

THE ASSOCIATION BETWEEN
PARENTING AND DISGUST SENSITIVITY

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ABSTRACT

THE ASSOCIATION BETWEEN PARENTING AND DISGUST SENSITIVITY

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The purpose of this thesis was to assess the association between the developmental stage of parenting and changes in disgust sensitivity. Little disgust research has focused on the parenting domain, and virtually none has attempted to describe disgust sensitivity differences between parents and non-parents. The study used an ex post-facto quasi-experimental design with a self-report survey method. The subjects were male and female parents of young children ($n=39$) recruited through daycare centers and a control group of non-parents, most of whom were college students ($n=114$). Participants were administered a survey packet which included the Disgust Scale-Revised (DS-R) and the Parenting Domain Disgust Scale (PDDS), a tool developed for this study. The PDDS was designed to be analogous to the DS-R in terms of three disgust subtypes (core, contamination, and animal reminder disgusts). The study was designed to test four hypotheses: (1) Parents would have lower DS-R scores than non-parents, (2) parents would have lower PDDS scores than non-parents, (3) greater differences would be seen between female parents and non-parents than between male parents and non-parents, and (4) subscales (core, animal reminder and contaminant disgusts) on the PDDS would be positively correlated with the same subscale scores on the DS-R.

Results supported two of the four hypotheses: Hypothesis 1 was not supported as there were no significant differences in DS-R scores between parents and non-parents. However, the PDDS scores of parents were significantly lower than those of non-parents which supported Hypothesis 2. This suggests that changes in sensitivity to parenting-related disgust elicitors do not generalize to non-parenting-related elicitors. I was not able to recruit enough male subjects to test Hypothesis 3. Hypothesis 4 was also supported, as grouped disgust subtype items on the PDDS correlated significantly with their counterparts on the DS-R.

INTRODUCTION

The psychological state of “being disgusted” includes a wide range of scenarios and sensations. Some people use the phrase to refer to a state of involuntary physical revulsion to an aversive sensation (such as gagging or becoming nauseated). At other times, they may be referring to a scenario of which they strongly disapprove. We recoil from certain things the moment we perceive them, without the need to cognitively process whether they pose a valid threat.

Disgust is often accompanied by fear, and one emotion may be mistaken for the other. Consider, for instance, things, such as spiders, that cause some individuals to reflexively withdraw the instant we detect them. It is not irrational to recoil as all arachnids are venomous though many are harmless. This reaction has been acquired over human evolutionary history as the possibility of harm accompanies the presence of a spider. Recent research, however, has found that disgust may play a role in the development of some phobias (Vernon & Berenbaum, 2004). Though these irrational reactions may be treated by desensitization in individuals with particularly intense phobias, they sometimes recur after extinction (Edwards & Salkovskis, 2006). Suppose, however, one were to open the door to a broken refrigerator and immediately detect the smell of rotting food and the sight of maggots. Again, a common reaction is to recoil. Obviously, maggots are far slower and less capable of attack than the average spider. We are often afraid of spiders, but rarely of maggots, slugs and worms. Yet, we still find ourselves repulsed by them; they are disgusting. The feeling of disgust is unlike the feeling of fear, though sometimes we confuse these two basic emotions as both safeguard us from threats via motivation for avoidance (Krusemark & Li, 2011).

Disgust, like fear, serves as a guardian of the body, but what about situations in which a natural disgust reaction is inappropriate? New parents are frequently confronted with stimuli such as feces, vomit, urine and spittle. Humans normally find these disgusting, but recoiling from the child-related elicitor is no longer an appropriate response. Some individuals have a higher disgust sensitivity than others (Tybur, Bryan, Lieberman, Caldwell Hooper, & Merriman, 2011), but what prevents new parents from avoiding naturally aversive stimuli? Presumably, our parental instincts must counteract such natural inclinations. But what happens when disgust reactions and parental instincts conflict? Since neither disgust nor parenting is new to our species, a method of mitigating this conflict of inclinations likely developed in our ancestors.

As with fear, disgust has various subtypes. These include core disgust, animal reminder disgust, contamination disgust and moral disgust (Haidt, Rozin, McCauley, & Imada, 1997). We are likely to find a maggot disgusting, but we also experience strong disgust when we see a child torturing a small animal or when we think about having sex with a relative. We may find ourselves disgusted at ideas such as racism or sexism (Mason, 2007). Thus, we cannot lump all forms of disgust into a single category. Furthermore, disgust sensitivity and disgust propensity are two separate properties. Disgust propensity is defined as “a general tendency to respond with the emotion of disgust to any given situation”. Disgust sensitivity, on the other hand, is our “tendency to experience disgust as something ‘horrid’” (van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006, p 1249). Essentially, propensity refers to how frequently we are likely to experience disgust, and sensitivity refers to the intensity with which we experience it.

Evolutionary psychologists view disgust as an adaptation that serves to divert us away from potentially harmful stimuli and behaviors such as infection risks and incest (Tybur, Lieberman, & Griskevicius, 2009). Of particular relevance to parenting is core disgust, which is a visceral response to aversive stimuli such as bodily waste. This response may affect one's ability to function effectively as a parent. From an evolutionary perspective, parental behavior is critical to successfully passing genes on to a new generation. But, as many parents discover shortly after their first child's arrival, conceiving children is far easier, less taxing and less aversive than the subsequent tasks of caring for them.

The selective forces separating effective and ineffective parenting are powerful (Flinn, 2011). The difference between the two may be related to disgust plasticity as addressed in this study. Being selected against in the environment of evolutionary adaptation does not eliminate undesirable traits from the gene pool. Furthermore, it is unclear to what extent these behaviors are affected by genetics as opposed to cultural and environmental influences.

