

Individual Differences in Disgust Sensitivity: Comparisons and Evaluations of Paper-and-Pencil versus Behavioral Measures

Paul Rozin

University of Pennsylvania

Jonathan Haidt

University of Virginia

Clark McCauley

Bryn Mawr College

and

Lance Dunlop and Michelle Ashmore

University of Pennsylvania

Sixty-eight undergraduate students experienced 32 hands-on tasks designed to provide a behavioral validation for the paper-and-pencil Disgust Scale, which the students had completed 2 months before. Tasks assessed participant-determined degree of exposure (looking at, picking up, touching, and in some cases eating) to objects such as a cockroach, cremated ashes, and a freshly killed pig's head and to disgusting video clips (seconds watching). These tasks elicited strong negative affect in a way that was ethical and not very disturbing to participants; they may be useful for future laboratory study of emotion. Participants also experienced nondisgusting control tasks, such as imitating a chicken or holding one's hand in ice-water. Analysis of task intercorrelations indicated four factors: food-related disgust, body-violation-and-death-related disgust, compliance motivation, and embarrassment. Only the two disgust factors correlated significantly with the paper-and-pencil Disgust Scale; a combination of the two correlated .58 with Disgust Scale scores obtained months before the laboratory assessment and correlated .71 with scores ob-

This research was supported by a grant from the Whitehall Foundation, and the preparation of the paper was supported by NIDA Grant R21-DA10858-0.

Address correspondence and reprint requests to Paul Rozin, Department of Psychology, University of Pennsylvania, 3815 Walnut St., Philadelphia, PA 19104-6196. E-mail: rozin@psych.upenn.edu.

tained immediately after this assessment. Most generally, these results are a reminder that there is no gold standard for personality assessment. As with paper-and-pencil measures, behavioral measures require getting beyond face validity to assess threats to validity from factors such as embarrassment and compliance motivation. © 1999 Academic Press

Key Words: disgust; emotion; individual differences; personality scales; behavior; validation.

This study began as a behavioral validation of the Disgust Scale, a paper-and-pencil measure of individual differences in disgust sensitivity (Haidt, McCauley, & Rozin, 1994). We wanted to see if people who had high scores on the Disgust Scale would in fact be more reluctant to touch, eat, and otherwise interact with disgusting objects. We devised 28 behavioral tests of disgust sensitivity, each one of which could be considered a study in its own right. We also included behavioral tests of compliance motivation. The combined results from all of these tasks contribute to both convergent and discriminant validation of the Disgust Scale, suggest a major division between disgust elicited by food and disgust elicited by death and body envelope violations, and indicate the complexity that lies beneath the face validity of behavioral measures.

PSYCHOLOGY OF DISGUST

Disgust is an important emotion in daily life. It plays a major role in negative socialization, and it is often involved when people withdraw from experiencing or thinking about offensive situations. We have reviewed the gradually expanding domain of disgust in both cultural evolution and development (Rozin, Haidt, & McCauley, 1993, in press) and provide here only a very brief overview of this literature.

We believe that disgust originated as the general mammalian rejection response to bad tastes (Rozin and Fallon, 1987), a response we call *distaste*. As experienced by adults, disgust is at its core a food rejection response, but one directed to the nature or origin of foods rather than to their sensory properties (Fallon & Rozin, 1983). The centrality of food in disgust is supported by the fact that "disgust" itself means "bad taste", that the facial expression characteristic of disgust accomplishes oral expulsion of foods (and is highly similar to the distaste face), and that nausea and gagging, both of which discourage eating, are the physiological events associated with disgust. A food origin of disgust is supported by the major students of this emotion in the past (Darwin, 1872/1965; Angyal, 1941) and is supported in most modern discussions (e.g., Ekman & Friesen, 1975; but see Miller, 1997).

We call this food-related disgust *core disgust* (Rozin et al., 1993). Core disgust differs from distaste because the rejection is based on the nature or origin of the food rather than its sensory properties and because the dis-

gusting entities are contaminating: if they touch an otherwise acceptable food, they render it unacceptable (Rozin & Fallon, 1987). Our analysis, along with the analysis of Angyal (1941), also implicates body products (in themselves and as potential foods) and some animals (in themselves and as potential foods) within the category of core disgust.

Consideration of the elicitors of disgust (Rozin & Fallon, 1987; Haidt et al., 1994) led us to suspect that everyday disgust covers a much wider range than food, body products, and animals. Analysis of disgust elicitors suggested by Japanese and American informants led us to suggest a number of other domains (Haidt et al., 1997; Rozin et al., 1993), including poor hygiene, "inappropriate" sexuality, violations of the normal body envelope (gore, surgery, deformity), and death.

We have suggested (Rozin & Fallon, 1987; Rozin et al., 1993; Haidt et al., 1994) that stimuli in these domains and the domains of core disgust (food, animals and body products) have in common that they remind us of our animality and we refer to these domains collectively as "animal-reminder disgust." We believe that humans do not like to acknowledge that they are animals and that disgust is a way to push away or avoid evidence of our animal nature. We noted in the analysis of the Disgust Scale (Haidt et al., 1994) that items dealing with avoidance of contact with death were among the best predictors of the total score on the scale. Furthermore, we noted that the quintessential eliciting odor of disgust is the odor of decay or death. Thus, the feature of animality that may be most disturbing to humans is that humans, like all other animals, must die. These observations are consistent with Ernst Becker's (1973) contentions in *The Denial of Death*: that mortality (as opposed aggression or sexuality) presents the major dilemma of human existence and that the threat of mortality activates the kinds of defense mechanisms postulated in the psychoanalytic movement. The central importance of the problem of mortality in human life has also surfaced recently in the concept of "terror management" (Greenberg et al., 1990), in which many cultural constructions, norms, attitudes, and regulations are viewed as bulwarks against the fear of mortality.

Further analysis of disgust elicitors suggested by informants led us to conclude (Rozin et al., 1993; Haidt, et al., 1997; Rozin, Haidt, McCauley, & Imada, 1997) that there is yet another level of expansion beyond animal-reminder disgust, including contact with certain other people (interpersonal contamination) and a subset of moral offenses (see Haidt, Koller & Dias, 1993; Haidt et al. 1997, and Rozin, Lowery, Imada, & Haidt, 1999, for cross-cultural evidence on moral disgust). We call this outer circle of disgust *socio-moral disgust*.

Disgust is closely linked to sympathetic magical thinking. Disgusting entities contaminate things they touch, illustrating the sympathetic magical law of *contagion*: "once in contact, always in contact" (Frazer, 1890/1959;

Mauss, 1902/1972; Rozin, Millman, & Nemeroff, 1986; Rozin & Nemeroff, 1990). Responses to disgusting entities are so strong that disgust often generalizes to entities that are not inherently disgusting, but look like disgusting things. Thus, people feel disgust toward objects like imitation feces made of plastic or chocolate (Rozin, Millman, & Nemeroff, 1986) or a synthetic mucuslike liquid, even though the observer knows the objects are not what they seem. This reaction illustrates the sympathetic law of *similarity*, which holds, in one form, that appearance is reality (e.g., if it *looks like* dog feces, it *is* dog feces). Many of the most common elicitors of disgust are effective by virtue of the laws of sympathetic magic. For example, a disgust reaction to wearing clean clothing previously worn by a disliked person involves the law of contagion.

