Does Disgust Increase Unethical Behavior?

Denton Hatch
Department of Management and Organizations
Eller College of Management
The University of Arizona
Tucson, AZ 85721
dentonhatch@email.arizona.edu

Tamar Kugler
Department of Management and Organizations
Eller College of Management
The University of Arizona
Tucson, AZ 85721
tkugler@email.arizona.edu

Charles N. Noussair
Department of Economics
Eller College of Management
The University of Arizona
Tucson, AZ 85721
cnoussair@email.arizona.edu

Abstract

There is disagreement in the literature over the relationship between disgust and moral behavior. Some studies found that disgust leads to harsher judgements of unethical behavior; however, this claim has been called into question in studies (e.g., Johnson et al., 2016) which failed to replicate this result. Winterich, Mittal, and Morales (2014) report a number of experiments, all of which find that disgust increases unethical behavior. Their support for a positive relationship between disgust and unethical behavior runs counter in spirit to the findings that disgust elicits harsher condemnations of unethical behaviors. Motivated by this puzzle and the lack of consistency in the literature, we replicated three studies from Winterich et al. to better understand the relationship between disgust and unethical behavior. We observe no effect of disgust on unethical behavior in any of the three studies, thus further supporting the argument that disgust has no effect on ethical decision-making.

Keywords: Unethical Behavior; Self-Interested Behavior; Disgust; Emotion; Replication

Introduction

Unethical behavior, while seen as harmful and morally unacceptable to society (Jones, 1991), is unfortunately quite common. This includes behaviors such as employees misusing company time (e.g., coming to work late or leaving early; Lim, 2002) or stealing supplies and merchandise (which totals more than $14 billion a year in lost revenue, according to the National Retail Federation, 2017). Because of the negative consequences of unethical behavior, scholars are interested in identifying factors affecting an individual's propensity to act unethically. As part of this attempt, researchers explored how emotions can influence an individual's engagement in unethical behavior (Gasper & Schweitzer, 2013; Kouchaki & Desai, 2015; Motro et al., 2016; Winterich et al., 2014).

One emotion that has recently attracted attention as a correlate of decision-making is *disgust*. Disgust is an evolutionary reaction geared towards guarding our bodies against potential contamination (Rozin & Fallon, 1987; Rozin, Haidt, & McCauley, 2008). This prehistoric reaction evolved to become more complex in humans, including animal-nature disgust (repressing or condemning actions like sex and defecation that remind humans that they are animals; Rozin, Haidt, & McCauley, 1999) and socio-moral disgust (repressing or condemning situations where people act with no dignity or take away the dignity of others; Rozin et al., 2008). Since actions that elicit disgust typically run counter to ethical norms (Jones, 1991), scholars have sought to explore the connection between disgust and ethical decision-making.

Past research found disgust (either physical or interpersonal) to be related to harsher moral judgments (Eskine, Kacinik, & Prinz, 2011; Schnall, Haidt, Clore, & Jordan, 2008) and a person's desire for purity (Horberg, Oveis, Keltner, & Cohen, 2009). For example, studies found that people primed with disgust judge unethical behaviors more severely (Schnall, et al.; Wheatley & Haidt,

2005), and are less trusting (Kugler, Ye, Motro, & Noussair, In Press). Scenarios designed to evoke strong disgust are also perceived as more unethical (Haidt, Koller, & Dias, 1993). Physiological evidence also supports this relationship. Disgust and moral judgement both activate the anterior insular cortex – a region of the brain associated with adverse stimuli (Hutcherson, Montaser-Kouhsari, Woodward, & Rangel, 2015; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003; Vicario, 2016). Chapman, Kim, Susskind, and Anderson (2009) showed that the same facial muscles are activated in participants when they experience visual disgust, unpleasant tastes, or moral disgust.