REVIEW OF THE LITERATURE

In this review, I will first discuss definitions and categories of disgust. Next, I will examine the history of disgust as an area of research and why the subject was largely unexplored by psychologists until the 1990s. The different subtypes of disgust will be discussed, as well as their functions and origins. I will then discuss the nature of parenting and the possibility that adaptations exist which better equip new parents for their task.

The Neglect of Disgust and Its Revival

Disgust is an important topic. Why then was it largely ignored between Darwin's (1872) treatment of it in *The Expression of the Emotions in Man and Animals* and William James's (1890) psychology textbook until the early 1990s? Rozin, Haidt and McCauley (2009) suggest that interest gravitated away from disgust because the subject is unattractive and off-putting by nature. They also suggest that other basic emotions seemed to hold more promising applications for research psychologists.

An equally interesting question is why there has been a surge of interest in the emotion of disgust over the past two decades. Rozin, Haidt and McCauley (2009) proposed six possible reasons for the rise of interest in disgust in psychology over the last two decades. The first is convenience; disgust is relatively easy to study in the laboratory setting. Second, the effects of contamination make for a fruitful approach to the study of disgust in the laboratory setting. A participant in a laboratory setting who is presented with a favorite food will instantly regard the food differently after a cockroach briefly walks across it, even if its feet were sterilized before the encounter. Such approaches are

also effective in studies of obsessive compulsive disorders and behaviors. Third, the development of the Disgust Scale by Haidt, McCauley and Rozin (1994) provided a tool by which disgust related constructs may be measured. Fourth, developments in affective neuroscience sparked interest in neural processes involved with disgust. These include cognitive mapping and brain scanning technologies as well as Sprengelmeyer's (1996) finding that individuals with Huntington's disease present a marked deficit in ability to recognize disgust expressions in others. Fifth, the association between disgust sensitivity and propensity with anxiety disorders has allowed for new areas of research. While disgust and fear are separate emotions, they converge in clinical phobias and obsessive-compulsive disorders. Sixth, the psychology of disgust has generated public interest. Lastly, another major contributor to the interest in disgust is Rozin, Haidt and McCauley's (1993) suggestion that disgust is the foundation for human morality.

Definitions of Disgust

Disgust has been defined as “a type of rejection response characterized by a specific facial expression, a desire to distance oneself from the object of disgust, a physiological manifestation of mild nausea, a fear of oral incorporation of the object of disgust and a feeling of ‘revulsion’” (Davey & Marzillier, 2009, p 54). This definition relates directly to core disgust, which is primarily a food-rejection response and the main focus of this thesis. Also important are factors such as which stimuli engage a genuine emotional response and under what conditions the responses are strong, weak, or absent. A particularly interesting area of study involves special conditions, such as child care, in which disgust may be inhibited.

Some definitions for disgust focus on its physical signs, such as making a face, experiencing nausea and distancing from stimuli. Facial expressions of disgust are commonly used as disgust markers. Even people blind from birth make the same expressions as sighted individuals (Galati, Scherer, & Ricci-Bitti, 1997). This type of description tells us about the effects of disgust. But to understand the emotion itself, we need to look at more than the behavioral manifestations of the emotion. According to Rozin, Haidt and McCauley (1993), the origins of disgust lie in our distant animal past and the recognition of death. Selection for disgust would emerge as those individuals would exhibit more anti-parasitic and anti-microbial behaviors, leading to increased personal hygiene and more discriminating eating habits (Prokop & Fančovičová, 2010).

Types of Disgust

Animal reminder disgust and terror management theory. Animal reminder disgust can be defined as an aversion towards stimuli that remind humans of their animal nature. Animal reminder disgust relates to Rozin, Haidt and McCauley's (1993) position that disgust first emerged as a result of the recognition of death. They argue that stimuli which remind us of our animal origins and thus our mortality bother us because we have a desire to rise above the animal kingdom. Animal reminder disgust elicitors include death, body envelope violations, and sex. Animal reminder disgust is exemplified by disgust felt when the similarities between human and animal behaviors are emphasized, thereby "lowering" humans to the animal level. Many aversive infant stimuli are of the animal reminder subtype. Infants crawl on all fours, eat sloppily, defecate in public and communicate by cries and non-verbal noises.

Death is perhaps the most poignant of disgust elicitors. Rozin, Haidt and McCauley (1993) report that their theory linking death and disgust was inspired by Becker's (1973) *The Denial of Death*, a book which established the foundations of terror management theory (TMT). TMT is defined as the argument that "people regulate the human body as a way to psychologically distance themselves from their animal nature and thereby deny mortality concerns" (Cox, Goldenberg, Pyszczynski, & Weise, 2007, p 495). Animal reminder elicitors, such as sex, blood and feces remind us of the mortality we share with animals, regardless of our sophistications. This knowledge terrifies us at an unconscious level, and disgust makes us less likely to dwell on things that bring it to mind.

Contamination disgust. Contamination disgust is defined as "an individual's fear of contagion with disgusting stimuli" (van Overveld, de Jong, Peters, & Schouten, 2011, p 326). Contamination aversion disgust contains core disgust but is distinct in that it is not limited to avoidance of oral ingestion of a disgusting stimulus. Contaminant-based disgust is often associated with obsessive-compulsive disorders such as compulsive hand washing. Connections have also been found between contagion-related disgust and moral disgust. Mating behavior in particular is related to contamination avoidance as the mouth and genitalia are especially vulnerable to pathogens (Tybur, Lieberman, & Giskevicious, 2009). Rozin, Haidt and McCauley (2009) state that "a particularly important feature of contagion, paralleled by disgust, is the journey from the physical to the moral. Although moral contagion is often indelible, it is sometimes treated as if it is physical" (p 21). Contamination-based OCD is an example of a high-disgust, low-fear disorder (Olatunji & Cisler, 2009).