DISGUST SCALE

The Disgust Scale (Haidt et al., 1994) is composed of 32 items, 4 in each of the 7 animal-reminder domains (food, animals, body products, sex, body envelope violations, death, and hygiene), and 4 tapping magical thinking in relation to these domains. In order to reduce method variance, half of the items in each subscale involve ratings of whether a particular situation is disgusting (not, slightly, or very) and the other half ask about behavior, with a TRUE/FALSE answer format (e.g., ‘it would bother me tremendously to touch a dead body’). The Disgust Scale showed the predicted moderate correlations with Zuckerman’s (1979) sensation seeking scales ($r = -.46$), and Boyar’s (1964) fear-of-death scales ($r = .39$). For the two college student samples and the two nonstudent adult samples who participated in the scale standardization, females showed higher disgust sensitivity than males.

DISGUST BEHAVIOR STUDY

The present study was designed to validate the Disgust Scale by determining its ability to predict disgust-related behavior. In pilot testing of disgust-eliciting tasks for this study we realized that, in addition to disgust sensitivity, compliance motivation might be an important determinant of individual differences in performance on these tasks. That is, two individuals may be equal in sensitivity to disgust, but one is more motivated than the other to do unpleasant things requested by an experimenter. Thus we included three tasks (cold pressor, watching a dull screen-saver, and imitating a chicken) to assess compliance motivation. Our general approach was to give the Disgust Scale to undergraduate students and then, several months later, to invite these students to the laboratory and assess how far they would go with a series of disgusting tasks.

We made the following specific predictions: (1) laboratory disgust task performances would intercorrelate positively and form a coherent Disgust Behavior scale; (2) scores on the Disgust Behavior scale would be partly

determined by individual differences in compliance motivation (a willingness to engage in unpleasant tasks in a laboratory setting), which would have to be assessed and accounted for in getting a valid measure of sensitivity to disgust; (3) males would go further with the disgust tasks than females, on average, because of their lower disgust sensitivity; and (4) The Disgust Behavior scale would correlate substantially with results from the paper-and-pencil Disgust Scale taken previously by the same participants.

METHOD

Participants

At the beginning of the 1993 Spring semester, 250 students in an introductory psychology class at the University of Pennsylvania were randomly assigned an anonymous participant number. This standard procedure in this class allows results from various in-class measures to be compared by person across studies without revealing identities. In January, all students filled out the 32-item Disgust Scale, using their anonymous participant numbers. Two months later a sign-up sheet was circulated through the class for a study on hypnosis. Sixty-eight of the students who volunteered were contacted (selected at random) and served as participants in late April and early May. Thirty-five participants were male, 33 female; 40 were white, 19 Asian, 6 Black, and 3 other; 22 were Jewish, 17 were Protestant, 11 were Catholic, and 9 were other or undeclared. Ages ranged from 17 to 23 (mean, 19; *SD*, 1.2.)

Procedure

The procedure for this study comprised 32 scripted tasks, each task a different interaction between experimenters and participants. Together these tasks provide an unusually comprehensive laboratory assessment of individual differences, but, as well, they require an unusually long description of procedures.

Participants were scheduled one at a time, with both a male and female experimenter present in the room with each participant. One experimenter did all of the talking, while the other one played the role of assistant, preparing and presenting all of the stimuli. The male and female experimenters alternated roles so that approximately half of the participants were run by a same-sex experimenter and half by an opposite-sex experimenter in a 2×2 matrix (sex of experimenter \times sex of participant). The study was carried out in a laboratory room which included kitchen facilities. A video camera was conspicuously present.

When the participants entered the room, they were told:

We're running an experiment over in the lab building on hypnosis in which we are trying to find out whether hypnosis really makes people do things that they would not normally do. But in order to do that, we have to first know what kinds of things people will do when they are not under hypnosis. That's what we want to know from you. So I'm going to give you a number of simple tasks, and I just want to find out whether you are willing to do them. Please don't try to imagine what the average person would do; we want to know what *you* are willing to do and how you feel. The point of this is not to go as far as you can with these things. What we really want to know is the point at which you don't want to continue. We don't want you to do anything you really don't want to do.

The participant was then given an informed consent form to be signed, including consent to be videotaped. All but 3 of the 68 participants who participated in this study were videotaped. Two refused for personal reasons, and one was not videotaped due to technical failure.

Using a procedure that continued to assure anonymity, we asked participants to indicate their participant number so that we could relate their findings to other findings in the course. Fifty-five participants remembered their number, allowing us to obtain their Disgust Scale scores from the classroom testing 2 months earlier. When we realized that several participants could not remember their participant number, we instituted, about one-third of the way through the study, an administration of the Disgust Scale after the laboratory study was completed. We have ex- post Disgust Scale results from 41 participants.

Participants sat at a table. A bottle of brand-name springwater, a roll of paper towels, and a package of disposable plastic cups were on the table. After signing the consent form, participants were told that the water, towels, and cups were there for their convenience. The experimenter then began to administer the first of 32 behavioral measures.

Thirty-Two Tasks

Twenty-eight disgust and magical thinking tasks emerged from a larger number of brainstormed possibilities, as we eliminated tasks that might be unethical or highly impractical, might overlap heavily with other tasks, or might yield little individual difference in response. Remaining possibilities were pilot tested, and the final 28 disgust-related tasks (25 lab procedures and 3 video clips) were selected on grounds of diversity, ease of realization, and pilot data, suggesting that our participant population would show individual differences in their responses. In addition, an initial easy task (see Cornchip, below) and three nondisgust compliance tasks were included (see Coldpressor, Chicken, and Screensaver) to provide discriminant validity and to add plausibility to the cover story about studying what nonhypnotized people are willing to do.

A single sequence of tasks was used for all participants, chosen according to the following considerations: (1) in order to make clear that their verbal agreement to do something would be followed by their being asked to do it, the first task (eating a corn-chip snack) was one that most people would agree to; (2) in order to make clear that a refusal response was quite acceptable, the second task was selected to be one in which virtually no participant would go to the last step (touching a cockroach to one's lips); (3) in order to support the cover story about hypnosis and to deflect attention from disgust, the third task was a nondisgust task—the cold pressor test; (4) the task that we thought might be most disturbing—touching cremation ashes—was placed at the end of the laboratory tasks; and (5) the four videotape observation tasks were performed after the laboratory tasks because they were watched in a different room. The remaining 24 tasks were performed in a fixed sequence that had been randomly determined.

We told participants that all of the stimuli were real; that is, exactly as described (a real, used Nazi hat; cockroach, etc.). This was in fact the case, except for the used comb (which was actually new) and the cremation ashes. The ashes were made from bone meal; they were contained in an urn that was actually made to hold human ashes. The 32 tasks were administered in the order presented below. The first three tasks are described in detail to give the reader a sense of the interaction.

Scoring

Scoring for each of the 32 behavioral tasks was based on a 60-point scale. For the first 28 tasks a score of "0" indicates refusal to take even the first step (maximum disgust sensitivity) and a score of "60" indicates a willingness to perform the highest step. (Scoring of the four video-watching tasks is discussed below.) A task with only one step received 60 points for performance of the step; a task with two steps received 30 points for each step, with similarly spaced scores up to a task with six levels of performance, each worth 10 points. Equivalent scoring schemes for each task allowed the tasks to be directly combined into the Disgust

Behavior scale and to be compared with each other. In each of the task-steps listed below, the first number in parentheses gives the percentage of the 68 participants who were willing to do the task-step, and the second number indicates the number of points assigned to a participant who went to that step and no higher. "E" refers to the experimenter, and "P" refers to the participant.

