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Ronald Thomas

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Testing the Relation between Disgust and Approach-Avoidance Behavior

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Thesis submitted to the Eberly College of Arts and Sciences at West Virginia University

in partial fulfillment of the requirements for the degree of

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Abstract

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Ronald Thomas

The Behavioral Immune System (BIS) is a set of psychological processes that evolved to protect individuals from harmful contaminants and pathogens in the environment (Miller & Maner, 2011; Schaller & Duncan, 2007; Tybur, Lieberman, Kurzban, & DeScioli, 2013). The primary mechanism through which the BIS functions is the emotion of disgust, which causes negative physical and affective reactions that encourage avoidance behavior and serve as a deterrent from approaching potentially harmful stimuli (Schaller & Duncan, 2007). Consequently, disgust is proposed to serve a disease-avoidance mechanism. However, relatively little research has empirically tested the link between disgust and general behavioral avoidance tendencies in the BIS literature. The purpose of this research was to directly test the association between disgust and general avoidance tendencies. The first study was correlational to demonstrate the association between trait levels of disgust sensitivity and avoidance tendencies. Participants completed self-report measures of disgust sensitivity and approach-avoidance tendencies, as well as a performance-based measure of approach-avoidance. Disgust sensitivity was positively correlated with avoidance as assessed by a self-report measure (i.e., the Behavioral Inhibition Scale; Carver & White, 1994) and negatively correlated with the approach of positive, but not negative, stimuli in the performance-based task. In the second study, a disgust induction (i.e., consumption of disgusting flavored jellybeans) was compared to a control condition (i.e., consumption of normally flavored jellybeans) in order to test the causal direction of the relation between disgust and avoidance. However, the induction could not be evaluated on whether disgust was induced. Although the groups acknowledged a difference in taste, there were no differences between the groups in self-reported feelings of disgust, although they differed on approach-avoidance tendencies in BeanFest. The data from Study 2 also replicated the correlational findings in Study 1. Disgust sensitivity was negatively correlated with the approach of positive stimuli in the performance-based task and was positively associated with self-reported avoidance. Across both studies, a consistent pattern emerged; people who were more sensitive to disgust exhibited more general avoidance tendencies. These findings have broad implications for behavioral tendencies across social domains. Those who are higher in disgust sensitivity tend to endorse more cautious and avoidant behavior, not just relative to clearly dangerous stimuli, such as phobias and other overt risks, but to general situations and events unrelated to disease.

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Testing the Relation between Disgust and Approach-Avoidance Behavior

The Behavioral Immune System (BIS) is a system of psychological processes that evolved to protect individuals from harmful contaminants and pathogens in the environment (Miller & Maner, 2011; Schaller & Duncan, 2007; Tybur et al., 2013). The primary mechanism through which the BIS functions is the emotion of disgust, which causes negative physical and affective reactions in the presence of potentially dangerous or harmful stimuli (Schaller & Duncan, 2007). These negative reactions encourage avoidance behavior and serve as a deterrent from approaching the potentially harmful stimuli. Consequently, the individual is proactively protected from potential contamination or infection. Although the theoretical underpinnings of the BIS posit that disgust and other psychological processes serve a disease-avoidance function, relatively little research has empirically tested the link between disgust and general behavioral avoidance tendencies. The purpose of the proposed research was to directly test the association between disgust and general avoidance tendencies. The first study was correlational to demonstrate the association between trait levels of disgust sensitivity and avoidance tendencies. In the second study, disgust was induced and compared to a control condition in order to test the causal direction of the relation between disgust and avoidance.

Behavioral Immune System

According to Darwinian Theory (1865), species evolve over generations as an expression of the reaction to environmental forces (e.g., disease, famine) that threaten survival and reproduction. For example, zebras' stripes are proposed to be an evolutionary reaction to the flies in the animals' ancestral environments that preyed on them by biting and consuming their blood, which posed a potential threat by spreading disease and weakening the animals from blood loss (Caro, Izzo, Reiner, Walker, & Stankowich, 2014). The stripes, especially the varied

patterns of stripes, deter flies, with fewer flies landing on the striped pattern. The flies in this case represent a macro level threat, i.e., something that is directly observable, but not always avoidable. In addition to macro level threats, there are micro level dangers, which possess just as much, if not more destructive power than those macro threats. Micro threats take the form of micro-organisms, such as bacteria and viruses, which pose a danger to larger organisms.

In order to defend from these threats, humans (as well as most other species) have developed a physiological immune system to protect against harmful pathogens and micro-organisms, which may invade the body causing illness and possible death. However, the physiological immune system is by no means perfect. It is metabolically costly to employ (Schaller & Park, 2011). When activated, most of the body's energy is diverted to the immune system and fighting off the given infection or disease, which results in other systems (e.g., digestive, nervous, endocrine) receiving fewer resources. As such, the organism is potentially left vulnerable to other threats. For example, while infected with the flu, people's locomotor and cognitive abilities are often slowed, which can put them at risk of harm from situations or targets not previously a danger, such as safely navigating a set of stairs (Schaller & Duncan, 2007; Schaller & Park, 2011).

The physiological immune system is a reactive system, meaning that it generally only becomes activated once the organism has been infected. However, there is no guarantee that the infection will be successfully repelled. If the organism has depleted resources already (i.e., from recent immune system use or a poor environment), there may not be sufficient resources to combat the infection and the organism may die. In addition to the loss of energy, there are other negative side effects from the immune system's activation (e.g., inflammation, fever, etc.) that can cause damage to the body (Miller & Maner, 2011; Schaller & Duncan, 2007). As such, the

physiological immune system is effective, but the costs and inherent risks involved do not make it without major weaknesses. To compensate for these weaknesses, some researchers have proposed that a psychological system evolved in humans as a first line of defense against disease and illness – the behavioral immune system (Miller & Maner, 2011; Schaller & Park, 2011; Tybur et al., 2013).

The Behavioral Immune System (BIS) is posited to be a set of psychological processes and behaviors that evolved to protect individuals from infection and contamination (Miller & Maner, 2011; Schaller & Duncan, 2007; Tybur et al., 2013). The underlying principle of the BIS is to protect through prevention, that is, by preventing the infection before it ever begins via avoidance of the cause. For example, contamination fear (i.e., how aware/anxious someone is about receiving something harmful from another person or something) and perceived vulnerability to illness (i.e., how vulnerable a person believes he or she is to becoming sick) are two psychological processes proposed to be part of the BIS. When these processes are activated, people are much less likely to venture near potentially harmful or unknown stimuli. By avoiding such stimuli, the chances of illness and infection are reduced. Thus, the BIS serves a disease-avoidance mechanism.

The BIS is inherently tied to the physiological immune system. Indeed, the BIS reacts to physical immune activity and vice versa: activation of one system results in a higher sensitivity for the other (Miller & Maner, 2011; Schaller, Miller, Gervais, Yager, & Chen, 2010). When shown images of people sneezing, participants exhibited signs of increased activation of their physiological immune system, as assessed by increased levels of interleukin-6, compared to participants who saw images of people pointing guns toward them (Schaller et al., 2010). Viewing other people exhibit signs of illness activated their BIS, which in turn activated their

physiological immune system. Conversely, participants who were recently ill demonstrated a more reactive BIS in a reaction time task compared to participants who had not been sick (Miller & Maner, 2011). Specifically, recently ill participants were faster to avoid images of disfigured individuals than healthy control participants. The recently ill participants' physiological immune systems were more active than the other participants', leading to a stronger BIS response to avoid potentially dangerous stimuli than those who were not recently ill. Thus, growing evidence indicates that the BIS and the physiological immune system are complementary systems that may have evolved together.

Disgust

The primary method through which the BIS functions is disgust (Schaller, 2007). Disgust is an emotion that causes a myriad of negative cognitive and physical reactions (e.g., nausea, vomiting, caution) to stimuli that have the potential to infect the individual with disease or pathogens (Schaller, 2011; Tybur et al., 2013). In turn, these reactions generally evoke avoidance behavior, thereby reducing the likelihood of the individual approaching the potentially harmful stimuli (Schaller & Park, 2011). Disgust is one of the universally recognized emotions and is present across cultures (Ekman, 1992; Olatunji et al., 2009), which supports the premise that the BIS is an evolutionary system, present in all humans. As additional support, disgust is easily elicited by a number of common targets, such as bodily excrement and fluids (e.g., vomit, urine, feces) or cues that indicate an unhealthy or dirty environment (e.g., rats, maggots, roaches) (Kavaliers & Choleris, 2011; Rozin & Royzman, 2001; Woody & Teachman, 2006). All of these triggers share a common feature: all are known transmitters of infectious disease or pathogens. Disgust's primary function in humans is to prevent contamination.

A prominent source of infection and disease in humans is other people (Schaller & Duncan, 2007). Those who are infected or ill tend to, but not always, demonstrate that infection in some visual way (e.g., coughing, sneezing, and inflammation). Individuals are responsive to these cues, often avoiding or distancing themselves from people who exhibit such cues. To be a proper preventative system, the disgust mechanism, and the BIS as a whole, are more prone to make false positives when it comes to detection (Navarrete & Fessler, 2006; Schaller & Park, 2011; Schaller, 2011; Tybur, Lieberman, & Griskevicius, 2009). Beyond signs of illness and contagious disease, individuals also experience disgust in response to people who deviate from the general healthy “archetype,” such as those with birth marks, physical deformities, or extreme obesity (Faulkner, Schaller, Park, & Duncan, 2004; Navarrete & Fessler, 2006; Schaller & Duncan, 2007; Tybur et al., 2013). Thus, individuals are very sensitive to visual signs of potential disease threat in others.