Core disgust. Food-related core disgust is the earliest recognized form of the disgust emotional reaction. Elwood and Olatunji (2009) state that “disgust was originally conceptualized as a protective mechanism designed to prevent the oral ingestion of inappropriate objects (Darwin, 1872/1965). The original function of disgust, to aid in disease avoidance and food selection, is most consistent with what is currently termed *core disgust*” (p 100). Core disgust was linked by Rozin et al. (1993) to both the recognition of death and the avoidance of orally ingested contaminants. From the basis of core disgust, disgust has become a highly diversified emotion strongly connected with all types of aversive constructs (e.g. racism, inhospitality, ingratitude, etc.). If core disgust lies at the base of the emotion’s development, it follows that most or all forms of disgust will share characteristics with core disgust, blurring their margins.

Not all disgust reactions are governed by the same mechanisms. More elaborate disgust mechanisms, such as moral disgust, utilize a disgust-evaluation system unnecessary for rejection of aversive food stimuli which take a more basic and primal route to disgust output (Rozin, Haidt, & Fincher, 2009). Core disgust, as a visceral disgust, is literally a gut reaction which does not rely on cognitive mechanisms more recently acquired in human evolutionary history. These gut-reactions or bypass most cognitive processes and mental pathways.

Visceral disgust. Visceral disgust is, by definition, directly related to the digestive tract. Visceral disgust refers to those types of disgust which occur at the gut level, including core disgust and contamination aversion disgusts (Herz, 2011). Visceral disgust directly engages the digestive tract and digestive processes via the enteric nervous system (Mayer, 2011). It is involved when nausea and stomach agitation results from

exposure to a disgusting stimulus. Visceral responses to aversive stimuli are of particular interest when directly related to infant care, such as feces, urine, vomit, spittle and partially masticated food (Olatunji, Haidt, McKay, & Bieke, 2008). Physical reactions which could be described as “gut-wrenching” or “stomach-turning” are the sort of overt responses best associated with visceral disgust. Many less noticeable responses may also occur in the gastrointestinal tract in response to visceral disgust including changes in peristalsis and muscular tension (Brunswick, 1924) as well as shifts in enzyme secretion and myoelectric activity (Vianna, 2006).

Sexual disgust. The effects of disgust on sexual behavior may involve animal reminder, core, moral and contaminant based disgusts (De Jong & Peters, 2009). Sexual disgust and morning sickness during pregnancy are of a particular relevance to this thesis. Both occur frequently and often intensely in women during pregnancy due to pronounced hormonal shifts, and both protect the developing embryo. During the first trimester, morning sickness is common, as are strange food cravings and novel disgusts at previously non-aversive stimuli. During this time, the embryo is at the highest risk for damage by teratogens; harmful chemicals which, if ingested, can negatively affect embryonic development. After this period has passed, sensitivity to these disgust elicitors tends to fade. Sexual disgust, however, may heighten, causing the mother to avoid sexual activities which may not have disgusted her before, but which may not be ideal for the developed embryo at this stage of the pregnancy (Fessler & Navarrete, 2003). These shifts in disgust have been linked to changes in levels of progesterone (Gorman, 2012).

Moral disgust. Further removed from basic disgust elicitors is moral disgust. Rozin, Haidt, and McCauley (1993) posit that the primary function of moral disgust is to preserve social order, which implies that it is a more recent evolutionary acquisition. This subtype of disgust is more cognitive than the other subtypes as it is associated with aversive attitudes and behaviors such as racism, sexism, inhospitality and cruelty. The proposed that morality evolved as a product of the disgust adaptation which was harnessed to produce offense at certain culturally determined moral violations.

The theory that morality is an extension of the food-rejection disgust system has been supported by a recent study by Eskine, Kacinik, and Prinz (2011). They found that participants' moral judgments could be manipulated by introducing sweet or bitter tasting stimuli to participants before moral judgments were passed on others' actions. Furthermore, Inbar, Pizarro, and Bloom (2009) found that political conservatives score higher on measures of core disgust sensitivity than political liberals and were more likely to disapprove of sociomoral issues such as gay marriage and abortion. Additional support of this association is found in a correlational study by Herzog and Golden (2009) on the relationship between disgust sensitivity and animal rights activism. They found a positive correlation between concern for the ethical treatment of other species and core disgust sensitivity.

The Physiological Basis of Disgust

When people say they have a "feeling in their gut," they generally mean there is some deeply felt intuition, the origins of which are unclear. Psychophysiological events coincide with emotional states and hormonal changes (Rohrmann, Hopp, Schienle, & Hodapp, 2009), and disgust is physiologically distinct from other emotions. Fear, anger

and happiness accelerate heart rate, blood pressure, respiration and skin conductance. Disgust, however, depresses these autonomic functions (Rozin, Haidt, & McCauley, 2000; Ritz, Thons, Fahrenkrug, & Dahme, 2005). The enteric nervous system (ENS) consists of over one hundred million visceral neurons lining the gastrointestinal tract that communicate with the brain via the vagus nerve. The ENS shares connections with the limbic system which governs aspects of the autonomic nervous system and emotional arousal. This system helps the brain govern digestive activity such as peristalsis and enzyme maintenance through interaction with subcortical structures such as the amygdala and the hypothalamus. The system is more than a simple extension of the autonomic nervous system. If the vagus nerve is severed, the ENS will continue to manage intestinal activity independently of central nervous system output. According to Mayer (2011), the ENS is an extension of the limbic system into the gut, and is sometimes referred to as “a second brain”.