1. *Cornchip*. E presented P with a fresh corn chip, dispensed with tongs from a bag of Fritos-brand corn chips, and said, "OK, here's the first task. I have here some fresh corn chips. Are you willing to take and eat one?"

Out of 68 Ps, 58 agreed to eat the corn chip. The 10 Ps that refused to eat the corn chip were then given a choice of eating a saltine cracker or a raisin. Four of these Ps chose to eat a cracker or raisin.¹ During this first task and the following one, E communicated to P that if P answered "yes" to a given step, E would ask P to perform that step, and this actually occurred in all tasks.

2. *Cockroach*. E held a covered container containing a dead sterilized cockroach (*Periplaneta Americana*). The cockroaches were between one and two inches in length and were purchased from a laboratory supply company. E said, "I have here a box which contains a dead, sterilized cockroach. It was raised in a clean laboratory environment. Are you willing to look at it?" (92% of participants were willing; 15 points).

If P did not wish to look at the cockroach, E told P, "OK, that's fine. That's exactly what we want to know." This was the standard response to *any* refusal throughout the experiment, although it was often shortened to "OK, that's fine" when E felt it was redundant to keep repeating the second sentence. If P looked at the cockroach, E asked P, "Are you willing to touch it with your fingertip?" (60% willing; 30 points).

If P did not wish to touch the cockroach, E told P the standard response to a refusal. If P touched the cockroach, E asked P, "Are you willing to pick it up in your hand?" (50%; 45). If P did not wish to pick up the cockroach, E gave P the standard response to a refusal. If P picked up the cockroach, E continued, "Are you willing to touch it to your lip?" (10%; 60).

Each step of this task was designed to be more disgusting than the previous step. At the point at which P did not want to continue with the task, the standard response to a refusal was given, and E proceeded to the next task. Only seven participants agreed to touch the cockroach to their lip, indicating that we established the acceptability of a refusal response in the great majority of cases.²

3. *Coldpressor*. This task served both to reinforce the framing of the study as a hypnosis control study and as a nondisgust compliance measure. E said to P, "I have a bucket of ice-water here. Are you willing to put your hand in?" If P said yes, E continued, "When I say 'Go,' please put your hand in up to the wrist. Hold it there until it becomes so unpleasant that you really want to pull your hand out." The maximum time participants were allowed to keep their hand immersed in the ice-water was 30 s. To score this task on the same 60-

¹ The 6 Ps who did not agree to eat anything were not removed from the analysis because on later tasks they were willing to engage, to some degree, with disgust objects. There was no P who simply refused to do anything. In retrospect it appears that Cornchip functioned as a perfectly good "easy" item, which was only "failed" by the most disgust-sensitive participants.

² We included these 7 Ps in the analysis, since all of them said no to at least one later task, indicating that they understood that they could refuse. There was, however, a single P who went all the way to the end of every disgust task, including eating ashes that were purportedly human cremation ashes. This P was a 17-year-old male who refused only to flap his arms like a chicken. This P is also the only 1 of 68 who reported feeling no sympathy, anger, fear, disgust, or disturbance while watching the gory films of slaughterhouses and infant facial surgery; he expressed only interest.

point scale as the other tasks, 2 points were given for each of the 30 s P kept his/her hand immersed. Three percent of participants refused to put their hand into the bucket, 67% removed it before 30 s, and 30% kept it in for the entire 30 s.

4. *Grassjelly*. P was presented with a commercial can of grass jelly juice, a beverage consumed in Taiwan. This drink is thick, greenish-brown, and viscous. It contains small gelatinous brown chunks which are suspended in solution when poured into a cup. The words "Grass Jelly Juice" were printed on the label on the can, along with a picture of the juice. E said, "This is grass jelly juice, a beverage from Taiwan. Are you willing to pour it about a third of the way into the cup?" (97%; 30). "Are you willing to take a sip?" (78%; 60).

5. *Usedhat*. A used men's hat (a "fedora") was placed in front of P. E said, "This is a hat we bought at a used clothing store in Bryn Mawr. Are you willing to touch it?" (100%; 20). "Are you willing to hold it?" (100%; 40). "Are you willing to put it on your head?" (69%; 60).

6. *Dogfood*. A 10-pound bag of Purina Dog Chow was placed on the table. E placed 3 or 4 pieces of dog food onto a clean paper plate, using a clean plastic spoon. "This is a commercial dry dog food. Are you willing to touch a piece?" (96%; 15). "Are you willing to pick up a piece?" (96%; 30). "Are you willing to touch a piece to your lip?" (40%; 45). "Are you willing to eat a piece?" (7%; 60).

7. *Tampon*. E placed a clean paper plate and a box of Tampax-brand tampons on the table in front of P. E removed an individual, wrapped tampon from the box. "This is a prepackaged tampon." E removed the wrapped tampon from its wrapper and placed it in front of P on the paper plate. "Are you willing to pick it up?" (100%; 15). "Are you willing to open it and hold it in your hand?" (97%; 30). "Are you willing to touch it to your lip?" (54%; 45). "Are you willing to put the tip in your mouth?" (31%; 60).

8. *Nazihat*. E placed an authentic World War II Nazi noncommissioned officer's hat in front of P. The hat had a visor, was gray-green in color, and had a swastika on a metal medallion in the front. E said: "This is a hat worn during the Second World War by a member of the National Socialist, or Nazi, party. Are you willing to touch it?" (91%; 15). "Are you willing to hold it?" (84%; 20). "Are you willing to put it on your head?" (44%; 60).

9. *Ketchup*. E placed a box of Nabisco brand Vanilla Wafers onto a clean paper plate directly in front of P. A pair of tongs was used to remove a cookie from the box. E squeezed ketchup from a red plastic ketchup bottle onto about one-third of a side of the cookie, leaving the rest of the cookie dry. "Are you willing to take a bite of the dry side of the cookie?" (85%; 30). "Are you willing to take a bite of the ketchup side of the cookie?" (28%, 60).

10. *Spit*. E placed a clean plastic cup in front of P and poured springwater from a bottle into the cup until it was about two-thirds full. "Are you willing to spit into the glass of water?" (71%; 30). "Are you willing to take a sip from the glass of water?" (41%, 60).

11. *Dollpin*. E placed a 2-foot-long doll and a box of straight pins in front of P. "This is a toy doll, and this is a straight pin. Are you willing to stick this pin through the doll's eye?" (81%, 60).

12. *Wormpop*. E took out a wrapped, transparent tequila-flavored lollipop (a commercial product) with a real worm inside of it. The lollipop was placed on a clean paper plate, directly in front of P. "This is a nonalcoholic tequila-flavored lollipop with a real worm in it. It's a popular novelty item around the Southwest. Are you willing to open up the lollipop?" (97%; 12). "Are you willing to touch the lollipop to your lip?" (78%; 24). "Are you willing to put the lollipop into your mouth?" (46%; 36). "Are you willing to suck on the side of the lollipop farthest from the worm?" (44%; 48). "Are you willing to suck on the side of the lollipop closest to the worm?" (34%; 60).