Pathogens are frequently passed among people in a community, but the potential harm of these ‘local’ pathogens pales in comparison to foreign pathogens that outgroup members may carry (Faulkner et al., 2004; Schaller & Duncan, 2007; Tybur et al., 2013). Such pathogens may be more harmful and deadly, because individuals are unlikely to possess any biological resistance or antibodies to fight off disease. Although this type of exposure scenario may be uncommon, it can be quite devastating to the population. Examples of large scale disease outbreaks include the various European diseases, such as smallpox, chicken pox and measles, that killed a large proportion of the native American population during colonization, which resulted because of a lack of resistance to diseases brought by outgroup members (Guerra, 1993). Thus, those who are not considered part of the individual’s group could be carriers of these especially dangerous pathogens and present an inherent risk. Consequently, outgroup members

may also trigger a disgust reaction to encourage avoidance (Faulkner et al., 2004; Hodson & Costello, 2007; Huang et al., 2011; Navarrete & Fessler, 2006; Schaller & Murray, 2008; Schaller & Park, 2011; Terrizzi, Clay, & Shook, 2014). Indeed, a large body of evidence is accumulating that demonstrates a clear association between BIS or disgust related measures and xenophobia or prejudice (Faulkner et al., 2004; Hodson & Costello, 2007; Huang et al., 2011; Navarrete & Fessler, 2006; Schaller & Murray, 2008; Schaller & Park, 2011; Schaller, 2011; Terrizzi, Shook & Ventis, 2010, 2012; Tybur et al., 2009, 2013). Specifically, disgust has been associated with prejudice toward immigrants, non-familiar out-groups, sexual minorities, and foreigners.

Although the vast majority of people have the capability to experience disgust, there is individual and cultural variation in the amount of disgust that people feel on average (Faulkner et al., 2004; Hodson & Costello, 2007; Huang et al., 2011; Navarrete & Fessler, 2006; Schaller & Duncan, 2007; Schaller & Murray, 2008; Schaller & Park, 2011). Disgust sensitivity is a measure of how susceptible people are to being repulsed with various stimuli, with higher sensitivity representing more general susceptibility. At the group level, cultures that have had less pathogen exposure historically tend to have lower disgust sensitivity than cultures that have had more frequent pathogen exposure (Schaller & Duncan, 2007; Schaller & Murray, 2008). These findings support the evolutionary argument for the BIS. In areas with greater pathogen prevalence (i.e., harsher environmental forces), those with lower disgust sensitivity (and thus, lower natural aversion to potentially infectious stimuli) would have been more likely to get sick and not reproduce in the quantity that those who were naturally more sensitive to disgust would have, giving rise to higher proportions of the population with a naturally higher disgust sensitivity.

Another general group difference in disgust sensitivity is that women typically demonstrate higher levels of disgust sensitivity than men do (Terrizzi et al., 2014; Tybur, Bryan, Lieberman, Caldwell Hooper, & Merriman, 2011). In particular, men and women differ greatly in sexual disgust (Tybur et al., 2011). Sexual disgust pertains to finding a healthy and less risky mate. Considering the mating costs involved for women are much higher than for men, it is reasonable that they would be more selective and exhibit a higher sensitivity to sexual disgust. Although consideration at the group and cultural level can be rather informative, disgust sensitivity is best considered at the individual level, because individual differences are more predictive than cultural or group averages. Also, disgust sensitivity has a large amount of individual variability, and people within even the same group and area can vary greatly in disgust sensitivity levels (Navarrete & Fessler, 2006; Tybur et al., 2013).

Avoidance Behavior

The effect that disgust ultimately has on behavior is regulating approach-avoidance behavior, with disgust reinforcing avoidance of potentially harmful stimuli. Considering the importance of this relation, research involving disgust and avoidance behavior is surprisingly sparse in the BIS literature. Of the few empirical studies to examine this relation, most have focused on the relation between disgust and avoidance with regard to anxiety disorders. Specifically, these studies have examined the extent to which individuals with phobias approach either the subject of their phobia or consume contaminated food compared to nonphobics (Deacon & Olatunji, 2007; Tsao & McKay, 2004; Woody & Tolin, 2002). Generally, individuals with anxiety disorders are higher in disgust sensitivity and more avoidant. Overall, these studies do find the expected positive relation between disgust and avoidance behavior. However, the conceptualization of both disgust and avoidance behavior, as well as the

population under study (i.e., individuals with anxiety disorders), are very specific and differ greatly from the majority of the disgust and BIS literature. Thus, these studies have limited generalizability to everyday behavior and other populations.

Disgust and avoidance have also been examined through less direct methods as well. As previously mentioned, participants who had been recently ill were faster to avoid images of disfigured individuals than healthy control participants were (Miller & Maner, 2011). In this study, avoidance was operationalized by having participants pull (to simulate approach) or push (to simulate avoidance) a lever in response to images of disfigured or non-disfigured individuals. Recently ill individuals were faster than the healthy controls to approach, or pull the lever, in response to non-disfigured individuals and to avoid, or push the lever, in response to disfigured individuals. These findings suggest that individuals who are higher in disgust sensitivity or those who are experiencing disgust are more avoidant of disfigured individuals. However, this study did not directly test this association. Moreover, these findings do not indicate the generality of this potential association. That is, disgust may just be associated with disgust toward individuals that pose a potential disease threat, or disgust may be associated with general avoidance tendencies across a number of domains and with regard to a variety of targets.

The work demonstrating the association between disgust and prejudice also implies that individuals who are higher in disgust sensitivity would be more likely to avoid outgroup members (Huang et al., 2011; Schaller & Murray, 2008; Schaller & Park, 2011; Terrizzi, Shook, & Ventis, 2010). Individuals who are higher in prejudice tend to avoid interacting with the outgroup members that they dislike. Again, although these findings suggest an association between disgust and avoidance, this relation has not been directly tested. Also, the focus is on avoiding other individuals, rather than basic approach-avoidance tendencies.

General approach-avoidance tendencies have been examined in a number of ways. One of the most common models is the behavioral inhibition and activation system, which is a set of physiological processes theorized to explain behavioral tendencies (Gray, 1987). There are two distinct systems, which operate through separate channels, but are considered together because they are complementary. The behavioral inhibition system is purported to reinforce behavior that avoids non-reward or risk of negative outcomes, and is sensitive to signals of punishment (Carver & White, 1994; Gable, Reis, & Elliot, 2000). Functionally, this mechanism inhibits risk-taking, which would include exploration of novel stimuli and situations. By comparison, the behavioral activation system reinforces behavior that approaches reward outcomes and escaping punishment, encouraging the overall pursuit of goals (Carver & White, 1994; Gable et al., 2000). In essence, this mechanism encourages approach behavior when there is a chance of being rewarded. Conceptually, disgust sensitivity should overlap with the behavioral inhibition system, as they both ultimately do the same thing – encourage avoidance behavior. Conversely, the behavioral activation system should be associated with less disgust sensitivity, due to the opposing nature of the two mechanisms.

The behavioral activation and inhibition systems are commonly assessed with a self-report measure (Carver & White, 1994). Overall, the measure is reliable and valid, predicting anxiety and punishment avoidance for the inhibition system, and happiness and reward responsiveness for activation system (Carver & White, 1994). However, as well established as the measure is, it is still only a self-report measure. Like other constructs, self-report of behavioral tendencies is inherently limited, as participants are not always accurate when it comes to judging their behavior in a hypothetical situation (Donaldson & Grant-vallone, 2002). Participants are also inclined to present themselves in a socially desirable or positive light

(Crowne & Marlowe, 1960). Consequently, there are inherent weaknesses with the behavioral activation and behavioral inhibition scale.

An alternative technique for assessing approach-avoidance behavior is a performance-based measure, called BeanFest (Fazio et al., 2004). BeanFest is a computer task in which participants are presented with a series of novel stimuli, referred to as ‘beans.’ For each bean, participants must decide to either approach or avoid the stimulus. Thus, the BeanFest task assesses participants’ fundamental approach-avoidance tendencies when presented with unfamiliar stimuli. The task is presented as a game in which participants have a point value, and their goal is to increase their point value by approaching beans that have a positive point value and avoiding beans that have a negative point value. Throughout the task, participants’ approach-avoidance decisions are recorded and can be assessed at the aggregate level as an index of approach-avoidance tendency. The strength of the BeanFest task is two-fold. First, by removing the task from “reality”, past experiences cannot inform the participant’s decisions, ensuring a better representation of their fundamental approach-avoidance tendencies. Second, the BeanFest task avoids the limitations inherent in self-report measures (e.g., social desirability, presentational concerns).

Past studies using the BeanFest task have shown that manipulating participants’ goal focus (i.e., promotion focus versus prevention focus) affects approach-avoidance behavior (Fazio et al., 2004). Specifically, participants who were primed to focus more on promotion and attaining more points approached more beans in the BeanFest task, whereas participants who were primed to focus on prevention or preventing the loss of points avoided more beans. Later work demonstrated a link between political ideology and approach-avoidance behavior in BeanFest, with more conservative participants approaching fewer beans than liberal participants

(Shook & Fazio, 2009). These studies have implications for disgust, as both goal focus and political ideology are related to disgust. Specifically, prevention focus is related to disgust; disgust serves the function of preventing illness and contamination (Shidlovski & Hassin, 2011). Similar to prevention focus, disgust is proposed to encourage avoidance behavior. There is also a relation between political ideology and disgust, such that political conservatism is associated with higher levels of disgust sensitivity (Hodson & Costello, 2007; Inbar, Pizarro, Iyer, & Haidt, 2011; Terrizzi, Shook, & McDaniel, 2013). Given the similarities between these constructs, the approach-avoidance behavior assessed with BeanFest may be associated with disgust. Thus, the necessary foundation has been established for investigating the relation between disgust and approach-avoidance as measured by BeanFest and the proposed research.

Present Research

The purpose of this research was to fill in the gaps in the BIS literature regarding the relation between disgust sensitivity and general approach-avoidance behavior. To do this, two studies were proposed. The first study was correlational to simply demonstrate the association between multiple measures of disgust sensitivity and approach-avoidance tendencies. For the latter construct, both a self-report measure and a behavioral task were utilized to demonstrate convergence across measures. The second study was experimental to test the causal relation between disgust and approach-avoidance behavior. Specifically, disgust was induced to determine the effect of disgust on approach-avoidance behavior compared to a control condition. Overall, it was expected that disgust would be positively associated with avoidance behavior and negatively associated with approach behavior. Thus, for Study 1, it was hypothesized that those higher in disgust sensitivity would demonstrate more avoidance behavior. For Study 2, it was

hypothesized that the disgust condition would demonstrate more avoidance than the control condition.

Study 1

The purpose of this study was to establish a relation between the primary variables, namely disgust sensitivity and approach-avoidance behavior. As such, the procedure did not involve any type of experimental manipulation, and it was simply correlational. It was expected that individuals who were higher in disgust sensitivity would exhibit lower levels of approach behavior and higher levels of avoidance behavior. Thus, the hypotheses were: 1) the disgust sensitivity measures would be positively correlated with avoidant behavior, as assessed by the BeanFest paradigm and the Behavioral Inhibition System scale; and 2) the disgust sensitivity measures would be negatively correlated with approach behavior, as assessed by BeanFest and the Behavioral Activation System scale.