The relationship of the enteric nervous system with our emotional states has also been described physiologically by Mayer (2011), who describes an intricate neural structure, which he terms the “Emotional Motor System.” Mayer defined the EMS as a system of cortico–limbic networks that is engaged during distinct homeostatic states and plays a part in executing distinct regional motor patterns of the viscera (p 454). This part of the nervous system controls visceral activity in different ways depending on emotional states. It is the part of the enteric nervous system most closely related to emotion at what we would call “the gut level.”

These findings suggest that neuroanatomical aspects of basic emotions are not exclusively contained within the brain but interact with components of the peripheral

nervous system. The idea that a relationship existed between the emotions and the gastrointestinal tract is not new. As early as the 1920s, the effects of different emotional states on different areas of the gastrointestinal tract were a subject of interest (Brunswick, 1924). Muscular activity, shifts in muscle tone, and other detectable differences were found to be significantly different in emotional states including pleasure, fear and disgust. Peristalsis, enzyme secretion, maintenance of intestinal flora, and other digestion-related functions and processes have long been known to be affected by differing emotional states. Strong evidence exists that activity in the gut itself may affect emotional states rather than simply be a consequence of them (Mayer, 2011; Vianna, 2006).

The Plasticity of Disgust

Changes in disgust sensitivity may be observed in several contexts. For females, observable effects of parenting on disgust begin early in the pregnancy. As morning sickness begins to affect a female's eating habits, she may become disgusted by flavors and odors which may have never before bothered her. At the same time, a woman often experiences novel (sometimes even bizarre) cravings for foods which she may have considered aversive before. Such changes commonly occur without previous exposure or any conditioning (Fessler & Navarrette, 2003). This is an example of disgust plasticity during a pregnancy. Some studies have found disgust to be more resistant to habituation than other emotions. Replicating a study by McKay (2006) on treatment of obsessive compulsive disorder, Adams, Willem, and Bridges (2010) used repeated exposure to a contamination threat (a dirty bedpan) to examine habituation effects on disgust-based contamination anxiety scores. In keeping with McKay's findings, they found disgust to be resistant to habituation. Olatunji, Wolitzky-Taylor, Willems, Lohr, and Armstrong

(2009) used the same contamination threat with a population of OCD participants, with controls, and progressive exposure to a contamination threat. Measures of both fear and disgust were used, and while fear was significantly moderated by habituation, disgust was not.

The Parenting Experience

Many changes take place with the arrival of an infant, and new parents' lives are greatly altered in terms of sleep schedule, stress levels, and communication. For parents, much of this new interaction is determined by their perceptions of their own skills as parents (Page, Combs-Orme, & Cain, 2007). Protective feelings emerge as well as the desire to prepare a home for the new arrival. This is commonly referred to as the "nesting instinct." Soon-to-be mothers often tend to engage in extensive cleaning, sterilization of surfaces, and even policing the refrigerator for food items which may be past their prime (Walsh, 2010). It is possible that hormones play a part in this behavior.

Social support and networking also affect changes in environment when a newborn is expected. Family members and friends generally engage in attention and gift-giving rituals such as baby showers. These help parents prepare for the arrival of the new child. In particular, family and friends intensify their interactions with the parents to be in terms of advice and preparatory consultation. Such support could play a role in shifts in disgust sensitivity. As anxiety and disgust are related, parents with no reprieve from caregiving and no assistance from friends and relatives could become more disgusting by infant-related aversive stimuli than parents with more extensive and/or reliable support networks (Milgrom, Schembri, Ericksen, Ross, & Gemmill, 2011).

Gender Differences in Disgust Sensitivity

Both disgust sensitivity and disgust propensity vary by gender (van Overveld, et al., 2006). Sex differences in disgust sensitivity were studied using the Three Domain Disgust Scale (TDDS) (Tybur, Bryan, Lieberman, Caldwell Hooper, & Merriman, 2011) which measures disgust sensitivity to contaminant, sexual, and moral stimuli. Women scored higher than men in sexual disgust, which is in keeping with the evolutionary position that females are more sexually selective than males (van Overveld, de Jong, & Peters, 2010). They were also more sensitive than men in terms of contaminant and moral disgust sensitivity. Druschel and Sherman (1999) investigated the association between disgust sensitivity and gender as well as the Five Factor Model of personality. Women had higher disgust sensitivity scores on the original Disgust Scale (Haidt, McCauley, & Rozin, 1994) than did men. Tucker and Bond (1997) compared gender and sex roles with disgust and contamination anxiety questionnaires and also found gender differences across disgust scores on several scales, including the Disgust and Contamination Sensitivity Questionnaire (Rozin, Fallon, & Mandell, 1984) and the General Disgust Questionnaire (Haidt et al., 1994).

There is also the question of generalization of disgust sensitivity in parents. Shifts in disgust plasticity in women are specific to their own offspring. Case, Repacholi and Stevenson (2006) studied a group of 13 mothers who participated in a two-part study concerning their levels of disgust when presented with aversive stimuli from their own infants and from non-related infants. First, the mothers completed a questionnaire concerning their disgust at the idea of changing their own child's soiled diaper in contrast with changing the diapers of unrelated infants. Mothers rated the changing of their own

children's diapers as less disgusting than those of non-related children. Further, sixty-four percent of these mothers reported that following the birth of their first child they found that their reactions to soiled diapers had become less pronounced. The researchers then exposed the mothers to scent-samples of the soiled diapers. Even when they did not know which child's diaper they smelled, all the mothers rated the smell of their own child's diaper as less aversive than those of unrelated children.