13. *Chicken*. As a measure of non-disgust-related compliance, E asked: "Are you willing to stand up and flap your arms like wings and cluck like a chicken?" (54%; 60).

14. *Condom*. E brought out a box of unlubricated Trojans brand condoms and placed one

wrapped condom on a paper plate in front of P. "I have here a new, unlubricated condom. Are you willing to pick it up?" (99%; 15). "Are you willing to open it up and hold it in your hand?" (88%; 30). "Are you willing to touch it to your lip?" (51%; 45). "Are you willing to put it in your mouth?" (23%; 60).

15. *Naziband*. E placed an authentic World War II Nazi armband in front of P. The armband was made of red cotton, with a white circle and a black swastika within the circle. "This is an armband worn during the Second World War by a member of the National Socialist, or Nazi, party. Are you willing to touch it?" (88%; 20). "Are you willing to hold it?" (82%; 40). "Are you willing to put it on your arm?" (44%; 60).

16. *Mucus*. E placed a toy head (commercial product) in front of P. The toy head had simulated greenish colored "mucus" dripping from its nostrils. "This is a toy found in many toy stores. As you can see, it has simulated mucus dripping from its nostrils. This simulated mucus is entirely safe to humans. Are you willing to touch the mucus?" (88%; 15). "Are you willing to put it in your hand?" (77%; 30). "Are you willing to touch it to your lip?" (29%; 45). "Are you willing to stick it into your mouth?" (6%; 60).

17. *Juicecomb*. E poured apple juice from a bottle into a clean plastic cup and placed a new, packaged comb on the table. E opened the sealed package, removed the comb, and stirred the glass of apple juice with the comb. "I have here a glass of apple juice. I have here a brand-new comb. I'm stirring the juice with the comb. Are you willing to take a sip of the juice?" (77%; 60).

18. *Usedcomb*. In order to convince P that the comb used in the next task was in fact a used comb E first asked P: "Are you willing to comb your hair with this comb [used to stir the apple juice in Task 17]? You can wash it off first in the sink if you want to" (66%; 30). If P agreed to comb his/her hair with the comb, E placed on the table two opaque eyeglass cases. The comb P used to comb his/her hair was placed into one of the cases. E then marked the case with a number on a label. After marking the case, E then removed a different comb from the second case. This second case already had a numbered label placed upon it, ostensibly having been previously used by another participant (the comb was actually new). "This comb was used by the previous participant, just like you used the one we just put away. Are you willing to comb your hair with *this* comb? You can wash it off first if you want to" (44%; 60).

19. *Mealworm*. E placed a live mealworm (a yellow-colored flour beetle larva, visibly wiggling, about 1-inch long) onto a clean paper plate. "This is a live mealworm. These grow in flour and grain storage areas. Are you willing to touch it?" (62%; 20). "Are you willing to pick it up and hold it in your hand?" (46%; 40). "Are you willing to touch it to your lip?" (9%; 60).

20. *Grasshopper*. E placed an opened, commercial, labeled can of Japanese honey-covered grasshoppers on the table next to a clean paper plate. E used a clean plastic spoon to put a grasshopper onto the plate. "These are edible grasshoppers that are consumed in Japan. Are you willing to touch it?" (73%; 15). "Are you willing to pick it up and hold it in your hand?" (66%; 30). "Are you willing to touch it to your lip?" (23%; 45). "Are you willing to eat it?" (12%; 60).

21. *Dogfudge*. E placed a piece of chocolate fudge coiled to look like dog feces onto a paper plate. "I have here a piece of fudge, shaped to look like dog poop. Are you willing to touch it?" (88%; 15). "Are you willing to pick it up in your hand?" (82%; 30). "Are you willing to touch it to your lip?" (64%; 45). "Are you willing to take a bite?" (57%; 60).

22. *Quarterslime*. E placed a 2-quart measuring cup full of green slime in front of P. The green slime was composed of canned okra and creamed-corn mixed with green food coloring. E said "I have here a bowl of slimy stuff made by mixing several food items together. Are you willing to touch it with your fingertip?" (73%; 30). "I am dropping this quarter into this container. Are you willing to reach in and pick it up?" (38%; 60).

23. *Gun*. As a measure of death-related magical thinking, E presented a pistol used for starting races. The pistol was made of metal and had the appearance of a real handgun, except that the gun barrel was solid metal, with no hole. E said "Here is a starter pistol. Notice that the clip is empty and that there are no bullets in the chamber." E showed P the empty bullet chamber, put the clip back into the gun, and then pulled the trigger several times, which made a clicking sound. E laid the pistol on the table in front of P and asked: "Are you willing to pick it up?" (97%; 20). "Are you willing to hold it against your temple?" (73%; 40). "Are you willing to pull the trigger?" (43%; 60).

24. *Cyanide*. This death-related magical-thinking task was modified from Rozin, Markwith, and Ross (1990). E placed a transparent bottle of sugar in front of P. Stuck to the bottle were two distinctive labels. The first label was a commercial black and white "poison" label. The second label said "sodium cyanide." E said, "Here is a bottle of sugar. Although the label says 'sodium cyanide,' the bottle has only sugar in it, and it never had cyanide. I bought the label, put it on this bottle, and put the sugar in." E poured springwater into a clean plastic cup. E then took a spoonful of sugar from the cyanide-labeled bottle and stirred it in the water. "Are you willing to take a drink of this water?" (78%; 60).

25. *Bedpan*. E placed a clean bedpan in front of P and poured apple juice into it from a clearly marked bottle of apple juice. "This is a bottle of apple juice and this is a clean, unused bedpan. Are you willing to drink the apple juice from the bedpan?" (28%; 60).

26. *Snake*. E said "I have behind this curtain a preserved snake. Are you willing to see it?" (94%; 20). If P said yes, E placed a preserved snake, about 2 feet long, covered with a sealed soft plastic wrapper, in front of P. "Are you willing to touch it?" (91%; 40). "Are you willing to hold it?" (84%; 60).

27. *Pighead*. E said "I have a fresh pig's head that I obtained at a local market. Are you willing to look at the head?" (78%; 15). (If yes, a real severed head of a fully grown pig was brought out from the refrigerator.) "Are you willing to touch it?" (37%; 30) (If yes, a pin is offered to the participant.) "Are you willing to stick a pin in its head?" (27%; 45). "Are you willing to stick a pin in its eye?" (21%; 60).

28. *Ashes*. E said: "I have an urn of human ashes I obtained from a crematorium. Are you willing to see the urn?" (90%; 10). (If yes, a real cremation urn was brought out.) "Are you willing to look at the ashes?" (73%; 20). (If yes, the urn was opened. The ashes were actually greyish-white bone meal.) "Are you willing to touch the ashes?" (37%; 30). "Are you willing to hold the ashes in your hand?" (31%; 40). "Are you willing to touch the ashes in your hand to your lip?" (4%; 50). "Are you willing to eat the ashes in your hand?" (1%; 60).