Method

Participants

A total of 136 undergraduate students were recruited from the Department of Psychology's subject pool at West Virginia University. Participants were recruited using the online SONA system which is available to all undergraduate students who are enrolled in a psychology class. The SONA system was also used for scheduling sessions. Four participants were excluded from analyses due to signs that they were not following directions and completing the BeanFest task properly (e.g., an entire block spent either only approaching or only avoiding). Thus, the final sample size was 132 ($M_{\text{age}} = 20.07$ years, $SD = 4.82$, range = 18 to 53; 55.6% female; 86% Caucasian, 6.2% African American, 3.9% Asian, 3.1% Hispanic, and .8% other).

Measures

Three Domain Disgust Scale (TDDS; Tybur et al., 2009). This is a 21-item scale that measures disgust sensitivity. Participants indicate the extent to which they find each item (e.g., “Shaking hands with a stranger who has sweaty palms”) disgusting on a scale ranging from 0 (Not at all disgusting) to 6 (Extremely disgusting). There are three disgust domains within the scale: Pathogen ($\alpha = .84$), Sexual ($\alpha = .87$), and Moral ($\alpha = .84$) disgust. Each subscale is comprised of seven items. The three domains correlate moderately with one another: $r_s = .40$ (Pathogen-Sexual), $.20$ (Pathogen-Moral), and $.36$ (Sexual-Moral).

Disgust Scale Revised (DSR; Olatunji et al., 2007, 2009). This is a 27-item scale that measures disgust sensitivity ($\alpha = .88$). Participants indicate their level of agreement with the first 14 items (e.g., “It would bother me to see a rat run across my path in a park”) on a scale ranging from 0 (Strongly Disagree) to 4 (Strongly Agree). For the last 13 items, participants indicate how disgusting they find each situation (e.g., “You are walking barefoot on concrete, and you step on an earthworm”) on a scale ranging from 0 (not disgusting at all) to 4 (extremely disgusting). The DSR has three subscales: Core (13 items, $\alpha = .74$), Animal Reminder (8 items, $\alpha = .78$), and Contamination Threat (6 items, $\alpha = .61$) disgust. The three subscales correlate moderately with one another: $r_s = .48$ (Core-Animal Reminder), $.45$ (Core-Contamination Threat), and $.24$ (Animal Reminder-Contamination Threat).

Disgust Propensity and Sensitivity Scale-Revised (DPSSR; van Overveld et al., 2006). This 16-item scale measures disgust sensitivity and disgust propensity. Participants indicate how often they experience different situations (e.g., “I become disgusted more easily than other people”) on a scale from 1 (“Never”) to 5 (“Always”). There are two sub-scales in

this measure: disgust propensity ($\alpha = .78$) and disgust sensitivity ($\alpha = .77$). The two subscales correlate moderately ($r = .59$).

Contamination Fear Subscale (CFS; Burns et al., 1996). This 10-item scale assesses participants' thoughts and concerns about contamination ($\alpha = .85$). Participants indicate the extent to which they agree with a series of statements regarding coming into contact with potentially contaminated objects and washing behavior (e.g., "I find it difficult to touch garbage or other dirty things"). Participants respond to each item on a scale from 0 ("Not at all") to 4 ("Very much"). This measure was included because it is part of the BIS and has an association with disgust sensitivity (Deacon & Olatunji, 2007). Thus, this measure was a possible covariate.

Perceived Vulnerability to Disease (PVD; Duncan et al., 2009). This 15-item scale measures participants' self-rated illness vulnerability by asking a combination of explicit questions (e.g., "In general I am very susceptible to colds, flu, and other infectious diseases") and attitude items (e.g., "I prefer to wash my hands pretty soon after shaking someone's hands"). Participants indicate the extent to which they agree with each statement on a scale from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). The scale has good internal consistency as a whole ($\alpha = .82$). The PVD scale also has two subscales: perceived infectability (7 items; $\alpha = .87$) and germ aversion (8 items; $\alpha = .74$). This measure was included because it is part of the BIS and has an association with disgust sensitivity (Navarrete & Fessler, 2006; Tybur et al., 2009). Thus, this measure was a possible covariate.

BeanFest (Fazio et al., 2004). BeanFest is a computer task that measures participants' basic approach-avoidance tendencies when presented with novel stimuli. The task is framed as a game in which participants have points that can range from 0 to 100. Participants start the game with 50 points, and their goal is to increase their points and avoid losing points. To do this,

participants must learn which stimuli, referred to as ‘beans,’ are positive (i.e., have a +10 point value) and which beans are negative (i.e., have a -10 point value). On a given trial of the game, participants are randomly presented with a single bean in the middle of the computer screen. Participants have five seconds to decide whether to approach or avoid the presented bean. If participants approach the bean, they learn the value of the bean (+10 or -10), and their point value is adjusted accordingly. If participants avoid the bean, their point value remains the same, but they do not learn the value of the bean. Decisions during these trials provide a basic assessment of participants’ approach-avoidance tendencies.

The BeanFest task is comprised of three phases. Participants first complete a “Practice Phase,” in which they experience six trials. The practice phase serves as a way to familiarize participants with the task and introduce them to a few of the beans. Next, participants complete the “Learning or Game Phase.” This is the phase in which approach-avoidance behavior is assessed. The learning phase consists of three blocks of 36 trials each. That is, in each block, participants are presented with 36 beans in a random order, one at a time. For each trial, participants have five seconds to decide whether to approach or avoid the bean. If participants do not respond within five seconds, the trial times out and the next trial begins. If a participant's point value reaches 100, the participant is notified that he/she has “won” a game. Conversely, if a participant's point value reaches 0, the participant is notified that he/she has “lost” a game. In either case, a new game is started with participant's point value at 50. Participants may win or lose multiple games; however, all participants experience the same number of trials (108 trials). Approach-avoidance behavior is calculated as the proportion of trials for which the participant chose to approach the presented bean. Thus, higher numbers indicate greater approach behavior. Overall approach-avoidance behavior was calculated (i.e., proportion approach across all 108

trials), as well as approach-avoidance by block and valence (e.g., proportion of approach trials for positive beans in the first block).

After completing the game phase, participants complete the “Test Phase.” In this phase, points and feedback are no longer given to the participant, and they are simply asked to indicate whether a demonstrated bean was “good” or “bad.” During this phase, participants are presented with 100 beans: the 36 game beans and 64 novel beans. During the test phase, attitude formation and generalization are assessed. Overall, the BeanFest task takes around 15 minutes to complete.

The Behavioral Activation System and Behavioral Inhibition System Scale (Carver & White, 1994). This 20-item scale measures tendency to approach (with Activation) and tendency to avoid (with Inhibition). Participants indicate the extent to which they agree with each item (e.g., “I worry about making mistakes”) on a scale from 1 (“Strongly Agree”) to 4 (“Strongly Disagree”). The Inhibition scale is assessed with 7 items (e.g., “I feel pretty worried or upset when I think or know somebody is angry at me”; $\alpha = .74$). The Activation scale is comprised of 3 subscales: Reward Responsiveness (5 items, $\alpha = .73$), Drive (4 items, $\alpha = .76$), and Fun Seeking (4 items, $\alpha = .66$). The strength of the inter-factor correlations varies: $r_s = -.12$ (Inhibition – Drive), $.28$ (Inhibition - Reward Responsiveness), $-.08$ (Inhibition - Fun Seeking), $.34$ (Drive – Reward Responsiveness), $.41$ (Drive - Fun Seeking), and $.36$ (Reward Responsiveness - Fun Seeking).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). This 20-item scale measures state positive and negative affect. Participants indicate the extent to which they are currently experiencing a number of positive (e.g., strong, interested) and negative emotions (e.g., irritable, distressed) on a scale from 1 (“Very slightly or not at all”) to 5 (“Extremely”). The Positive ($\alpha = .88$) and Negative ($\alpha = .87$) factors each have 10 items, and

they intercorrelate at $r = -.17$. This measure was included to help establish that differences in approach-avoidance were truly associated with differences in disgust sensitivity, and not just negative affect.

Demographic Questions and Potential Covariates. Participants were asked to report standard demographic information: gender, age, year in college, sexual orientation, political orientation, marital status, ethnicity, religious affiliation, SES, hometown size, and psychology courses taken. In addition, several questions assessed general health or salience of illness (e.g., Have you received a flu shot this semester?, Have you been ill in the past month?). Past research has demonstrated that recently being ill can have an effect on participant vulnerability to illness and disgust sensitivity (Miller & Maner, 2011). To control for any possible confounds, these items were included to use as potential covariates in the analyses.

Procedure

After entering the lab, participants were received by the experimenter and seated at individual computer workstations. The experimenter gave the participants an overview of the study and reviewed the informed consent form. Participants were asked to read and sign the informed consent form. The experimenter then handed out written instructions for the BeanFest task (see Appendix A). The experimenter read the instructions out loud, while participants read along. After going through the instructions, the experimenter allowed the participants to ask questions about the BeanFest task. After answering any questions, participants began the BeanFest task. After completing the BeanFest task, participants completed the questionnaires in a random order clumped by group: disgust measures (TDDS, DSR, and DPSSR) first, then the Behavioral Activation and Behavioral Inhibition Scale, then potential covariates (PANAS, CFS, PVD). The study always ended with demographics and recent illness questions (see Appendix B

for all measures). After completing the questionnaires, the participants were thanked, given credit, and excused.

Results

All variables were assessed for normality, outliers, and multivariate outliers. Two problems were found: the Contamination Fear Subscale (CFS) and the Behavioral Activation System Reward Responsiveness (BASRR) factor were both non-normally distributed. CFS had a skewness of .75 ($SE = .21$) and BASRR had a skewness of -1.67 ($SE = .21$) and kurtosis of 2.92 ($SE = .42$). Because the CFS was positively skewed, it was corrected with a square root transformation. The BASRR was negatively skewed and had to be inverted before being logarithmically transformed. BASRR was still non-normal after this transformation (skewness = 1.02; $SE = .21$). Analyses were run with both transformed and untransformed variables. However, there were no differences in the strength or significance of the results. Thus, for ease of interpretation, the following results are reported with the untransformed data. Means, standard deviations, and Cronbach's alphas for all self-report measures are reported in Table 1.