STATEMENT OF THE PROBLEM

This study explored changes in disgust associated with parenting. The study investigated whether there is a suppression of visceral disgust associated with the care of infants. This was assessed by the Disgust Scale-Revised (DS-R) (Olatunji et al., 2007) and the Parenting Domain Disgust Scale (PDDS) which was developed for this study. I hypothesized that:

1. Parents of young children would have lower DS-R scores than non-parents. This was expected on the basis that parenting may be facilitated by a moderating adaptation which reduces disgust sensitivity.
2. Parents and non-parents would have significantly different scores on the PDDS.
3. Greater differences in Disgust Scale scores would be found between female parents and female non-parents than between male parents and male non-parents. This interaction between sex and parent status was expected due to previous studies indicating that females are more disgustible than males.
4. Subtype scales (core, animal reminder and contaminant disgusts) on the PDDS should positively correlate with same subscales on the DS-R. This was hypothesized because the items in the PDDS are designed to elicit the same types of disgust as the DS-R in the context of the parenting domain.

METHODS

Participants

I had originally planned to recruit parents of children under seven years old through day care centers and to use their friends and relatives of similar ages as non-parent controls. However, only 12 non-parents completed the survey. In order to obtain a sufficiently large non-parent control group, I recruited 107 participants from an undergraduate psychology course.

Participants were recruited from three child care centers in western North Carolina and one undergraduate psychology course. The criteria for participation among the parents were (a) having children less than seven years of age and (b) being under 40 years old. The second criterion was instituted so that the average age of the parents would be closer to that of the non-parents, most of who were recruited from the undergraduate psychology class. The 153 participants included 39 parents and 114 non-parents. Participant demographics are shown in Table 1. For each of the 39 parents, the youngest child reported on the demographics page was coded for age and sex. Participants' children included 22 boys ranging from 4 months old to 5.83 years old ($M = 2.52$, $SD = 1.40$), and 17 girls ranging from 18 months old to 6.33 years old. ($M = 3.51$, $SD = 1.18$). Overall, the coded children's mean age was 2.96 years old with a standard deviation of 1.18 years.

Materials

The measures employed included the Disgust Scale-Revised (DS-R) (see Appendix A) which includes 25 items measuring disgust sensitivity in three domains;

core, animal reminder and contamination disgust. Two additional questions are included to eliminate respondents who are either not paying attention or are not taking the measure seriously, and are not scored. One item was omitted from this version because it was of a sexual nature and was considered potentially off-putting for the purposes of the study. All three subscales have had alphas above .70 in other studies (Olatunji, Haidt, McKay, & David, 2008). All items on the revised version of the scale use 5 point Likert-type answers. The first section contains 13 statements relating to disgust, such as “It would bother me tremendously to touch a dead body” (animal reminder disgust). The second section contains 12 items with described scenarios which the respondent may indicate as “not disgusting,” (0) “somewhat disgusting” (2) or “very disgusting,” (4), for example “You see maggots on a piece of meat in an outdoor garbage pail” (core disgust). This version of the Disgust Scale is widely considered to be a reliable psychometric measure (Olatunji, Moretz, McKay, Bjorklund, de Jong, Haidt, & Schienle, 2009) and is a commonly used tool in disgust studies.

Participants were also given a 13 item Parenting Domain Disgust Scale (PDDS) (see Appendix B). This scale was developed for the present study and measures infant and child-aversive disgust. These items consist of one or two short sentences describing scenarios of aversive parenting-related contexts. The PDDS uses the same 5-point Likert-scale response measure as the DS-R, with ranges from 0 (not at all disgusted) to 4 (very disgusted) as used in the DS-R. Items 1, 4, 5, 12 and 13 relate to core disgust; items 2, 3, 6 and 9 relate to contamination disgust, and items 7, 8, 10 and 11 relate to animal reminder disgust.

Also included were three peripheral scales which served as distracters from the disgust measures: the Subjective Happiness Scale (SMS; see Appendix D) (Lyubomirsky & Lepper, 1999), the Attitudes Toward Parenting Scale (ATPS, see Appendix E) (developed by author) and the Physical Activity Scale-2 (PAS-2, see Appendix F) (Andersen, Groenvold, Jørgensen, & Aadahl, 2010). The SMS is a four-item scale measuring general happiness. The ATPS is a five item scale developed for this study and measures the participant's general regard of parenting. The PAS-2 measures amount of reported sleep and levels of physical activity at work and during personal time.

The first page of the survey explained that the purpose of the study was to examine emotional changes that occur in people during the parenting experience. An informed consent sheet followed a short FAQ section about the study. This was followed by a demographic information sheet which asked the participant's year of birth (from which age is calculated), sex, and ages and sexes of children living with the participant. Also included was a line for the reported amount of child care provided by the participant. This was followed, in order, by the Subjective Happiness Scale, the Attitudes Toward Parenting Scale, the Physical Activity Scale-2, the Parenting Domain Disgust Scale, and finally the Disgust Scale-Revised.

Reliabilities of all scales were high. Cronbach's alpha was .888 for the Parenting Domain Disgust Scale, .882 for the Disgust Scale-Revised, .882 for the Attitudes Toward Parenting Scale, and .824 for the Subjective Happiness Scale.