However, while there is support in the literature for the relationship between disgust and the harsher moral judgment, other studies called this claim into question (Ugazio, Lamm, & Singer, 2011; Ong, Mullette-Gillman, Kwok, & Lim, 2014). Ugazio et al. (2012) found that disgust, induced using a flatulence spray, did not lead to harsher moral judgments. David and Olatunji (2011) found no difference in participant's ratings of wrongness of transgressions when disgust-inducing innocuous words were present. Other studies failed to replicate seminal papers on the relationship between disgust and moral opinion. Johnson, Cheung, and Donnellan (2014) conducted a replication of Schnall, Benton, and Harvey's (2008) hand-washing study and found no effect of hand washing on moral judgement. Johnson et al. (2016) failed to replicate the results in Schnall et al. (2008) and found no moderating effect of sensitivity to bodily states or the accessibility of mood (which were suggested as possible moderating explanations). Furthermore, Landy and Goodwin (2015) conducted a meta-analysis and found only a small effect of disgust (d = 0.11) which disappeared when publication bias was accounted (d = - 0.01). Altogether, these results show inconsistency and lack of robustness in the literature on disgust and moral opinion.

Pertaining to that same literature, Winterich et al. (2014) considered the relationship between disgust and unethical behavior in multiple studies. They found that incidental disgust increased participants' engagement in what they term Self-Interested Unethical Behavior (SIU). In interpreting their results, they theorized that disgust increases the need for self-protection, which, in turn, increases unethical behavior. These results, while very interesting, run counter in spirit to the findings that disgust leads to more severe individual's moral judgment. This can only be reconciled if disgust influences the moral standards individuals hold others to differently than the standards applied to their own behavior.

This contrast motivates our current research. We replicated three studies from Winterich et al. (2014) to check whether we find similar results. Following the guidelines for replications proposed by Simonsohn (2015), the samples in all three studies we conducted have more than 2.5 times the original sample sizes of Winterich et al. Even though we followed the original procedures to our best abilities, we found no relationship between disgust and unethical behavior. These results not only limit the implications of Winterich et al. but also support recent studies which find no effect of disgust on moral opinion.

Experiment 1

Method

Participants and Design: 760 undergraduate students (49.2% female; M_{age} = 21.16) from a university in the Southwestern United States participated in this study for payment and course credit. For comparison, the demographics of these participants are similar to the 296 participants in Study 1a of Winterich et al. (2014; i.e., 47% female; M_{age} = 20.94). Participants were randomly assigned to either the *Disgust* or *Neutral* condition.

Materials and Procedure: Experiment 1 is a replication of Study 1a from Winterich et al. (2014)[1] and was pre-registered on OSF (osf.io/9e658). Participants in both conditions were asked to evaluate a list of five supermarket products with regard to five dimensions (bad/good, negative/positive, undesirable/desirable, unfavorable/favorable, and dislike/like) on a 7-point scale. The specific products the participants evaluated differed between conditions. In the Disgust condition, the products were anti-diarrheal medicine, diapers, feminine care sanitary napkins, cat litter, and adult incontinence products - all items associated with bodily functions. In the Neutral condition, the products evaluated were light bulbs, vitamins, candles, shampoo, and pens. After completing the product evaluations, participants rated a list of 23 emotions on a 10-point scale asking how they felt while viewing the products. The list of emotions were the same ones used in Winterich et al. and described with identical words. We used participants' average responses to the four disgust terms (disgusted; dirty; gross; and unclean) as our measure of disgust (Cronbach $\alpha = .927$).

Next, participants were asked to complete a 10-question trivia game from Mullen and Nadler (2008). Before answering the trivia questions, participants were told that this task was being used to investigate the effects of incentives on task performance and that some participants would receive a monetary incentive for their participation and others would not. Specifically, participants were informed that those in the *Incentive* condition would receive 20 cents for each correct answer on the trivia quiz (up to $2.00), while those in the *Non-Incentive* condition would receive no payment. Whether a participant was in the incentive condition would be determined by a coin the participant flipped privately before the trivia game started. Participants were then asked to locate

[1] We have used the exact materials and procedures from the original study of Winterich et al. as described in their online appendix (accessible through https://doi.org/10.1016/j.obhdp.2014.07.004), and provided by the original authors. We are grateful to the authors for sharing their materials with us.

a quarter on their desk, flip it once, and indicate if they got heads (corresponding to the no incentive condition) or tails (the incentive condition). The experimenter or other participants did not observe the participants while they flipped the coin. Therefore, participants had an opportunity to falsely report being in the incentive condition (i.e., indicating they got tails when they, in fact, got heads). The design ensured that individual cheating cannot be detected, though it allows statistical detection of differences in average misreporting between experimental conditions.