CFS, PVD, PANAS, and demographics were examined as potential covariates. The correlations between the potential covariates and the primary variables are all reported in Table 2. As PVD and CFS correlated with many of the disgust sensitivity measures and a couple of the approach-avoidance indices, all analyses were conducted with and without these variables included as covariates. However, the results did not differ in strength or direction when any of the covariates were controlled. Therefore, all of the results are reported without covariates included.

BeanFest. Preliminary analyses were conducted with the BeanFest data to ensure that participants were attending to the computer task and that past performance patterns were

replicated. First, approach-avoidance behavior during the game, or learning phase, was examined. Approach-avoidance indices were created by averaging participants' approach rates to the different types of bean (positive or negative) in each block. When participants approached a bean on a given trial, it was given a score of "1," and when they avoided a bean, it was given a score of "0." Thus, the approach-avoidance indices reflected the proportion of trials participants approached positive or negative beans during each block of the game. A 3 (block) X 2 (bean valence) repeated measures ANOVA was performed on the approach rates throughout the game. There was no significant effect for block ($p = .27$), but there was a significant main effect for bean valence, $F(1, 131) = 100.82, p < .001$. Positive beans ($M = .70, SD = .19$) were approached significantly more than negative beans ($M = .50, SD = .24$) were. There was also a significant interaction between block and bean valence, $F(2, 130) = 30.23, p < .001$ (see Figure 1). Post hoc analyses decomposing the interaction indicated that through the course of the task, approach rates for positive beans increased across the three blocks ($Ms = 66\%, 70\%$, and 73% , respectively; all differences $p < .05$), whereas the approach rates for negative beans decreased across the three blocks ($Ms = 57\%, 50\%$, and 46% , respectively; all differences $p < .05$). This pattern matches the results from previous studies in which BeanFest was utilized (e.g., Fazio et al., 2004; Shook & Fazio, 2009).

In the test phase after the game, participants' learning of the beans (i.e., ability to correctly classify beans as positive or negative) was assessed. Learning was indexed in a similar manner to approach. Correct responses were scored as "1," and incorrect responses were scored as "0." These scores were averaged for the negative and positive beans separately. Thus, learning represented the proportion of positive or negative beans correctly classified. Participants correctly identified both positive ($M = .56, SD = .18$) and negative ($M = .73, SD =$

.19) beans at levels higher than chance (i.e., .50) during the test phase ($t(132) = 4.17, p < .001$; $t(132) = 13.83, p < .001$, respectively). In other words, participants learned to distinguish both positive and negative beans at levels better than chance, indicating that they were engaged with the task.

Primary Analyses. To assess the main hypotheses, bivariate correlations were run between the disgust sensitivity measures (i.e., the Three Domain Disgust Scale, the Disgust Scale Revised, and the Disgust Propensity and Sensitivity Scale) and the approach-avoidance measures (Behavioral Activation and Inhibition Scale, approach-avoidance indices from the BeanFest task) (see Table 3). Several of the disgust sensitivity measures (i.e., the TDDS Sexual subscale, the DSR Animal Reminder and Core subscales, and Disgust Propensity) were positively correlated with the Behavioral Inhibition scale. The DSR Contamination Threat subscale, the TDDS Moral and Pathogen subscales, and the DPSSR Disgust Sensitivity subscale followed the same pattern and had positive correlations with Inhibition, but did not reach conventional levels of significance. None of the disgust sensitivity measures were associated with the Behavioral Activation scales. That is, participants who were higher in disgust sensitivity generally reported more avoidance of negative outcomes.

With regard to the BeanFest approach-avoidance indices, there were several significant correlations with disgust sensitivity measures. Specifically, the TDDS Pathogen subscale, the DSR Contamination Threat subscale, and the DSR Core subscale negatively correlated with approach of positive beans across all three blocks of the game, with one exception. Pathogen disgust did not significantly correlate with approach of positive beans in the third block, although the correlation was in the same direction. Thus, the higher participants were on these factors of disgust sensitivity, the less likely they were to approach positive beans across the entire task.

None of the disgust sensitivity measures correlated with approach-avoidance of negative beans, except for the moral disgust component of the TDDS. During the first and second blocks of the game, moral disgust sensitivity positively correlated with approach of negative beans. The higher participants were in moral disgust, the more likely they were to approach negative beans in the first two blocks.

Discussion

The purpose of Study 1 was investigating a correlational relation between disgust sensitivity and approach-avoidance behavior as measured through the BeanFest task and the Behavioral Inhibition/Activation Scale. The results partially confirmed the main hypotheses. Specifically, disgust sensitivity was positively correlated with avoidance behavior, but only with positively valued stimuli in the BeanFest task. In other words, the more disgust sensitive the participants were, the more likely they were to avoid the positive beans during the BeanFest task. Interestingly, disgust sensitivity generally was not associated with approach-avoidance of negative beans. This difference could be because disgust sensitivity reduces risk of exposure: beans that have proven to be bad are learned quickly, but ones that are good may take more time to learn. During that time, the positive beans are ambiguous and riskier to approach. Those who are more sensitive might be taking the safer route and avoiding them altogether.

In regards to the self-report measures of approach-avoidance, the only significant associations were with the Behavioral Inhibition Scale. Most of the disgust factors positively correlated with the Inhibition Scale, whereas none correlated with the Behavioral Activation Scales. The more easily disgusted that people felt, the more likely they were to endorse attitudes that focus on avoiding negative outcomes, but there was no difference in the endorsement for attitudes that focus on attaining positive outcomes. One possible explanation for these findings is

that the behavioral immune system does not reward positive outcomes: it reinforces the avoidance of negative outcomes and non-interaction with negative stimuli. Those who are higher in sensitivity, who are more likely to have the behavioral immune system activated, are being more cautious and avoiding the negative outcome. This would also explain the findings from BeanFest; people with higher sensitivity behaved more cautiously with the positive beans and approached them less, avoiding the potentially negative outcome.

From these findings, it would appear that disgust sensitivity significantly relates to both approach-avoidance behavior as measured through BeanFest and self-report questionnaires. The more sensitive participants are, the more endorsement with the Inhibition scale and less approach of the positive beans in BeanFest. The primary limitation of Study 1 was the lack of experimentation: all of these findings were correlational. Study 2, however, was designed to address this limitation, by introducing an experimental manipulation of disgust.

Study 2

The purpose of this study was to investigate a causal relation between disgust and approach-avoidance behavior. Specifically, does disgust lead to avoidance behavior? Thus, the study involved an experimental manipulation, in which disgust was induced through the consumption of jellybeans that were disgustingly flavored (e.g., dog food flavored). A control group ate regularly flavored jellybeans (e.g., chocolate). It was expected that disgust activation would increase avoidant behavior. Thus, it was hypothesized that participants randomly assigned to the disgust induction condition would exhibit more avoidant behavior, as assessed by the BeanFest task, than participants randomly assigned to the control condition.

Method

Participants

A total of 135 undergraduate students were recruited from the Department of Psychology's subject pool at West Virginia University. Participants were recruited using the online SONA system which is available to all undergraduate students who are enrolled in a psychology class. The SONA system was also used for scheduling study sessions. To prevent any potential retest effects, those who participated in Study 1 were not allowed to sign up for Study 2. Before performing the analyses, two participants were removed for questionable performance on BeanFest (e.g., an entire block spent either only approaching or only avoiding). Thus, the final sample was 133. The sample was primarily female (62%), age range from 18 to 28 years ($M = 19.62$, $SD = 1.69$, and predominantly Caucasian (84%; 6.3% African American, 6.3% Asian, 2.4% Hispanic, and 0.8% American Indian).

Measures

Participants completed the same measures as in Study 1: Three Domain Disgust Scale, Disgust Scale Revised, Disgust Propensity and Sensitivity Scale-Revised, Contamination Fear Subscale, Perceived Vulnerability to Disease, BeanFest, the Behavioral Inhibition System scale, the Behavioral Activation System scale, the PANAS, and the Demographics questions.

Manipulation

Participants were randomly assigned to eat either regularly flavored or disgustingly flavored jellybeans. The disgust induction was accomplished through consumption of three jellybeans, with a dog food flavor. The control condition consumed three chocolate fudge flavored jellybeans, which were visually indistinguishable from the dog food flavored jellybeans. Participants were allowed to spit the jellybeans out into a trash can. However, the participants

were not allowed to have other food or drink in the lab, so they were not able to wash the flavor out of their mouths if they found it unpleasant. The jellybeans were pro-vegetarian, with no dairy, animal products, gluten, or peanut byproducts, so they were safe for the majority of participants to consume.

Procedure

When participants arrived at the lab, they were asked to spit out any gum they were chewing and were asked to rinse their mouths at the water fountain before being taken to the lab. They were then shown into individual private rooms. The experimenter gave the participants an overview of the study and reviewed the informed consent form. Participants were asked to read and sign the informed consent form. In the rooms, there was a small container with three jellybeans that participants were instructed to consume for a taste test. Participants were randomly assigned to the disgust or control condition. To both provide more credibility for the “taste-test” cover story, and to allow for a measure of how disgusting the participants found the jellybean, participants completed a short questionnaire about what they thought of the jellybeans, how much they liked the jellybeans, and what flavor they believed the jellybeans to be. After completing these questions, participants were told that they were moving on to an unrelated study. They were then given the BeanFest task and after completing it and the PANAS, the procedure continued as in Study 1 (the other measures were presented in random order, and the study concluded with the demographics). After the completion of the study, the participants were debriefed by the experimenter about the nature of the study, and they were allowed to ask any questions they may have. Finally, participants were thanked, given credit, and excused.

Results

All variables were assessed for normality, outliers, and multivariate outliers. The Moral factor of the Three Domain Disgust Scale was non-normally distributed, with skewness of $-.87$ ($SE = .21$), the Behavioral Activation System Reward Responsiveness was non-normally distributed with skewness of -2.19 ($SE = .21$), and the Behavioral Activation System Drive Scale was also non-normally distributed, with skewness of $-.75$ ($SE = .21$). All of the subscales were negatively skewed and had to be inverted before being transformed. TDDS-M and BASDS were corrected with a square root transformation. BASRR was logarithmically transformed, but was still non-normal after this transformation with skewness of 1.37 ($SE = .21$). Analyses were run with both transformed and untransformed variables. However, there were no differences in the strength or direction of the results. Thus, for ease of interpretation, all of the following results are reported with the untransformed data. Means, standard deviations, and Cronbach's alphas for all self-report measures are reported in Table 4.