Next, P was led into a neighboring room, which was set up as a video-editing room. P sat in front of a color video monitor. E said, "We are going to show you several video clips now. They run about two minutes each. Please turn it off by hitting this button when you don't want to watch any more." E started a segment and recorded the time at which P pressed the stop button (unless P watched the whole clip). Since each clip was 2 min in length, P's behavior was scored on a 60-point scale by dividing the number of seconds watched by 2. Except for the computer screensaver, the video clips escalated in intensity of disgust content. After viewing each clip, P was asked to fill out an eight-item questionnaire. Using a 9-point Likert scale, this questionnaire asked P to rate how sympathetic, upset, disgusted, angry, fearful, disturbed, and interested he/she felt while watching the clip, and it asked P to estimate what percentage of University of Pennsylvania would be willing to watch the particular film segment to the end.

29. *Surgeryfilm*. E said, "This is a film of actual infant facial surgery." The video showed a surgical procedure being performed on an infant, involving peeling the face off of the skull, from scalp to eye level.

30. *Monkeyfilm*. E said, "This is a film of a live monkey's brain being eaten." The video showed a live monkey rendered unconscious by blows to the head at a dining table. Its skull was opened, and dinner guests consumed its brain.

31. *Screensaver*. E said, "This is a screen saver." The video showed a repetitive pattern of moving shapes. This clip served as a nondisgust compliance task.

32. *Butcherfilm*. E said, "This is a film of an actual slaughter house." The video showed cows being killed, skinned, and cut apart.

After responding to all tasks, participants completed a questionnaire asking them to rate how interesting, enjoyable, and pleasant the session was and how much they would recommend the session to a friend. All of these items were rated on 9-point Likert scales, from "not at all" to "extremely." The last page of the questionnaire asked for demographic information, including gender and ethnicity. Forty-one participants were then readministered the Disgust Scale.

RESULTS

Participant's Experiences

We believed, based on our prior work in this field, that it was ethical and nontraumatizing to expose college students to the various stimuli used in this study. Their evaluations of their experiences at the end of the study confirmed this expectation. Their ratings on 9-point scales showed that they generally found the session interesting ($m = 6.9$) and enjoyable ($m = 6.2$), and they even used pleasantness ratings that were above the midpoint ($m = 5.3$). Most tellingly, on the question "would you recommend this session to a friend?" ($m = 6.7$), 74% of participants gave values above the midpoint (i.e., 6–9), while only one person circled the lower anchor, labeled as "not recommended at all." Consistent with the idea that students stopped short of major discomfort is the fact that ratings on these four items were not correlated with performance on the behavioral items. Furthermore, debriefing by the experimenters afterwards failed to discover signs of trauma or resentment. It therefore appears that as long as a refusal option is made salient and fully acceptable, disgust can be ethically elicited and studied in the laboratory.

Preliminary Item Analysis

Inspection of means and *SDs* of behavioral items (see Table 1) indicated that all had sufficient variability of response for useful analysis. However, the two Nazi items, Nazihat and Naziband, produced much lower behavior scores from participants who identified themselves as Jewish ($m = 29$ for hat and $m = 28$ for armband) than from non-Jewish participants ($m = 51$ and $m = 50$; both differences, $p < .001$). These items were dropped on the grounds that they meant something different to Jewish than to non-Jewish respondents. Thus there were 26 disgust-related behavioral items for subsequent analyses.

The Disgust Behavior Scale

We created an overall Disgust Behavior scale by averaging each participant's performance on the 26 disgust-related tasks. The Disgust Behavior

TABLE 1
 Mean (*SD*) and Correlation with Disgust Behavior and Disgust Scale
 for 32 Behavioral Items and 2 Paper-and-Pencil Scales

Item	Mean (<i>SD</i>)	Corr. with Disgust Behavior	Corr. with Disgust Scale
26 items of Disgust Behavior Scale			
(16) Mucous	30(16)	.76***	-.26
(20) Grasshopper	26(19)	.70***	-.46***
(21) Dogfudge	44(22)	.69***	-.31*
(22) Quarterslime	34(24)	.69***	-.29*
(19) Mealworm	23(20)	.68***	-.39**
(9) Ketchup	34(20)	.67***	-.08
(14) Condom	39(15)	.63***	-.17
(28) Ashes	24(14)	.57***	-.33*
(12) Wormpop	36(20)	.57***	-.11
(24) Cyanide	47(25)	.56***	-.30*
(2) Cockroach	32(18)	.56***	-.43**
(17) Juicecomb	46(25)	.55***	-.05
(11) Dollpin	48(24)	.54***	-.05
(27) Pighead	24(22)	.53***	-.31*
(18) Usedcomb	33(27)	.50***	-.27
(25) Bedpan	17(27)	.49***	-.17
(10) Spit	34(25)	.47***	-.05
(5) Usedhat	54(9)	.47***	-.33*
(30) Monkeyfilm	38(21)	.47***	-.29*
(7) Tampon	42(14)	.46***	-.15
(32) Butcherfilm	36(26)	.41***	-.20
(6) Dogfood	36(12)	.33**	-.02
(23) Gun	43(18)	.31*	-.22
(29) Surgeryfilm	39(23)	.29*	-.30*
(4) Grassjelly	53(15)	.26*	-.06
(26) Snake	54(16)	.24	-.33*
Total Disgust Behavior Scale	37(11)	—	-.41**
Six other behavioral items			
(1) Cornchip	51(21)	.39**	-.22
(13) Chicken	33(30)	.37**	-.08
(3) Coldpressor	39(18)	.35**	-.13
(31) Screensaver	27(19)	.10	.11
(15) Naziband	43(20)	.24	-.31*
(8) Nazihat	44(19)	.20	-.44**
Scales taken previously			
Disgust Scale	.53(.16)	-.41**	—
Sensation Seeking	1.24(.38)	.24	-.33*

Note. Behavioral items scored on a 0–60 scale, where “60” means participant went all the way to the last (most disgusting) step. First 26 items comprise the Disgust Behavior scale. Items are sorted by their correlation with Disgust Behavior, and these correlations are part-whole corrected. Disgust Behavior correlations based on 68 participants. Disgust Scale and Sensation Seeking scores and correlations are based on the 55 participants whom we could match to an earlier administration of these scales.

* $p < .05$.

** $p < .01$.

*** $p < .001$ (two-tailed).

scale is therefore also on a 60-point scale, where high scores indicate a high willingness to engage in disgust-related behaviors and low scores indicate a low willingness to engage in such behaviors. The mean Disgust Behavior score across 68 participants was 37.1, with a standard deviation of 11.0, and the scale α was .91. The 26 items of Disgust Behavior had a mean interitem correlation of .29.

The first column of Table 1 shows the correlation of each of the 32 behavior items (arranged in order from highest to lowest correlation) with the Disgust Behavior scale. For the 26 items that are averaged into the Disgust Behavior scale, these correlations (corrected for part-whole inflation) range from .24 to .76. The second column of Table 1 shows the correlation of each item with the total score on the paper-and-pencil Disgust Scale taken several months previously (correlations are across the 55 participants whose Disgust Scale scores could be identified by their anonymous participant number). For the 26 items of the Disgust Behavior scale, correlations with the Disgust Scale range from $-.02$ to $-.43$ and average $-.23$ (correlations are negative since high scores on the Disgust Scale predict low behavioral engagement).

There is a surprise near the bottom of Table 1: Cornchip, which we included as an initial easy task and did not include in Disgust Behavior, turns out to be substantially correlated with Disgust Behavior. We return to this surprise below.