Procedure

Survey packets were distributed to parents by the directors at three child care centers. Parents filled out the survey packets and returned them to me via postage-paid

business reply envelopes included in their packets. Additional packets were provided to these participants who were encouraged to pass them to non-parent acquaintances of their same gender and similar ages, if at all possible. Parent and non-parent participants recruited from child-care centers were incentivized by inclusion in a drawing for two \$100 gift cards to their choice of either Wal-Mart or Amazon.com. One drawing was held for parents and one for non-parents. Participants were also provided with an option to receive a summary of research findings via e-mail at the conclusion of the study.

Survey packets were also distributed to students of a human sexuality psychology class. Students were incentivized with extra credit in exchange for their participation. Student participants were also given the option of requesting a summary of research findings via e-mail at the study's conclusion.

RESULTS

Primary Analyses

Hypothesis 1, that parents would have lower Disgust Scale-Revised scores than non-parents, was not supported. There was no significant difference in DS-R scores between parents ($M = 50.59$, $SD = 17.18$) and non-parents ($M = 49.05$, $SD = 16.87$); $t(148) = .487$, $p = .627$. This finding suggests that becoming a parent does not decrease a person's sensitivity to general disgust elicitors.

Hypothesis 2, that parents and non-parents would have significantly different scores on the PDDS, was supported. Parents ($M = 13.92$, $SD = 8.97$) had significantly lower scores than non-parents ($M = 18.97$, $SD = 9.86$); $t(151) = -2.82$, $p = .005$. This suggests that parenting-related disgust sensitivity decreases after or during the experience of raising a young child. Age was controlled for by separately running a correlation analysis for non-parents ($M = 18.97$, $SD = 9.86$; $r = -.085$, $p = .368$) and for parents ($M = 13.92$, $SD = 8.97$; $r = -.313$, $p = .052$), neither of which was significant. This indicates a difference between parent and non-parent groups that cannot be accounted for by aging.

There were not enough male parent participants to test Hypothesis 3. However, differences between genders on both scales could be analyzed for the 99 non-parent college students. Among this group, males ($M = 43.56$, $SD = 14.74$) and females ($M = 53.15$, $SD = 16.91$) had significantly different scores on the Disgust Scale-Revised ($t(97) = -2.86$, $p = .005$), but no significant difference existed between these groups on the Parenting Domain Disgust Scale.

Hypothesis 4 was that the subscales on the PDDS would correlate positively and significantly with the corresponding subscales on the DS-R. This was supported in that the disgust subtypes (core, animal reminder, and contamination) on the Parenting Domain Disgust Scale were positively correlated with corresponding subtypes on the Disgust Scale-Revised.

While core disgust item groupings correlated best with each other, the PDDS contamination subtype item group actually correlated better with the DS-R's core disgust items, and the PDDS's animal reminder item group correlated better with the DS-R's core and contamination subtypes. Disgust subtype correlations between the PDDS and DS-R are displayed in Table 2.

Other Analyses

While the two disgust scales were the central focus of the study, the Attitudes Toward Parenting Scale (ATPS) and the Subjective Happiness Scale (SHS) were included as distracters to the disgust scales. The Subjective Happiness Scale (SHS) and the Attitudes Toward Parenting Scale (ATPS) shared a low but significant positive correlation ($r = .182, p = .029$). The ATPS was negatively correlated with scores on the Parenting Domain Disgust Scale ($r = -.223, p = .007$) but was not significantly correlated with the Disgust Scale-Revised ($r = .038, p = .652$). The SHS was not significantly correlated with the Parenting Domain Disgust Scale or the Disgust Scale-Revised.

DISCUSSION

While parents in the study did not differ in general disgustibility from non-parents (Hypothesis 1), they were less disgusting when it came to aversive scenarios associated with young children (Hypothesis 2). Thus, changes in parent-related disgust sensitivity do not generalize to non-parenting related disgust elicitors. It is likely that these changes in parenting-related disgust sensitivity would not even generalize to elicitors originating from other people's children. According to some findings, parents of infant children found aversive stimulus (diaper odor) from their own children less disgusting than those of other children, even when they did not know which child the source of the stimulus (Case et al., 2006), which indicates strong discrimination between related children and non-related children for moderation of disgust sensitivity. The items on the Parenting Domain Disgust Scale are analogous in disgust subtype to the items of the Disgust Scale-Revised, but are formulated in the context of parenting-related scenarios. Therefore, these findings suggest that a person with children should be just as likely to be disgusted by finding a fly in their soup or dog feces on their carpet as a person without children might be.

The results of this study and of other studies of disgust suggest that changes do take place in basic emotions during the life-stage of parenthood. I have suggested that these changes can be attributed to some adaptive mechanism beyond single habituation, though these findings alone are insufficient to make such a claim. Disgust's resistance to habituation has been described by other studies (McKay, 2006; Adams, Willem & Bridges, 2010; Olatunji, Wolitzky-Taylor, Willems, Lohr, & Armstrong, 2009) establishing it as a robust and dependable adaptation with very clear benefits. If then, we

found ourselves pitted against such a powerful and visceral force with no means of negating it except by deliberate and repeated exposure (habituation), then our otherwise beneficial adaptation is now selecting directly against our reproductive success. For this reason, natural selection would necessarily have to evolve a developmental selectiveness to an adaptation as powerful as disgust.

This study has focused on parents of children less than seven years old. Seven years may or may not be sufficient time for habituation to overcome disgust. The adaptation I am proposing, which would mitigate or even nullify the potency of disgust elicitors originating from one's own progeny, would occur very quickly. Sometime within the first few months of a child's life is a safe estimate, but very possibly even within the first weeks or days. I propose a very short transition period because of the high vulnerability human infants have, as opposed to the young of most other animal species which are very often ambulatory within mere hours of birth. Human children require immediate and frequent attention to survive, and could not afford to wait weeks or months for care, while their parents gradually conquer their squeamishness.

