, 143-147.

PAPERS PRESENTED AT PROFESSIONAL MEETINGS

Slank, K. L., & Franchina, J. J. (1990). Effects of early visual and
    taste experience on intake in chicks (Gallus domesticus) of
    different ages. Eastern Psychological Association, Philadelphia.

Slank, K. L., & Franchina, J. J. (1988). Effects of restraint and
    deprivation on perceived intensity and preference for sweet and
    bitter. Midwestern Psychological Association, Chicago.

Marshall, K. S., Slank, K. L., & Franchina, J. J. (1988). Effects of
    prior taste experience on salivation and amount eaten. Southeastern
    Psychological Association, New Orleans.

Dyer, A. B., Franchina, J. J., & Slank, K. L. (1988). Novelty and
    compound aversion conditioning. Midwestern Psychological
    Association, Chicago.

Franchina, J. J., Dyer, A. B., & Slank, K. L. (1988). Preexposure and higher-order conditioning in taste- and visual-mediated aversion effects. Midwestern Psychological Association, Chicago.

Franchina, J. J., Dyer, A. B., & Slank, K. L. (1988). Novelty/Familiarity of visual telereceptive cues influences taste neophobia. Southeastern Psychological Association, New Orleans.

Slank, K. L., & Franchina, J. J. (1987). Effects of food palatability and calorie information on appetite in restrained eaters. Southeastern Psychological Association, Atlanta.

Slank, K. L., & Franchina, J. J. (1987). Effects of food palatability and perceived calories on appetite in restrained eaters. Midwestern Psychological Association, Chicago.

Slank, K. L., & Franchina, J. J. (1986). Effects of deprivation on salivary responding in the absence of food stimuli. Southeastern Psychological Association, Orlando.

Slank, K. L., & Franchina, J. J. (1986). Effects of deprivation level and food palatability on salivary responding in dieters and nondieters. Midwestern Psychological Association, Chicago.

Arnegard, R. J., Slank, K. L., & Marshall, K. S. (1986). Magnitude estimation of sweetness in compounds of sweet and bitter flavor concentrations. Virginia Academy of Science, Harrisonburg, VA.

Slank, K. L., Seaver, B., & Arnegard, R. (1985). Effects of deprivation level on preference behavior for pictures of foods. Virginia Academy of Science, Richmond, VA.

REVIEWING EXPERIENCE

Carlson, N. R. (1987). Basic principles of learning. Psychology: The science of behavior (2nd ed.) (pp. 231-271). Newton, MA: Allyn and Bacon.

Baron, R. A. (1989). Learning: How we're changed by experience. Psychology: The essential science (pp. 136-163). Needham Heights, MA: Allyn and Bacon.