Validation of the Disgust Scale

We created the Disgust Scale as a paper-and-pencil measure of individual differences in disgust sensitivity, and one of our major goals in the current study was to determine whether the Disgust Scale would predict willingness to engage in disgusting behaviors. Disgust sensitivity measured by the Disgust Scale does indeed correlate with Disgust Behavior, $r = -.41$ ($p < .01$, two-tailed) for the 55 participants who had taken the Disgust Scale in class months earlier. For the 41 participants who took the Disgust Scale at the end of the laboratory tasks, the correlation with Disgust Behavior was $r = -.51$ ($p < .01$). The Disgust Scale therefore appears to be a significant predictor of actual behavior.

Furthermore, Disgust Scale scores appear to be fairly stable over the course of several months: mean(*SD*) of the Disgust Scale was .53(.16) for the 55 participants taking the scale in class and .52(.15) for the 41 participants taking the scale at the end of the laboratory study. For the 34 participants for whom we have Disgust Scale scores both from class and from the end of the laboratory study, the correlation between the two measures is .79, nearly as high as the scale's alpha reliability (.81 for class testing, .80 for lab testing), despite the fact that participants completed the scale in two very different physical and emotional contexts.

Further support for the validity of the Disgust Scale comes from an analy-

sis of the three Disgust Behavior items that had exact parallels on the Disgust Scale: Condom, Ashes, and Dogfudge. The correlations between these three behavior items and the corresponding Disgust Scale items were $-.39$, $-.21$, and $-.21$, respectively. These values are higher than the average correlation of each behavioral item with the other 31 items of the Disgust Scale: $-.07$, $-.12$, and $-.11$, respectively. This suggests that when people say that it would bother them to touch a condom to their lip, they are in fact less likely to actually touch a condom to their lip, although the correlations between corresponding paper-and-pencil and behavioral items are not large.

The correlation of $-.41$ between the questionnaire measure and the behavioral measure is not so high that the Disgust Scale can be taken as a proxy for Disgust Behavior. When we began this research we shared the common assumption that a behavioral measure of a trait is the “gold standard” against which paper-and-pencil questionnaires must be judged. However further analysis of our results suggests that the behavior tasks are measuring several things and that behavioral measurements are not necessarily superior to paper-and-pencil questionnaires.

Analysis of Disgust Behavior Items

It is reasonable to suppose that when participants decided whether to touch, wear, or eat something in the present study, they were responding to more than just their sensitivity to disgust. The most obvious alternative is that participants differed in their general willingness to comply with requests to do unpleasant things in the laboratory—not just the unpleasantness of disgust but any kind of unpleasantness. We recognized this possibility by including three compliance tasks that had nothing to do with disgust (Cold-pressor, Chicken, and Screensaver). Another possibility occurred to us only after the study was completed: perhaps participants differed in their sensitivity to embarrassment, which might influence their willingness to do “silly” things, such as putting tampons in their mouths or imitating a chicken in front of our experimenters.

In order to explore these possibilities, we conducted a principal components analysis of the 30 behavioral items (including Cornchip but excluding Nazihat and Naziband). The results indicated eight components with eigenvalues greater than 1.0; the first four factors (eigenvalues 9.4, 3.2, 1.8, and 1.7) accounted for 54% of the variance and could be interpreted after varimax rotation. The first rotated factor was identified as Food-Related Disgusting Behaviors (Food Behaviors); the four top loadings ranged from .73 to .68 for Cornchip, Cyanide, Juicecomb, and Ketchup. The second rotated factor was identified as Body-Violation-and-Death-Related Disgusting Behaviors (BVD Behaviors); the four top loadings ranged from .81 to .56 for Monkeyfilm, Butcherfilm, Surgeryfilm, and Ashes. The third rotated factor was identified as Embarrassing Behaviors; the four top loadings ranged from .84

TABLE 2

Correlations of Four Behavioral Factor Scores, Disgust Scale, and Disgust Behavior with a Variety of Demographic and Individual Difference Measures

Measure	Four behavioral factors				Disgust Scale	Disgust Behavior
	Food	BVD	Embarrassment	Compliance		
Filmupset	-.32*	-.46***	-.04	.04	.34*	-.41**
Sex	.22	.40**	-.01	-.13	-.10	-.30*
Asian	-.17	.22	-.31*	.23	.03	-.07
Jewish	.04	-.25	.26	-.25	.10	-.03
Catholic	.11	-.29*	.16	.27*	.22	.05
Sensation Seek	.12	.31*	-.01	.12	-.33*	.24
Disgust Scale	-.36*	-.48***	.03	.04	—	-.41**
Disgust Behavior	.56***	.62***	.44**	.32*	-.41**	—

Note. BVD, body-violation-and-death. Correlations based on 59 participants with data on all 32 tasks, except Disgust Scale scores (available only for 55 participants). Sex scored, female = 0, male = 1; Asian, Jewish, and Catholic scored, no = 0, yes = 1. Negative correlation with a behavioral factor score means that respondents were less willing to perform the indicated behavior. All correlations are part-whole corrected.

* $p < .05$.

** $p < .01$.

*** $p < .01$ (two-tailed).

to .61 for Tampon, Chicken, Condom, and Spit. The fourth rotated factor was more tentatively identified as Compliance Behaviors; the three top loadings ranged from .75 to .40 for Screensaver, Gun, and Coldpressor (Gun also loaded .52 on BVD Behaviors). Very similar results were obtained from an oblimin rotation in which the largest factor correlation was .37 between food and embarrassment factors and the Food and BVD factors were correlated .21.

These results indicate that, in addition to food-related disgust and disgust related to body violation and death, our behavioral items are tapping individual differences in sensitivity to embarrassment and compliance motivation. In order to explore further the forces at work in our behavioral items, we gave a regression-calculated factor score on each of the four rotated factors to each of the 59 participants with complete behavioral data. (Factor scores could not be calculated for participants with missing data on one or more of the behavioral tasks.) Varimax rotation produces uncorrelated factors, and the factor scores are therefore uncorrelated. The correlations of these four factor scores with our other measures are presented in Table 2.

Behavior Factor Scores Related to Other Measures

Filmupset is the average of each participant's rating of how upset he/she was after the three disgust films (Surgeryfilm, Monkeyfilm, Butcherfilm). Average ratings of upset and of the other six emotional reactions rated after

each film were highly correlated; principal components analysis of the seven averages showed only one component with an eigenvalue greater than 1.0, accounting for 60% of the variance. The average of upset ratings had the highest loading on this factor (.91) and we use this average to summarize the film ratings. Table 2 shows that participants most upset by the disgust films were less likely to perform food-disgusting and BVD-disgusting behaviors, but no less likely to perform embarrassing or compliance behaviors. It is not surprising that participants who report being more upset by the films also watch less of them (Filmupset vs BVD behaviors $r = -.46$, $p < .001$), but it is worth noting that those more upset by the films also do less of the food-related behaviors (Filmupset vs Food Behaviors, $r = -.32$; $p < .05$).

The next rows in Table 2 show the relations between demographic characteristics and the four behavioral components. Male students are more likely than females to perform BVD-disgusting behaviors. Asian students are less likely than others and Jewish students marginally more likely than others ($p = .06$) to perform embarrassing tasks. Catholic students are more likely to perform compliance behaviors and less likely to perform BVD behaviors. Except for the prediction that males would perform more disgusting behaviors than females, these relationships were not predicted. They may be of substantive interest in future research, but here they are worth noting as supporting our interpretation of the four factors. That is, the results are consistent at least with stereotypic expectations that Asian students are more easily embarrassed than others, that Jewish students are less easily embarrassed, and that Catholic students are more compliant.