After participants indicated the outcome of their coin flips, they began a trivia quiz. The questions on the trivia quiz were the same ones used in Winterich et al. (2014) and were designed so that most participants correctly answered all the questions. After the trivia task was completed, participants were told that those in the incentive condition would receive the entire payment of $2 and were asked to indicate again their condition. Following Winterich et al., we used the percentage of participants reporting that they were in the incentive condition as a measure of self-interested behavior. Since the coins provided were fair, if all participants responded truthfully, about 50% would be in the incentive condition. A percentage significantly greater than the level expected by chance would indicate self-interested unethical behavior.

Results

Manipulation check: Participants in the Disgust condition reported experiencing significantly more disgust than those in the Neutral condition ($M_{disgust} = 3.48$ vs. $M_{neutral} = 1.57$, $t(758) = 14.058$, $p < .0001$, $d = 1.02$). These results are similar to those obtained in the disgust manipulation check of Winterich et al. ($M_{disgust} = 3.56$ vs. $M_{neutral} = 1.33$, $t(294) = 10.95$, $p < .0001$). We also averaged the eleven negative affect words ($\alpha = .92$) and the eight positive affect words ($\alpha = .91$). Participants in the disgust condition reported more negative affect ($M_{disgust} = 2.19$ vs. $M_{neutral} = 1.76$, $t(758) =$

4.40, p < .0001) and less positive affect ($M_{disgust}$ = 4.19 vs. $M_{neutral}$ = 5.61, $t(758) = 9.27$, p < .0001) than those in the neutral condition.

Coin flip reports: The results show that participants were significantly more likely than chance to report being in the incentive condition (58.56%, *one-sample binomial test*, $p < .001$ and 58.55%, *one sample binomial test*, $p < .001$ for the Disgust and Neutral conditions respectively). However, there was no difference between the two conditions (58.56% vs. 58.55%, $X^2(1) = .998$, $p = 1.000$, $\phi^2 = .0013$). For comparison, Winterich et al., found that 52% of participants reported tails (essentially no cheating) in the Neutral condition, and 63% did so in their Disgust condition, leading to a "marginal effect of disgust" (p. 154; $X^2(1) = 3.19$, $p = .07$). Therefore, we fail to replicate their findings. They also report a chi-square test for specified proportions, concluding that in the Disgust treatment, participants reported being in the incentive condition significantly more than expected by chance (63%, $X^2(1) = 10.63$, $p < .01$), while the percentage in the Neutral treatment was no different than chance (52%, $X^2(1) = .28$, $p = .60$). It is worth noting that because of the probabilistic nature of hypothesis testing, finding that one condition differs from chance and failing to find that another condition differs from chance should not be interpreted as a significant difference between the two conditions.

Discussion

Study 1 found that inducing incidental disgust did not increase the level of self-serving unethical behavior. We observed considerable cheating in both conditions, which is consistent with previous findings using this task (e.g., more than 60% of participants in each condition reported getting tails in study 2 of Mullen & Nadler, 2008), but inconsistent with the 52% of participants who reported being in the incentive condition in Winterich et al. (2014). Note that our successful

manipulation check rules out the possibility that participants in our study simply did not experience disgust.

In the discussion of their study, Winterich et al. (2014) speculated that their results may be inflated because "some of the products shown to participants in the neutral condition may be associated with cleanliness (shampoo) and light (light bulbs and candles)" which reduced unethical behavior in the Neutral condition (p. 154). They, therefore, conducted subsequent studies using additional disgust manipulations and unethical behavior measurements. We replicated two of these studies and report them below as our experiments 2 and 3.