CFS, PVD, PANAS, and demographics were examined as potential covariates. The correlations between the potential covariates and the primary variables are reported in Table 5. As PVD and CFS correlated with most of the disgust sensitivity measures and several of the approach-avoidance indices, all analyses were conducted with and without these variables included as covariates. However, the results did not differ in strength or direction when any of the covariates were controlled. Therefore, all of the results are reported without covariates included.

BeanFest. Preliminary analyses were conducted with the BeanFest data to ensure that participants were attending to the computer task and that past performance patterns were replicated. First, approach-avoidance behavior during the game, or learning phase, was

examined. A 3 (block) X 2 (bean valence) repeated measures ANOVA was performed on the approach rates throughout the game. There was a significant main effect for block, $F(2, 131) = 4.12, p = .02$. Approach significantly decreased between the first ($M = .60, SD = .16$) and second ($M = .57, SD = .18$) blocks, $p = .016$. There were no other significant differences between the blocks. There was also a significant main effect for bean valence, $F(1, 132) = 107.53, p < .001$. Positive beans ($M = .67, SD = .17$) were approached significantly more than negative beans ($M = .47, SD = .23$) were. There was also a significant interaction between block and bean valence, $F(2, 131) = 26.18, p < .001$ (see Figure 2). Post hoc analyses decomposing the interaction indicated that through the course of the task, approach rates for positive beans increased from block one to block three ($Ms = 66\%$ and 71% , respectively; $p < .05$), whereas the approach rates for negative beans decreased from block one to blocks two and three ($Ms = 54\%, 45\%$, and 42% , respectively; $ps < .05$).

In the test phase after the game, participants' learning of the beans (i.e., ability to correctly classify beans as positive or negative) was assessed. Participants correctly identified both positive ($M = .56, SD = .19$) and negative ($M = .74, SD = .21$) beans at levels higher than chance (i.e., $.50$) during the test phase ($t(132) = 3.72, p < .001$; $t(132) = 13.38, p < .001$, respectively). In other words, participants learned to distinguish both positive and negative beans at levels better than chance.

Manipulation Check. To determine whether the manipulation was successful, an independent samples t -test was run to compare the self-reported ranking of how the jellybean tasted. Participants in the control condition ranked their beans as better tasting overall, using the average of all the taste items ($M = 4.01, SD = 1.07$) than participants in the disgust condition ($M = 2.96, SD = 1.15$), $t(130.99) = 5.44, p < .001$. Specifically, the differences were found in the

taste of the beans, where the control condition ranked theirs as better ($M = 3.76$, $SD = 1.37$) than the disgust condition ($M = 2.39$, $SD = 1.30$; $t(131) = 5.54$, $p < .001$); The flavor of the jellybeans in the control condition was ranked as better ($M = 3.69$, $SD = 1.46$) than the disgust condition ($M = 2.22$, $SD = 1.35$; $t(131) = 6.04$, $p < .001$). The scent of the jellybeans in the control condition was ranked as better ($M = 3.64$, $SD = .82$) than the disgust condition ($M = 3.13$, $SD = 1.14$; $t(131) = 2.95$, $p = .004$). Finally, the jellybeans in the control condition were rated as more pleasant ($M = 6.06$, $SD = 2.34$) than those in the disgust condition ($M = 3.64$, $SD = 2.28$; $t(131) = 6.06$, $p < .001$). To evaluate the effect of the manipulation on mood, relevant items from the PANAS were examined for differences between conditions. Unfortunately, there were no differences between the control and disgust conditions in the extent to which participants reported feeling disgusted, repulsed, sickened, grossed out, or queasy (all $ps > .05$). Thus, although the experience of eating the disgusting flavored jellybeans was more unpleasant than the regularly flavored jellybeans, it did not make participants feel more disgust. Based on these results, it appears that the manipulation did not work to induce disgust.

To ensure that groups did not differ on any other traits, the two conditions were also compared by disgust sensitivity, behavioral inhibition, and behavioral activation (see Table 6). There were no significant differences between the conditions on any of the self-report measures (all $ps > .05$). When compared along demographic variables, the results were the same: there were no significant differences between the control and disgust condition.

Primary Analyses. To assess the main hypothesis, a 2 (condition) X 2 (valence) X 3 (block) ANOVA was conducted comparing the BeanFest approach-avoidance indices by condition. There were main effects for block [$F(2,130) = 4.15$, $p = .018$], valence [$F(1,131) = 106.56$, $p < .001$], and an interaction for valence and block [$F(2,130) = 25.87$, $p < .001$]. There

was a between subjects effect for condition, $F(1, 131) = 4.07, p = .046$, with the control condition approaching more often ($M = .61, SE = .02$) than the disgust condition ($M = .55, SE = .02$). From this, it can be concluded that the manipulation did affect approach-avoidance behavior.

Bivariate correlations were then run between the disgust sensitivity measures (i.e., the Three Domain Disgust Scale, the Disgust Scale Revised, and the Disgust Propensity and Sensitivity Scale) and the approach-avoidance measures (Behavioral Activation and Inhibition Scale, approach-avoidance indices from the BeanFest task) to determine whether the relations found in Study 1 were replicated in Study 2 (see Table 7). The negative association between disgust sensitivity and approach of positive beans in BeanFest was replicated. Specifically, Contamination Threat, Core, Propensity and Sensitivity were associated with less approach of positive beans. The negative association between disgust sensitivity and behavioral inhibition was also replicated. Animal Reminder, Core, Propensity, and Sensitivity were significantly related to more behavioral inhibition. Unlike Study 1, several measures of disgust sensitivity (i.e., Animal Reminder, Core, Propensity, and Sensitivity) were positively associated with the approach of negative beans. Additionally, there were several negative associations between the Fun Seeking subscale of behavioral activation and disgust sensitivity (Pathogen, Sexual, and Contamination Threat).

Discussion

The purpose of Study 2 was to investigate a causal relation between disgust and approach-avoidance behavior. The results, however, were inconclusive. The two conditions were significantly different on measures of avoidance in BeanFest, but it is unclear whether the

disgust induction was effective. Thus, while it can be said that the manipulation had an effect, it is not clear whether the hypothesis was correct or incorrect.

The two conditions were significantly different in how they rated the jellybeans they were given on their taste, smell, flavor, and pleasantness. The disgust condition rated their jellybeans significantly more negatively than the control condition did. However, the groups did not differ in their feelings of disgust as reported in the PANAS, so although the jellybeans may have been unpleasant, it is not known if they were disgust inducing. A possibility is that the induction worked but the effect did not last through the entirety of the BeanFest task and thus had worn off before the completion of the disgust-related items on the PANAS. The participants ate the jellybeans, filled out the taste test form, completed BeanFest, and then completed the PANAS. Potentially, the manipulation had an effect that did not persist the approximately twenty minutes it took to complete BeanFest, which would explain why participants did not report feeling more disgusted. Because the conditions were so similar overall on ratings of the PANAS, it could be concluded that the manipulation did not last through the entire study, so the primary hypothesis of Study 2 cannot be evaluated.

Examining the correlations of the disgust sensitivity and approach-avoidance variables collapsed across condition demonstrates basic replication of the patterns of associations in Study 1. In general, disgust sensitivity was associated with more behavioral inhibition and less approach of positive stimuli during the BeanFest task. Thus, these data further strengthen the argument of the hypothesized relation between disgust sensitivity and approach-avoidance behavior.

A couple of findings in Study 2 were inconsistent with Study 1. First, several disgust sensitivity measures were positively associated with approach of negative beans in Study 2. This

association demonstrates the opposite of what was hypothesized: that with higher levels of disgust sensitivity, there is more approach behavior. The second inconsistency was a significant negative association between fun seeking and disgust sensitivity. Although this association was not demonstrated in Study 1, it follows the anticipated direction: that with higher levels of disgust sensitivity, there is less approach behavior. The inconsistencies between the studies could have resulted from the manipulation present in Study 2; possibly the induction given at the beginning led to the emergence of associations not present without the induction. Overall, the correlational findings from Study 2 support the general thesis of this work: disgust sensitivity is associated with more avoidance behavior and less approach behavior.

General Discussion

Examining the results from both studies demonstrates a clear association between disgust sensitivity and approach-avoidance behavior. Both studies showed a negative association between disgust sensitivity and the approach of positive beans, as well as a positive association between disgust sensitivity and self-reported behavioral inhibition. All of this is congruent with the theoretical literature on disgust as part of the behavioral immune system; as people become more sensitive to disgust they endorse more behaviors to avoid potential negative consequences. These are important findings because while not the first, they are part of a small area of research looking at a connection between disgust sensitivity and approach-avoidance behavior directly. These two studies in particular went a step further by using a combination of both behavioral and self-report measures of approach-avoidance, and the associations were present in both types of measures. This allows for a connection to be made between both people's tendency to report themselves as risk avoidant to their actual behavior when presented with a simulated risk (to risk losing or gaining points in BeanFest).

The consistent negative association between the approach of positive beans and disgust sensitivity is rather informative. This pattern indicates that those who were more disgust sensitive were being more cautious about how they played the game, avoiding more of the positive beans than those who were lower in sensitivity; keeping in mind that approach is a riskier strategy to the game (potentially lose/gain points), whereas avoiding protects points. Those who were higher in disgust sensitivity were more protective about what they had, choosing not to take the risk as often. Furthermore, observing that the control condition and the disgust condition differed in the expected directions (control approaching more often) during BeanFest provides strong evidence about the effect of external stimuli on approach-avoidance behavior. It is important to remember that disgust sensitivity is a function of the behavioral immune system: the generalizing preemptive component of the immune system. It could be interpreted that the effect observed in both studies is that when presented with stimuli that could potentially be dangerous, those with a more reactive behavioral immune system behaved more cautiously than those with less reactive systems. This contrasts with the effect with stimuli that were unquestionably negative/dangerous; there was no difference in behavior in that situation. Above all, finding these associations across two different studies and a variety of measures demonstrates that these findings are robust and are less likely to be spurious effects.