Sensation Seeking is the mean across two subscales of Zuckerman's (1979) Sensation Seeking Scale (Experience Seeking and Thrill-and-Adventure Seeking, which are the two subscales that previous research had found correlated with the Disgust Scale). Table 2 shows that participants scoring high on Sensation Seeking were more willing to perform BVD-disgusting tasks, but not more willing to perform food-disgusting, embarrassing, or compliance tasks. As in our previous research, Sensation Seeking was negatively correlated with the Disgust Scale ($r = -.33$, $p < .05$).

Finally, the paper-and-pencil Disgust Scale is negatively correlated with performance of both food-disgust and BVD-disgust behaviors ($r = -.36$, $p < .05$; $r = -.48$, $p < .01$) and positively correlated with upset in reaction to the disgusting film clips ($r = .34$, $p < .05$). Notably, the Disgust Scale is not related to performance of embarrassment ($r = .03$) or compliance ($r = .04$) behaviors.

Taken together, these results offer some validation for our interpretation of the four behavioral components represented in the factor scores. Food-disgust and BVD-disgust behaviors are both related to self-report of disgust sensitivity on the Disgust Scale and to being upset after disgusting films.

Embarrassing behaviors are unrelated to Disgust Scale scores. Compliance behaviors are unrelated to Disgust Scale scores. Thus food-disgust and BVD-disgust behaviors are related to self-report of disgust sensitivity (Disgust Scale, Filmupset), but embarrassing and compliance behaviors are not.

Although only two of the behavioral components have to do with disgust, all four contribute to our summary Disgust Behavior measure. The last row in Table 2 shows that food-disgust and BVD-disgust behaviors are the most important contributors to Disgust Behavior, but that embarrassing and compliance behaviors also contribute to Disgust Behavior. That is, sensitivity to embarrassment and compliance motivation both affect willingness to perform disgusting tasks in our laboratory, but do not contribute to sensitivity to disgust as assessed by the paper-and-pencil Disgust Scale.

This interpretation is bolstered by an inspection of the last column in Table 1, which shows the correlation of each behavioral item with the total Disgust Scale. Ten items showed correlations of absolute value less than .20, and most of these appear, on their face, to involve some potentially embarrassing silliness: eating dogfood, sticking a pin in a doll's eye, putting a condom or tampon into the mouth, or drinking from a bedpan. In contrast, the eight items that yielded correlations of absolute value greater than .30 involved only one seemingly silly task (Dogfudge) and had a preponderance of serious tasks: touching or eating real insects, touching cremation ashes, sticking a pin into a real pig's head.

If this analysis is correct, we can expect that a combined measure of food-disgust and BVD-disgust behaviors would yield a purified behavioral measure that might correlate higher with the paper-and-pencil Disgust Scale than did our original summary Disgust Behavior measure. For each of the 59 participants with behavioral component scores, we averaged the food-disgust and BVD-disgust component scores to form a new index, FBVD-Behavior (Food-Body-Violation-Death-Behavior). There were 47 participants with both FBVD-Behavior scores and prior Disgust Scale scores, and the purified behavioral measure of disgust correlated $-.58$ ($p < .001$) with the Disgust Scale for these participants. Similarly, there were 33 participants with both FBVD-Behavior scores and postlaboratory Disgust Scale scores, and the behavioral measure correlated $-.71$ ($p < .001$) with this later administration of the Disgust Scale.

The postlaboratory Disgust Scale was of course completed by participants in the context of having just been through the behavior tasks, so the correlation of $-.71$ is no doubt inflated by participants' using their task behavior as an anchor for completing the paper-and-pencil Disgust Scale. No such inflation is possible, however, for the $-.58$ correlation of disgust behaviors with the paper-and-pencil Disgust Scale taken months earlier. The size of the this correlation offers substantial predictive validation of the Disgust Scale.

DISCUSSION

This study was designed to provide a behavioral validation of the Disgust Scale, our paper-and-pencil measure of sensitivity to disgust. We began by devising laboratory tasks that would elicit disgust, with the expectation that these tasks would form a coherent scale of willingness to perform disgusting behaviors. We also devised three tasks (Coldpressor, Chicken, Screensaver) to be unpleasant for reasons having nothing to do with disgust (pain, embarrassment, boredom) to distinguish individual differences in compliance from individual differences in sensitivity to disgust.

We began our analyses by averaging performance on 26 disgust-related tasks, and the resulting Disgust Behavior scale showed a significant correlation ($-.41$) with the paper-and-pencil Disgust Scale completed by participants 2 months before the laboratory study. Because we obtained Disgust Scale scores from some students at the end of the laboratory study, we were also able to show that Disgust Scale scores are relatively stable over 2 months. The mean and *SD* of Disgust Scale scores was essentially unchanged over this period, and the retest correlation was $.79$, nearly as high as the alpha reliabilities for the two testings ($.81$ and $.80$). Beyond these generally supportive results for the Disgust Scale and Disgust Behavior scale, however, some unexpected findings emerged.

Embarrassment and Compliance in the Disgust Tasks

Factor analysis of the behavioral tasks, including both the disgust tasks and the compliance tasks, indicated four factors: food-disgust behaviors, body-violation-and-death behaviors, embarrassing behaviors, and compliance behaviors. Tasks particularly sensitive to individual differences in embarrassment included Tampon, Chicken, and Condom. In retrospect, it is not surprising that, in front of experimenters in white coats, some participants might find it embarrassing to play with a tampon or a condom or flap their arms while clucking like a chicken. Tasks sensitive to differences in compliance motivation were, as expected, Screensaver and Coldpressor. Thus the results indicated that the laboratory disgust tasks summarized in Disgust Behavior were tapping two factors in addition to sensitivity to disgust: sensitivity to embarrassment and compliance motivation.

In short, our behavioral measures and our overall Disgust Behavior scale are not pure measures of individual differences in disgust. Rather the behavioral measures need item analysis and construct validation just as paper-and-pencil measures do. We did anticipate the possibility that individual differences in compliance motivation might help determine responses to our disgust tasks, but we were surprised to find that these tasks also tapped individual differences in sensitivity to embarrassment.

It is interesting to note that the Disgust Scale was correlated with food- and BVD-disgust behaviors ($-.36$ and $-.48$), but not with embarrassment or compliance behaviors ($.03$ and $.04$). To this extent the paper-and-pencil Disgust Scale is actually a purer measure of sensitivity to disgust than is our summary Disgust Behavior measure. Consistent with this interpretation, the mean of the two disgust-behavior factor scores—FBVD-Behavior—correlated $-.58$ with Disgust Scale scores from 2 months before the laboratory testing. That is, a measure of disgust behaviors purified of embarrassment variance and of compliance variance correlated better with the Disgust Scale ($-.58$) than did the unanalyzed Disgust Behavior scale ($-.41$).

We believe that this $-.58$ correlation is one of the larger correlations of verbal report with later behavioral measure in the whole literature on personality measurement. Indeed the correlation between the Disgust Scale and FBVD-Behavior is in the same ballpark as the correlation between SAT scores and first year college GPA, although it may suffer, as GPA prediction often does, from the restriction of range imposed by studying students at a relatively selective institution drawing individuals of relatively homogenous socioeconomic background.