Paternal uncertainty suggests that this adaptation would occur more vividly with females whose biological connection to their child begins in utero, and whose disgust sensitivity changes begin in the first trimester. Males are delayed in terms of connecting with their children, are less sensitive to disgust elicitors a priori, and have biological imperatives against investing in or becoming attached to what may be the offspring of another male. These differences make men more, not less, necessary to future disgust studies.

Limitations of this Study

As with most research, there are limitations to the present study. First, the original recruiting strategy failed to recruit enough non-parent participants and had to be supplemented with a student source with a lower average age, introducing risks for intelligence differences, environmental differences (e.g. students versus non-students), etc. Second, the study failed to recruit enough male parent participants to test Hypothesis 3 (gender differences for disgust plasticity). Third, changes could be due to personality traits of individuals who are more likely to have children, and not actually related to the experience of being a parent which simply co-occurs with said traits most of the time. Finally, it is possible that the data collected were measures of people's ideal selves and not actual selves. Answers could reflect people's efforts to satisfy social expectations, as well as personal expectations, about what it means to be a good parent.

Evolutionary psychology would predict that actual changes should occur in people's subjective experiences related to parenting, in order to better equip them for protection of and care for their offspring. Those without such a trait would be selected against in the environment of evolutionary adaptation as they would be more averse to infant care related disgust elicitors and their offspring would therefore have a lower survival rate. This was an assumption of this study, but there is the possibility that no changes occur as measured by these scales, and differences in scores could be a reflection of social expectations for what we consider a "good parent" to be. A person so pressured may often still experience the same visceral, gut-level aversive reactions to many disgusting stimuli, but repress and deny experiencing them because they feel that not doing so could make them look like bad people and bad parents. This could be controlled

for by the use of implicit measures, or physiological measures such as biofeedback. This could be a promising area of research, as disgust has a unique and measurable effect upon the autonomic nervous system (e.g. decrease of blood pressure, decreased heart rate, respiratory changes).

Notes for Future Research

To better test these hypotheses, future research should improve upon this design in four ways. First, use parents of children under six months old, rather than seven years. This is important because, as previously mentioned, it is evident that changes in disgust sensitivity should occur in a relatively brief adjustment period for new parents. A wider range of ages was studied for this thesis for availability and convenience reasons, and because older children are ambulatory and capable of producing more varied stimuli than infants. However, any changes occurring in their parents were most likely present before the toddler stage, and so parents of younger children may yield more descriptive results.

Second, recruit first-time parents. This will help establish a time frame for when changes in disgust sensitivity or propensity occur. It is yet unclear whether changes in disgust sensitivity are permanent or if they revert to a previous level after aversive stimuli are no longer present in their environment as time passes. Changes may also occur more quickly because there is some level of familiarity with the adjustment. Third, recruit a sizeable group of male parents, to identify gender differences in disgust plasticity. I feel the failure to do so here was this study's principal shortcoming. The existence of gender differences in sensitivity to general disgust elicitors has been observed repeatedly (Druschel & Sherman, 1999; Olatunji, Arrindell, & Lohr, 2005; Tybur et al., 2011;

present study) but changes in male disgust sensitivity and propensity in the parenting context is still lacking.

Fourth, use both biological and adoptive parents. This would help establish whether or not genetic relatedness plays a role in disgust plasticity. Some considerations should be made by any researchers attempting to investigate the parenting domain in these respects. If using an adoptive parent group, control for socioeconomic status. Adoptive parents are generally from a higher SES. Consider also that adoptive parents are generally very certain they want to be parents, and must go through expensive and arduous processes to do so, while many biological parents do not plan the pregnancy and are often unsure if they are ready for the task. A method of controlling for these two factors might be to recruit the biological parent group from fertility clinics, whose clients, like those of adoption agencies, also make deliberate choices to become parents and can also afford expensive and arduous processes to do so.

Lastly, make provisions in the study for pregnant women, which I would suspect is where changes in disgust plasticity first begin for females. This is recommended for future studies because for women, the experience of parenthood begins at the biological level with the experience of pregnancy. The pregnancy stage could represent a major sub-area of parenting-related disgust plasticity. Pregnant women regularly experience dramatic changes in disgust sensitivity as progesterone levels increase. Paternity uncertainty and parental investment theories provide the basis of Hypothesis 3 and the anticipation of gender differences in disgust plasticity. Based on the results of this thesis, I believe future researchers who are mindful of these factors and limitations when

designing new studies on disgust plasticity can expect some very interesting and meaningful findings in this growing area of research.

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APPENDICES

Appendix A The Disgust Scale-Revised (DS-R)

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
- ___ 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.
- ___25. You are about to drink a glass of milk when you smell that it is spoiled.
- ___26. You are walking barefoot on concrete, and you step on an earthworm.
-

The DS-R (Disgust Scale-Revised), Haidt, McCauley, & Rozin, 1994; Modified by Olatunji et al., 2007.