However, that is not the only story in the data across the two studies. There was also a positive association between certain disgust subscales and the approach of negative beans. In Study 1, this positive association was only found with one subscale (i.e., Moral Disgust). Considering that it was not particularly strong and was only with one subscale in Study 1, this finding does not seem meaningful. However, in Study 2, this association was found again with multiple measures of disgust sensitivity (i.e., Animal Reminder, Core, Propensity, and

Sensitivity). Interestingly, this association was only found with approach in blocks 2 and 3 of the BeanFest game. These findings are contrary to what was expected. There may have been more going on between these constructs in Study 2, potentially a side effect of the manipulation or a third variable related to the manipulation.

From all of this, it can be said that there is a relationship between disgust sensitivity and approach-avoidance behavior: that generally higher disgust sensitivity correlates with higher avoidance both behaviorally (as seen in the BeanFest task) and self-endorsed with the questionnaire measures. This finding is important because it is one of a small number of studies that established a connection between the behavioral immune system (through disgust) and approach-avoidance behavior directly (behaviorally through BeanFest and self-reported through the questionnaires), and not indirectly through a proxy (e.g., reaction time to different stimuli). Through that connection, the literature can move forward and investigate more complex questions and expand upon the relationship between disgust sensitivity and approach-avoidance behavior. Previous work in this area primarily conceptualized approach-avoidance behavior through willingness to interact with the object of a phobia; this work demonstrates that it does not need to be such an extreme case to find an association between the constructs. The implication this carries is that the findings of this work will apply much more generally than may have previously been thought. For example, disgust sensitivity could play a role in social avoidance that doesn't qualify as a phobia, or in prejudice and discrimination towards groups that does not have a connection to disease threat.

Limitations. One major limitation of these studies was the relative uniformity of the participants. In both studies, the demographics were non-representative: Caucasian by a large majority and primarily female. In a replication study, care should be taken to obtain a more

diverse sample to examine if these findings will generalize to the broader population. Although previous research and theory indicate that there should not be any major difference between populations and groups, not having a more diverse sample of other groups is still a limitation to correct in the future.

Another major limitation was the manipulation not working as intended in Study 2. Without the ability to say that the induction caused disgust, the ability to draw conclusions from it was severely limited. It is possible to say that there was a casual difference between the approach rates in the two conditions, but it cannot be said what actually caused it: it could be general negative or positive affect, disgust, or something different. The manipulation may not have lasted long enough to get through the entire study. A simple remedy to this would be to have participants take the jellybeans steadily throughout the course of the study, as opposed to taking them at the beginning all at once. Or to use a different type of manipulation altogether, involving something more intense or hands-on for the participant. Ensuring that the manipulation check occurs early into the study would have been a better way to ascertain how the induction worked as well.

A limitation in these studies was the exclusive reliance upon self-report measures for disgust sensitivity. Although it would be a little difficult to implement, facial expressions of the participants after the induction could be measured to check for disgust in the participants; in conjunction with their self-report data, it should provide a better measure of disgust levels than just self-report. Similar to the variety of disgust measures used, an improvement to any future studies would make use of more approach-avoidance measures. Though care should be taken to not make the study too long and fatigue the participants.

Another major limitation in these two studies is that with the manipulation check not working as intended, there is no way to comment on the source of the differences observed in Study 2. The manipulation had an effect on the approach-avoidance of the two conditions, but there is no way to determine if it was negative affect, positive affect, disgust, or something else similar that was roused by the induction procedure really being the primary driving force behind all the findings discussed in Study 2.

Conclusion. Over two studies this work has demonstrated an association between disgust sensitivity and approach-avoidance behavior across a number of measures consistently; providing more evidence for the argument that the behavioral immune system through disgust influences how people interact with the world and unknown stimuli within it. This study in particular was able to provide evidence for the behavioral immune system influencing not only how people interact with the world through BeanFest, but also how people view themselves interacting with the world through the Behavioral Inhibition/Activation System. Although a causal link could not be demonstrated, this is still a definitive step forward with these two constructs.

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Tables and Figures

Table 1

Descriptive Statistics for Self-Report Measures in Study 1

Measure	Mean	SD	α
TDDS	4.46	.93	.86
TDDS-Pathogen	4.71	1.00	.73
TDDS-Sexual	3.97	1.43	.83
TDDS-Moral	4.69	1.34	.87
DSR	2.84	.54	.83
DSR-Contamination	2.33	.79	.62
DSR-Animal Reminder	2.98	.75	.66
DSR- Core	2.95	.55	.72
Propensity	20.06	4.93	.65
Sensitivity	20.75	5.10	.74
Behavioral Inhibition	3.01	.58	.75
BAS-Reward Responsiveness	3.61	.52	.85
BAS-Fun Seeking	3.09	.66	.77
BAS-Drive	2.96	.70	.84
CFS	2.18	.84	.87
PVD	3.54	.84	.74
Illness Recency	3.28	1.20	.61
Positive Affect	2.68	.82	.89
Negative Affect	1.50	.50	.91

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; CFS – Contamination Fear Scale; PVD – Perceived Vulnerability to Disease

Table 2

Correlations between Primary Measures and Covariates in Study 1

Variables	Age	Gender	Positive Affect	Negative Affect	PVD	CFS	Illness Recency
TDDS-Pathogen	.08	.16	.07	.09	.24**	.33***	.02
TDDS-Sexual	.03	.46***	-.01	-.07	.36***	.30***	.17*
TDDS-Moral	.17	.11	.25**	-.06	.18*	.13	.07
DSR-Animal Reminder	-.24**	.18*	-.21*	.11	.12	.22*	.01
DSR-Contamination Threat	.05	.08	.05	.07	.46***	.58***	-.04
DSR-Core	-.01	.31***	-.09	.08	.32***	.36***	.11
Propensity	.08	.07	-.14	.21*	.16	.26**	.14
Sensitivity	.02	-.05	-.12	.22*	.25**	.36***	-.01
Behavioral Inhibition	-.09	.15	-.10	.17	-.01	.01	.20*
BAS Reward Responsiveness	-.04	.12	.09	-.03	-.12	.05	.11
BAS Fun Seeking	-.12	.17	-.00	-.10	-.23**	-.25**	.12
BAS Drive	-.06	.06	.07	-.08	-.15	.07	-.00
B1 Negative Approach	.12	-.07	-.01	.02	.05	.12	-.03
B2 Negative Approach	.06	-.07	-.07	.08	.06	.13	.06
B3 Negative Approach	.01	-.03	-.11	.16	.02	.12	.08
B1 Positive Approach	.04	-.13	.03	-.09	-.22*	-.17*	-.07
B2 Positive Approach	.00	-.11	-.01	-.05	-.07	-.11	.04
B3 Positive Approach	-.08	-.20*	.01	.04	-.12	-.11	.05

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; CFS – Contamination Fear Scale; PVD – Perceived Vulnerability to Disease; B1 – Block 1; B2 – Block 2; B3 – Block 3

Table 3

Correlations between Disgust Sensitivity and Approach-Avoidance Variables in Study 1

Variables	TDDS- Pathogen	TDDS- Sexual	TDDS- Moral	DSR- Animal Reminder	DSR- Contamination Threat	DSR- Core	Propensity	Sensitivity
B1 Negative Approach	.05	.12	.20*	-.02	.10	-.05	-.05	.01
B2 Negative Approach	.09	0.0	.17*	.03	.03	-.03	-.04	-.08
B3 Negative Approach	.16	.02	.11	.13	.10	.04	.01	-.03
Avg. Negative Approach	.12	.04	.18*	.06	.09	-.01	-.03	-.04
B1 Positive Approach	-.23**	-.08	.07	-.11	-.24**	-.23**	-.09	-.04
B2 Positive Approach	-.19*	-.01	.09	-.04	-.29**	-.22*	-.02	-.01
B3 Positive Approach	-.16	-.01	.06	-.02	-.24**	-.19*	-.00	.04
Avg. Positive Approach	-.22*	-.04	.08	-.06	-.30**	-.25**	-.04	-.00
Behavioral Inhibition	.07	.20*	.10	.28**	.06	.23**	.25**	.15
BAS Reward Responsiveness	.07	.10	.08	-.05	-.01	.01	.01	-.04
BAS Fun Seeking	.07	-.14	-.06	-.05	-.14	.05	-.10	-.12
BAS Drive	.08	-.08	.02	-.08	.03	.02	.03	.02

* $p < .05$, ** $p < .01$

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; Block 1; B2 – Block 2; B3 – Block 3

Table 4

Descriptive Statistics for Self-Report Measures in Study 2

Measure	Mean	SD	α
TDDS	4.52	.92	.87
TDDS-Pathogen	4.96	.99	.79
TDDS-Sexual	3.96	1.42	.84
TDDS-Moral	4.66	1.26	.85
DSR	2.97	.55	.84
DSR-Contamination	2.45	.78	.63
DSR-Animal Reminder	3.05	.79	.69
DSR- Core	3.12	.55	.69
Propensity	20.88	5.50	.75
Sensitivity	22.11	5.02	.72
Behavioral Inhibition	2.96	.57	.72
BAS-Reward Responsiveness	3.55	.69	.94
BAS-Fun Seeking	3.15	.67	.81
BAS-Drive	2.98	.74	.88
CFS	2.36	.85	.88
PVD	3.71	.91	.80
Illness Recency	3.27	1.29	.67
Positive Affect	2.56	.86	.90
Negative Affect	1.48	.49	.92

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; CFS – Contamination Fear Scale; PVD – Perceived Vulnerability to Disease

Table 5

Correlations between Covariates and Primary Measures in Study 2

Variables	Age	Gender	Positive Affect	Negative Affect	PVD	CFS	Illness Recency
TDDS-Pathogen	-.06	.21*	.04	.09	.44***	.46***	.08
TDDS-Sexual	.08	.51***	-.09	-.04	.25**	.34***	.01
TDDS-Moral	.15	-.02	.15	.09	.10	.12	.10
DSR-Animal Reminder	-.13	.04	.05	.06	.32***	.47***	.07
DSR-Contamination Threat	.08	.00	.21*	.09	.44***	.61***	.02
DSR-Core	-.04	.28**	.03	.20*	.51***	.58***	.10
Propensity	.03	.21*	-.14	.35***	.38***	.39***	.13
Sensitivity	.01	.25**	-.05	.28**	.45***	.43***	.10
Behavioral Inhibition	-.20*	.18*	-.19*	.07	.12	.07	.07
BAS Reward Responsiveness	-.19*	.11	.08	.05	-.03	-.15	.06
BAS Fun Seeking	-.08	.09	-.08	.20*	-.13	-.20*	.07
BAS Drive	.08	-.00	.14	.14	.00	-.07	-.03
B1 Negative Approach	-.13	.06	.12	.14	.08	.02	.01
B2 Negative Approach	-.02	.18*	.02	.26**	.10	.18*	.02
B3 Negative Approach	.01	.17	-.11	.19*	.04	.20*	-.01
B1 Positive Approach	-.10	-.08	.12	.01	-.13	-.26**	-.24**
B2 Positive Approach	-.11	-.05	.09	.08	-.21*	-.26**	-.26**
B3 Positive Approach	-.13	-.04	.02	.03	-.09	-.11	-.24**