Although there are topics on which people are unable or unwilling to communicate their feelings, it appears that sensitivity to disgust is rather a topic on which investigators can take seriously what people say as well as what people do. This confidence should not extend to predicting particular behaviors, however. We included three behavioral items that were direct analogs of three paper-and-pencil items on the Disgust Scale (Condom, Ashes, Dog-fudge), and the correlations between verbal report and behavior months later were not impressive ($.39$, $.21$, and $.21$), despite being higher than the average correlation of these same three behavioral items with other items on the Disgust Scale ($.07$, $.12$, and $.11$). Thus, as noted in the literature revolving around the "crisis in personality" (Mischel, 1968; Epstein, 1983), there is little warrant for expecting single verbal items to predict single behaviors, but reasonable possibility that an average of multiple verbal items may predict an average of multiple behavioral items. The weakness of single items and the power of aggregation is a generalization that has emerged as well from the literature concerning how attitudes can predict behavior (Ajzen, 1988).

Cornchip Surprise

In addition to our surprise about the power of embarrassment and compliance motivation in our laboratory setting, the results for Cornchip, our first behavioral item, were also a surprise. Cornchip asked participants to eat a cornchip pulled with tongs from a bag and extended to them. This item was designed to provide an easy task that every participant could easily agree to, but in fact 10 of 68 participants refused and refusal was substantially correlated ($.39$) with our overall Disgust Behavior scale. Indeed Cornchip

loaded high on the food-disgust factor. It is clear that Cornchip was tapping sensitivity to disgust, although we did not intend it to do so.

In retrospect, we believe that several aspects of Cornchip procedure opened the door to disgust reactions. First, the participant had no idea how long the bag of chips had been opened, and stale chips tasting of stale oil can be unappetizing. A second factor, perhaps, was the use of tongs. We wanted to maintain hygiene by keeping hands out of the bag, but the use of tongs may have implied that the experimenter knew that there was something about the chips that made touching them undesirable. A third possibility is that disgust-sensitive people are simply very cautious about what they put into their mouths, hesitating even to consume a food item that we had expected to be acceptable to all participants. This last possibility is consistent with our view that core disgust is well conceptualized as a vigilant guardian of the mouth. But these are post hoc speculations that may be explored in future research.

BVD versus Food Disgust

The third and perhaps most substantive surprise in our results was the existence of two factors in our behavioral items, one having to do with food disgust and the other having to do with body-violation-and-death disgust. These factors were analyzed with varimax rotation that produced independent factors, but oblimin rotation produced factors correlated only negligibly at .21. Our previous research in developing the paper-and-pencil Disgust Scale had found that items to do with body violation and items to do with death tended to correlate higher than items from any other pair of domains (e.g., food with body products). But the relative independence of food-disgust sensitivity and BVD-disgust sensitivity in the present results was not anticipated.

Thus, it appears that the distinction between food- and BVD-disgust sensitivity emerges more strongly in the behavioral results than in the paper-and-pencil results of earlier studies. Why this should be so is not at all clear. In future research we hope to interview individuals who are high on BVD disgust but low on food disgust and people who are high on food disgust but low on BVD disgust. Comparison of individuals who are not consistent in the two disgust factors should give us some hints toward understanding these factors.

CONCLUSION

Disgust is unique among negative emotions in that, though often intensely negative, it can be elicited in the laboratory in strong but ecologically valid ways and yet remains ethically justifiable (according to both our participants and our institutional review board). Compared to other emotions usually considered negative—shame, sadness, embarrassment, anger, and fear—disgust

offers a royal road to understanding of elicitors, sequelae, and individual differences. For studies of individual differences in sensitivity to disgust, our results provide substantial behavioral validation of the paper-and-pencil Disgust Scale.

REFERENCES

- Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago: Dorsey Press.
- Angyal, A. (1941). Disgust and related aversions. *Journal of Abnormal and Social Psychology*, **36**, 393–412.
- Becker, E. (1973). *The denial of death*. New York: Free Press.
- Boyar, J. (1964). *The construction and partial validation of a scale for the measurement of the fear of death*. Ann Arbor, MI: UMI Dissertation Information Service.
- Darwin, C. R. (1872). *The expression of emotions in man and animals*. London: John Murray. (Reprinted Chicago: University of Chicago Press, 1965.)
- Ekman, P., & Friesen, W. V. (1975). *Unmasking the face*. Englewood Cliffs, NJ: Prentice Hall.
- Epstein, S. (1983). Aggregation and beyond: Some basic issues on the prediction of behavior. *Journal of Personality*, **51**, 360–392.
- Fallon, A. E., & Rozin, P. (1983). The psychological bases of food rejections by humans. *Ecology of Food and Nutrition*, **13**, 15–26.
- Frazer, J. G. (1959). *The golden bough: A study in magic and religion*. New York: Macmillan (reprinting of 1922 abridged edition, edited by T. H. Gaster. Original work published 1890).
- Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A. V. M., Kirkland, S., & Lyon, D. (1990). Evidence for terror management theory II: The effects of mortality salience on reactions to those who threaten or bolster the cultural worldview. *Journal of Personality and Social Psychology*, **58**, 308–318.
- Haidt, J., McCauley, C. R., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality & Individual Differences*, **16**, 701–713.
- Haidt, J., Koller, S. H., & Dias, M. G. (1993). Affect, culture, and morality, or is it wrong to eat your dog? *Journal of Personality and Social Psychology*, **65**, 613–628.
- Haidt, J., Rozin, P., McCauley, C. R., & Imada, S. (1997). Body, psyche, and culture: The relationship between disgust and morality. *Psychology and Developing Societies*, **9**, 107–131.
- Mauss, M. (1972). *A general theory of magic*. (R. Brain, Trans.) New York: Norton. (Original work published 1902.)
- Miller, W. I. (1997). *The anatomy of disgust*. Cambridge, MA: Harvard Univ. Press.
- Mischel, W. (1968). *Personality and assessment*. New York: Wiley.
- Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review*, **94**, 23–41.
- Rozin, P., Haidt, J., & McCauley, C. R. (1993). Disgust. In M. Lewis & J. Haviland (Eds.), *The handbook of emotions* (pp. 575–594). New York: Guilford.
- Rozin, P., Haidt, J., & McCauley, C. R. (in press). Disgust. In M. Lewis & J. Haviland (Eds.), *The handbook of emotions* (2nd ed.). New York: Guilford.
- Rozin, P., Haidt, J., McCauley, C. R., & Imada, S. (1997). The cultural evolution of disgust.

- In H. M. Macbeth (Ed.), *Food preferences and taste: Continuity and change* (pp. 65–82). Oxford, UK: Berghahn.
- Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999). The moral/emotion (CAD) triad hypothesis: A mapping between the other-directed moral emotions, disgust, contempt, and anger, and Shweder's three universal moral codes. *Journal of Personality and Social Psychology*, **76**, 574–586.
- Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology*, **50**, 703–712.
- Rozin, P., & Nemeroff, C. (1990). The laws of sympathetic magic in disgust and other domains. In *Cultural psychology* (pp. 205–232). Cambridge, UK: Cambridge Univ. Press.
- Zuckerman, M. (1979). *Sensation seeking: Beyond the optimum level of arousal*. Hillsdale, NJ: Erlbaum.