Appendix B

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

- ___ 1. You are playing with your infant daughter by holding her up in the air over your head, and as you gently bounce her, she spits up on you
- ___ 2. You must change your child's diaper ten minutes before you sit down for supper.
- ___ 3. You enter the bathroom to see your 3 year old playing with his bath toys in the toilet.
- ___ 4. You move a cushion on your sofa and discover the half-eaten remains of your child's jelly sandwich from last week.
- ___ 5. Your toddler finds unwrapped candy on the ground and eats it before you can stop him.
- ___ 6. While changing your 5 year old son's bed sheets, you feel dampness and smell urine.
- ___ 7. You see your 4 year old daughter outside playing with a dead mouse she has mistaken for a stuffed animal.
- ___ 8. A friend of yours tells you his 6 year old daughter still hasn't learned to make her bed.
- ___ 9. You are carrying your 3 year old daughter. She turns to whisper something to you but instead coughs directly into your face.
- ___ 10. Your 5 year old shows you that he has discovered how to turn his eyelids inside out.
- ___ 11. You take your family to a nice restaurant and your 3 year old is making a huge mess of his food by throwing it, spitting it out, and smearing it everywhere.
- ___ 12. Your child's kindergarten teacher informs you that he has a serious nose-picking habit.
- ___ 13. You just opened a bottle of your favorite Gatorade on a hot day. Your 4 year old drinks from it without your permission and there are now crumbs of some kind floating in it.

Appendix D

Subjective Happiness Scale

Please circle your answers from 0 to 4 for how much you agree or disagree. (**For non-parents, base answers on your understanding of the parenting experiences of others that you know**).

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. "Overall, I see becoming a parent as a very positive event in a person's life."

0	1	2	3	4
Strongly disagree		Neither agree nor disagree		Strongly agree

2. "I think becoming a parent is the most important thing a person can do with their life."

0	1	2	3	4
Strongly disagree		Neither agree nor disagree		Strongly agree

3. "The presence of a child always makes one's life more enjoyable overall."

0	1	2	3	4
Strongly disagree		Neither agree nor disagree		Strongly agree

4. "The joys of parenting outweigh the challenges and added responsibilities."

0	1	2	3	4
Strongly disagree		Neither agree nor disagree		Strongly agree

5. "Being a parent makes any person a better and stronger version of himself or herself."

0	1	2	3	4
Strongly disagree		Neither agree nor disagree		Strongly agree

Appendix E

The Attitudes Toward Parenting Scale

For each of the following statements and/or questions, please **circle the number** on the scale that you feel is most appropriate in describing you.

1. In general, I consider myself:

1	2	3	4	5	6	7
A very unhappy Person			A very happy person			

2. Compared to most of my peers, I consider myself:

1	2	3	4	5	6	7
less happy			more happy			

3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?









1	2	3	4	5	6	7
not at all			very much			

4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?

1	2	3	4	5	6	7
not at all			very much			

Appendix F

The Physical Activity Scale-2

Physical activity in everyday life			
The following questions deal with your daily physical activity at work, at home and during your leisure time. Therefore, this includes more than sports and exercise. It includes all types of physical activity and inactivity that you perform in everyday life.			
Daily 	How many hours and minutes do you sleep on an average weekday (include rest or naps during the day)	<input type="text"/>	<input type="text"/>
Daily 	In your work/studies* , how many hours and minutes per day do you engage in: Sedentary work? Standing or walking work?  Heavy physical work? (for instance heavy lifting or climbing stairs) Not working <input type="checkbox"/>	<input type="text"/> Hours <input type="text"/> Hours <input type="text"/> Hours	<input type="text"/> Minutes <input type="text"/> Minutes <input type="text"/> Minutes
Daily 	How many hours and minutes per day do you ride a bicycle or walk for transportation to and from work? Not working <input type="checkbox"/>	<input type="text"/> Hours	<input type="text"/> Minutes
Daily 	In your leisure time , how many hours and minutes per day do you spend with watching TV, sitting quietly, reading, and listening to music or the like?	<input type="text"/> Hours	<input type="text"/> Minutes
Weekly 	In your leisure time , how many hours and minutes per week do you engage in light physical activity such as walking, light cleaning, <u>raking lawn</u> , or lightly strenuous exercise such as yoga, bowling or similar activities? (do not include transportation to and from work)	<input type="text"/> Hours	<input type="text"/> Minutes
Weekly 	In your leisure time , how many hours and minutes per week do you engage in <u>gardening</u> , <u>carrying loads upstairs</u> or moderately strenuous sport such as gymnastics, <u>swimming</u> , <u>bicycling</u> , strength conditioning or similar activities? (do not include transportation to and from work)	<input type="text"/> Hours	<input type="text"/> Minutes
Weekly 	In your leisure time , how many hours and minutes per week do you engage in strenuous sport and conditioning exercise such as running, jogging, soccer, tennis, aerobics or similar activities? (do not include transportation to and from work)	<input type="text"/> Hours	<input type="text"/> Minutes

Appendix G

Table G1

Participant Group Sizes and Age Distributions

	<u>DAYCARE</u>				<u>COLLEGE</u>			
	Parent		Non-Parent		Parent		Non Parent	
	Male	Female	Male	Female	Male	Female	Male	Female
<i>N</i>	6	28	2	10	1	4	38	64
M Age	31.8	29.8	24.5	28.2	22.0	25.5	21.9	21.1
Range	23-39	23-39	24-25	22-34	n/a	22-32	19-27	18-27
SD	6.1	4.5	.7	4.5	n/a	4.7	1.8	1.7

PARENTING AND DISGUST SENSITIVITY

Table G2

Pearson's r Correlations between Disgust Subtype Item Groups

	PDDS Core	PDDS Animal Reminder	PDDS Contamination
DS-R Core	.497	.519	.450
DS-R Animal Reminder	.289	.396	.284
DS-R Contamination	.477	.474	.426

All correlations are significant at the 0.01 level (2-tailed).