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; CFS – Contamination Fear Scale; PVD – Perceived Vulnerability to Disease; Block 1; B2 – Block 2; B3 – Block 3

Table 6

Descriptive Statistics for Self-Report Measures in Study 2

Measure	Mean Control	SD Control	Mean Disgust	SD Disgust	<i>t</i>
TDDS-Pathogen	4.95	1.07	4.97	.92	-.11
TDDS-Sexual	3.99	1.47	3.94	1.38	.19
TDDS-Moral	4.85	1.33	4.46	1.16	1.79
DSR-Contamination	2.45	.81	2.45	.75	.01
DSR-Animal Reminder	3.03	.79	3.07	.80	-.29
DSR- Core	3.15	.51	3.08	.53	.73
Propensity	21.30	5.61	20.49	5.41	.84
Sensitivity	22.27	5.26	21.96	4.82	.35
Positive Affect	2.70	.74	2.43	.95	1.84
Negative Affect	1.48	.51	1.47	.47	.15
PANAS-Disgusted	1.31	.73	1.36	.80	-.37
PANAS-Repulsed	1.20	.60	1.22	.68	-.13
PANAS-Sickened	1.19	.53	1.25	.78	-.51
PANAS-Grossed Out	1.19	.50	1.29	.71	-.96
PANAS-Queasy	1.13	.42	1.20	.58	-.88
Behavioral Inhibition	3.03	.54	2.90	.60	1.25
BAS-Reward Responsiveness	3.64	.57	3.48	.78	1.38
BAS-Fun Seeking	3.19	.67	3.11	.67	.68
BAS-Drive	3.06	.69	2.90	.78	1.25

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; PANAS – Positive and Negative Affect Schedule

Table 7

Correlations between Disgust Sensitivity and Approach-Avoidance Variables in Study 2

	TDDS- Pathogen	TDDS- Sexual	TDDS- Moral	DSR- Animal Reminder	DSR- Contamination Threat	DSR- Core	Propensity	Sensitivity
B1 Negative Approach	.08	.02	.11	.04	-.04	.03	-.03	.06
B2 Negative Approach	.10	.13	.07	.18*	.08	.22*	.21*	.25**
B3 Negative Approach	.08	.05	.05	.17*	.08	.16	.18*	.23**
Avg. Negative Approach	.10	.08	.08	.16	.06	.17	.15	.21*
B1 Positive Approach	-.06	.02	.10	-.16	-.21*	-.18*	-.19*	-.20*
B2 Positive Approach	-.06	-.00	-.00	-.09	-.23**	-.19*	-.19*	-.23**
B3 Positive Approach	-.08	-.02	-.01	.05	-.15	-.10	-.05	-.05
Avg. Positive Approach	-.08	-.01	.03	-.07	-.22*	-.17*	-.16	-.18*
Behavioral Inhibition	.16	.14	.01	.18*	.09	.23**	.45***	.37***
BAS Reward Responsiveness	-.00	-.03	.08	.03	-.17	-.05	.09	.06
BAS Fun Seeking	-.18*	-.21*	-.00	-.07	-.21*	-.10	.13	-.01
BAS Drive	-.14	-.15	.01	-.04	-.04	-.07	.09	-.02

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: TDDS – Three Domain Disgust; DSR – Disgust Scale Revised; BAS – Behavioral Activation System; Block 1; B2 – Block 2; B3 – Block 3

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Figure 1. Interaction between Positive and Negative Valence Approach Rates in BeanFest for Study 1

Figure 2. Interaction between Positive and Negative Valence Approach Rates in BeanFest collapsed across conditions in Study 2

Appendix A

INSTRUCTIONS FOR BEANFEST

You are going to play a computer game that we call BEANFEST. The game involves beans and points. The objective of the game is to increase your points by selecting beans that increase your point total and avoiding beans that decrease your point total. You will begin the game with 50 points and will be presented with a series of beans, one bean at a time. Your job is to select the “good” beans and avoid the “bad” beans. For every “good” bean you select, your point total will increase by 10 points until you reach 100, at which point you win the game. However, for every “bad” bean you select, you will lose 10 points, until your score reaches 0, at which point you will lose the game. As you play the game, it is important to learn which beans have a positive value and choose them in order to make gains. Also, you need to learn which beans have a negative value so that you can avoid them in order to avoid losing points.

The beans vary in appearance in two important ways. First, they vary in shape - circular to oval to oblong. Second, they vary in the extent to which they are speckled - marked with few to some to many dots. It is important to learn how to tell the beans apart in order to be successful. Here are a few examples.

Circular with few speckles

Oval with some speckles

Oblong with many speckles

BEANFEST consists of three rounds, and there are many trials in each round. On each trial, you will be presented with a bean in the upper portion of the screen. Use the keyboard to indicate whether you wish to select the bean or not. Press the “K” key, if you wish to select the bean. Press the “D” key, if you do not want to select the bean.

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The lower third of the screen provides you with valuable information. To the left is your point meter. It displays your current points as a bar ranging from 0 to 100. Your specific point level is displayed numerically. In addition, the point bar fluctuates to reflect your current level.

If you choose not to select the presented bean, your decision will be shown in the lower right of the screen, as below. Your point value will not change.

Decision	NO
Effect of bean	

If you select the bean, your decision will be shown in the lower right of the screen, as below, and your point value will be updated. The effect of the bean will also be displayed, with negative numbers indicating that the bean reduced your points and positive numbers indicating that the bean increased your points. So, for example, if you choose a bean whose value is +10, your point value will increase by 10 and your display will show the following:

Decision	YES
Effect of bean	10

If, on the other hand, you choose a bean whose value is -10, your point value will decrease by 10 and your display will show the following:

Decision	YES
Effect of bean	-10

As noted earlier, you will begin the game with 50 points. You should try to do your best throughout the game to gain points and avoid losing points by making good decisions about which beans to select. Reaching 100 represents winning the game, and reaching 0 represents losing the game. If your point level ever reaches 100, you will immediately be notified of the fact that you have won. You will then start a new game with 50 points. If your point level ever reaches 0, you will immediately be notified of the fact that you have lost. Again, you will then start a new game with 50 points. In any new games, the beans retain their original values. That is, previously good beans continue to increase your points and previously bad beans continue to decrease your points.

The game actually begins with a short practice block of 6 trials. These 6 beans are just a few of the ones that you will see during the game, but they are of the same type and have the same value as they will during the game. So, this is your first opportunity to begin to learn about some of the beans. For these 6 practice trials, always respond YES. The practice trials are intended as an opportunity to familiarize you with the game and feedback displays.

Once the practice block is over, there will be a break in case you have any questions about the game. At that time, we can address them before starting the game. When you start the actual game, you will begin with 50 points. Remember, try to increase your points and avoid losing your points. Press the "K" key if you wish to select the bean, and the "D" key if you do not. At the beginning of the game, you will probably select beans somewhat indiscriminately,

simply because you do not know any better. You will need to learn which beans have positive values and which have negative values. As you begin to do so, you can be more selective about which beans to choose and which to avoid, which is the only way to increase your points. Remember, the beans vary visually in two **(and only)** two important ways: (1) shape, from circular to oval to oblong and (2) number of speckles, from few to some to many. Try your best on the task.

TEST PHASE

In this final test phase, you will be presented with the beans to which you were just exposed. No point meter or feedback will be displayed. In this part of the experiment, we simply want to know whether you believe a given bean to be “good” or “bad.” Again, use the keyboard. Press the “K” key if this is a bean that you would select, i.e., one that you believe increases your point level. Press the “D” key if this is a bean that you would not select, i.e., one that you believe would decrease your points. Try to respond as accurately and as quickly as possible. Don't be in such a hurry that you regret your response. But, try to respond as quickly as you can without sacrificing accuracy. So, maximize both the speed and the accuracy of your responses. There may be some beans that are unfamiliar or that you are unsure about. For these beans make your best guess. Just be sure to respond on each and every trial within the allotted 10 seconds.

There is no practice block. So be ready.

Appendix B

Study Measures

Three Domain Disgust Scale
(Tybur et al., 2009)

The following items describe a variety of concepts. Please rate how disgusting you find the concepts described in the items, where 0 means that you do not find the concept disgusting at all, and 6 means that you find the concept extremely disgusting.

1. Shoplifting a candy bar from a convenience store
2. Hearing two strangers having sex
3. Stepping on dog poop
4. Stealing from a neighbor
5. Performing oral sex
6. Sitting next to someone who has red sores on their arm
7. A student cheating to get good grades
8. Watching a pornographic video
9. Shaking hands with a stranger who has sweaty palms
10. Deceiving a friend
11. Finding out that someone you don't like has sexual fantasies about you
12. Seeing some mold on old leftovers in your refrigerator
13. Forging someone's signature on a legal document
14. Bringing someone you just met back to your room to have sex
15. Standing close to a person who has body odor
16. Cutting to the front of a line to purchase the last few tickets to a show
17. A stranger of the opposite sex intentionally rubbing your thigh in an elevator

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18. Seeing a cockroach run across the floor
19. Intentionally lying during a business transaction
20. Having anal sex with someone of the opposite sex
21. Accidentally touching a person's bloody cut

Disgust Scale-Revise
(Olatunji et al., 2009)

Please indicate how much you agree with each of the following statements, or how true it is about you. Please write a number (0-4) to indicate your answer:

0 = Strongly disagree (very untrue about me)

1 = Mildly disagree (somewhat untrue about me)

2 = Neither agree nor disagree

3 = Mildly agree (somewhat true about me)

4 = Strongly agree (very true about me)

___ 1. I might be willing to try eating monkey meat, under some circumstances.

___ 2. It would bother me to be in a science class, and to see a human hand preserved in a jar.

___ 3. It bothers me to hear someone clear a throat full of mucous.

___ 4. I never let any part of my body touch the toilet seat in public restrooms.

___ 5. I would go out of my way to avoid walking through a graveyard.

___ 6. Seeing a cockroach in someone else's house doesn't bother me.

___ 7. It would bother me tremendously to touch a dead body.

___ 8. If I see someone vomit, it makes me sick to my stomach.

___ 9. I probably would not go to my favorite restaurant if I found out that the cook had a cold.

___ 10. It would not upset me at all to watch a person with a glass eye take the eye out of the socket.

___ 11. It would bother me to see a rat run across my path in a park.

___ 12. I would rather eat a piece of fruit than a piece of paper

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____ 13. Even if I was hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed flyswatter.

____ 14. It would bother me to sleep in a nice hotel room if I knew that a man had died of a heart attack in that room the night before.

How disgusting would you find each of the following experiences? Please write a number (0-4) to indicate your answer:

0 = Not disgusting at all

1 = Slightly disgusting

2 = Moderately disgusting

3 = Very disgusting

4 = Extremely disgusting

____ 15. You see maggots on a piece of meat in an outdoor garbage pail.

____ 16. You see a person eating an apple with a knife and fork

____ 17. While you are walking through a tunnel under a railroad track, you smell urine.

____ 18. You take a sip of soda, and then realize that you drank from the glass that an acquaintance of yours had been drinking from.

____ 19. Your friend's pet cat dies, and you have to pick up the dead body with your bare hands.

____ 20. You see someone put ketchup on vanilla ice cream, and eat it.

____ 21. You see a man with his intestines exposed after an accident.

____ 22. You discover that a friend of yours changes underwear only once a week.

____ 23. A friend offers you a piece of chocolate shaped like dog-doo.

____ 24. You accidentally touch the ashes of a person who has been cremated.

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____25. You are about to drink a glass of milk when you smell that it is spoiled.

____26. As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth.

____27. You are walking barefoot on concrete, and you step on an earthworm.

Disgust Propensity and Sensitivity Scale-Revised
(van Overveld et al., 2006)

Respond to the following items on a scale from 1 to 5, 1 being never and 5 being always.

1. I screw up my face in disgust.*
2. Disgusting things make my stomach turn.*
3. I experience disgust.*
4. I find something disgusting.*
5. I feel repulsed.*
6. When I experience disgust, it is an intense feeling.*
7. I become disgusted more easily than other people.*
8. I avoid disgusting things.*
9. It scares me when I feel faint.*
10. It scares me when I feel nauseous.*
11. When I feel disgusted, I worry that I might pass out.*
12. I think feeling disgust is bad for me.*
13. I think disgusting items could cause me illness/infection*.
14. I worry that I might swallow a disgusting thing.*
15. It embarrasses me when I feel disgusted.*
16. When I notice that I feel nauseous, I worry about vomiting.*

Contamination Fear Subscale

(Burns et al., 1996)

Respond to the following items on a scale of 0 to 4, 0 being Not at All and 4 being Very Much.

1. I feel my hands are dirty when I touch money.
2. I think even slight contact with bodily secretions (sweat, saliva, etc.) may contaminate my clothes or somehow harm me.
3. I find it difficult to touch an object when I know it has been touched by strangers or by certain people.
4. I find it difficult to touch garbage or dirty things.
5. I avoid using public toilets because I am afraid of disease and contamination.
6. I avoid using public telephones because I am afraid of contagion and disease.
7. I wash my hands more often and longer than necessary.
8. I sometimes have to wash or clean myself simply because I think I may be dirty or 'contaminated'.
9. If I touch something I think is 'contaminated', I immediately have to wash or clean myself.
10. If an animal touches me, I feel dirty and immediately have to wash myself or change my clothing.

Perceived Vulnerability to Disease

(Duncan et al., 2009)

Respond to the following items on a scale of 1 to 7, 1 being strongly disagree and 7 being strongly agree.

1. In general, I am very susceptible to colds, flu and other infectious diseases.
2. I am unlikely to catch a cold, flu or other illness, even if it is 'going around'. (reverse-scored)
3. If an illness is 'going around', I will get it.
4. My immune system protects me from most illnesses that other people get. (reverse-scored)
5. I am more likely than the people around me to catch an infectious disease.
6. My past experiences make me believe I am not likely to get sick even when my friends are sick. (reverse-scored)
7. I have a history of susceptibility to infectious disease.
8. I prefer to wash my hands pretty soon after shaking someone's hand.
9. I avoid using public telephones because of the risk that I may catch something from the previous user.
10. I do not like to write with a pencil someone else has obviously chewed on.
11. I dislike wearing used clothes because you do not know what the last person who wore it was like.
12. I am comfortable sharing a water bottle with a friend. (reverse-scored)
13. It really bothers me when people sneeze without covering their mouths.
14. It does not make me anxious to be around sick people. (reverse-scored)
15. My hands do not feel dirty after touching money. (reverse-scored)

Behavioral Inhibition Scale & Behavioral Activation Scale

(Carver & White, 1994)

Using the scale below, please write the appropriate number in the blank beside each item.

	1	2	3	4
	Strongly
Agree			Strongly
Disagree
1. ____	If I think something unpleasant is going to happen, I usually get pretty "worked up."			
2. ____	I worry about making mistakes.			
3. ____	Criticism or scolding hurts me quite a bit.			
4. ____	I feel pretty worried or upset when I think or know somebody is angry at me.			
5. ____	Even if something bad is about to happen to me, I rarely experience fear or nervousness.			
6. ____	I feel worried when I think I have done poorly at something.			
7. ____	I have very few fears compared to my friends.			
8. ____	When I get something I want, I feel excited and energized.			
9. ____	When I'm doing well at something, I love to keep at it.			
10. ____	When good things happen to me, it affects me strongly.			
11. ____	It would excite me to win a contest.			
12. ____	When I see an opportunity for something I like, I get excited right away.			
13. ____	When I want something, I usually go all-out to get it.			
14. ____	I go out of my way to get things I want.			
15. ____	If I see a chance to get something I want, I move on it right away.			
16. ____	When I go after something I use a "no holds barred" approach.			
17. ____	I will often do things for no other reason than that they might be fun.			
18. ____	I crave excitement and new sensations.			
19. ____	I'm always willing to try something new if I think it will be fun.			

DISGUST AND APPROACH-AVOIDANCE

20. ____ I often act on the spur of the moment.

PANAS

(Watson, Clark, & Tellegen, 1988)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

1	2	3	4	5
Very slightly	A little	Moderately	Quite a bit	Extremely
Or not at all				

<p>_____ interested</p> <p>_____ distressed</p> <p>_____ excited</p> <p>_____ upset</p> <p>_____ strong</p> <p>_____ guilty</p> <p>_____ scared</p> <p>_____ hostile</p> <p>_____ enthusiastic</p> <p>_____ proud</p> <p>_____ disgusted</p> <p>_____ tense</p> <p>_____ infuriated</p> <p>_____ outraged</p> <p>_____ grossed out</p> <p>_____ queasy</p> <p>_____ furious</p>	<p>_____ irritable</p> <p>_____ alert</p> <p>_____ ashamed</p> <p>_____ inspired</p> <p>_____ nervous</p> <p>_____ determined</p> <p>_____ attentive</p> <p>_____ jittery</p> <p>_____ active</p> <p>_____ afraid</p> <p>_____ angry</p> <p>_____ repulsed</p> <p>_____ anxious</p> <p>_____ sickened</p> <p>_____ contempt</p> <p>_____ mad</p> <p>_____ disturbed</p>
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Demographics Questions

Gender: Male Female

Age: _____

Year in College:

Freshman

Sophomore

Junior

Senior

Other: _____

Sexual orientation:

Straight/Heterosexual

Lesbian/Homosexual Female

Gay/Homosexual Male

Bi-sexual

Transgendered

Other _____

Political orientation:

Very conservative

Conservative

Moderate

Liberal

Very liberal

What political party best represents your beliefs?

___ Democrat ___ Republican ___ Libertarian ___ Independent ___ Other

Marital Status:

_____ Single

_____ Married

_____ Separated

_____ Divorced

_____ Widowed

Ethnicity:

_____ White/Caucasian

_____ Hispanic/Latino(a)

_____ African-American/Black

_____ Asian

_____ Native American

_____ Other – Please list: _____

DISGUST AND APPROACH-AVOIDANCE

What is your religious affiliation:

_____ Christian – Protestant
_____ Christian – Catholic
_____ Hindu
_____ Buddhist
_____ Not religious

_____ Muslim
_____ Jewish
_____ Atheist
_____ Agnostic
_____ Other – Please list: _____

What is your family income?

_____ Less than \$10,000
_____ \$10,000 to \$19,999
_____ \$20,000 to \$29,999
_____ \$30,000 to \$39,999
_____ \$40,000 to \$49,999
_____ \$50,000 to \$59,999
_____ \$60,000 to \$69,999
_____ \$70,000 to \$79,999
_____ \$80,000 to \$89,999
_____ \$90,000 to \$99,999
_____ \$100,000 to \$149,999
_____ \$150,000 or more

How would you characterize your hometown?

_____ rural (unincorporated)
_____ small town (village or town)
_____ suburban (metropolitan area of a large city)
_____ small city (population < 30,000)
_____ medium-sized city (population 30,000 – 100,000)
_____ large city (population > 100,000)

Please list all psychology courses that you have taken.

Illness Recency

Respond to the following items on a scale of 1 to 7, 1 being strongly disagree and 7 being strongly agree.

1. Over the past couple days, I have not been feeling well.
2. Lately, I have been feeling a little under the weather.
3. I have felt sick within the past week.
4. I had a cold or flu recently.

When was the last time you had a cold?

- A. Today
- B. A couple days ago
- C. A week ago
- D. A couple weeks ago
- E. A month ago
- F. A few months ago
- G. A year or more ago

Taste Test Form

Directions: Choose the number that best answers each question. 1 is the worst and 6 is the best.

How does the food look?	1	2	3	4	5	6
How does the food taste?	1	2	3	4	5	6
How is the texture?	1	2	3	4	5	6
How is the flavor?	1	2	3	4	5	6
How does the food smell?	1	2	3	4	5	6

On a scale of 1-10, 1 being unpleasant, 10 being pleasant, rate the food.

1	2	3	4	5	6	7	8	9	10
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What flavor do you think it was?