Experiment 2

This study is a replication of Study 1b in Winterich et al. (2014). Instead of using product evaluation to manipulate disgust, disgust was induced using a movie, which is a standard and reliable way to manipulate incidental emotions (Gross & Levenson, 1995). Self-interested behavior was measured using a decision-making task described below.

Method

Participants and Design: 161 undergraduate students (41.88% female; M_{age} = 21.11) from a university in the Southwestern United States participated in this study for payment and course credit. The demographics of these participants are similar to the participants in study 1b of Winterich et al. (54% female; M_{age} = 19.16), and our sample size is over 3 times larger than the 51 participants in the original study. Participants were randomly assigned to either the Disgust or Neutral condition.

Materials and Procedure: In a close replication of Winterich et al. (2014), participants in the Disgust condition watched a scene from the movie "Trainspotting", used previously to induce

disgust (Horberg et al., 2009; Schnall, Haidt, et al., 2008). Participants in the Neutral condition watched a short clip about retreaded tires[2]. Participants then completed the same filler questions from Winterich et al. regarding the video.

Afterward, participants played the Gneezy (2005) deception game. This is a sender-receiver game where the sender could send a deceptive message to another participant in order to increase their own payoff. Each participant in the role of a sender was paired with a receiver. The sender was presented with two payment allocations: Option A would pay $2 to the sender and $3 to the receiver; Option B would pay $3 to the sender and $2 to the receiver. The sender could send the receiver one of two messages. Message 1 stated that Option A would give the receiver a higher payoff than Option B (the truthful message), and Message 2 indicated that Option B would give the receiver a higher payoff than Option A (the deceptive message).

Participants were repeatedly informed during this task that their partners would (a) never know their identity and (b) never know the actual payouts for each option. Therefore, participants had complete anonymity as well as no further consequences for acting in a self-interested manner in the task. Participants then decided which message to send by circling their choices on a piece of paper which was collected by the experimenters. One of the session participants, designated as the receiver, was given one of those messages chosen at random and decided between Option A or Option B[3].

As in the original study, we had participants after the deception game report on a 10-point scale the degree to which they experienced specific emotions while watching the video clip. The

[2] This movie used in the Neutral condition differed from the nature video used in the original study, a documentary from National Geographic.

[3] The original authors did not have a Participant B. We included one to avoid deception. This change, as well as the different video used in the control condition, were the only differences between our study and the original study.

same four terms representing disgust that were employed in Study 1 were averaged together to construct a measure of disgust (Cronbach $\alpha = .974$).

Results

Manipulation Check: Participants in the Disgust condition reported experiencing significantly more disgust than those in the Neutral condition ($M_{disgust} = 8.31$ vs. $M_{neutral} = 1.88$, $t(159) = 23.610$, $p < .0001$, $d = 3.72$). These results are similar to those obtained in the disgust manipulation check in Winterich et al. ($M_{disgust} = 8.83$ vs. $M_{neutral} = 1.73$, $t(48) = 17.85$, $p < .0001$). We averaged the six negative affect words ($\alpha = .83$) and three positive affect words ($\alpha = .86$). There was a significant difference in negative affect ($M_{disgust} = 3.10$ vs. $M_{neutral} = 1.72$, $t(159) = 5.742$, $p < .0001$) and positive affect ($M_{disgust} = 2.38$ vs. $M_{neutral} = 3.75$, $t(159) = 4.841$, $p < .0001$) between the two conditions.

Percentage choosing to send a deceptive message to partner: Winterich et al. (2014) found a very large effect size for their manipulation: about twice as many participants in their Disgust condition sent the deceptive message compared to the Neutral condition (67% and 35%, $X^2(1) = 4.94$, $p = .03$ for the Disgust and Neutral conditions, respectively). In our study, we found no difference between the two conditions. 43.0% of the participants in the Disgust condition chose to send the deceptive message, and 47.6% sent the deceptive message in the Neutral condition. A logistic regression with message choice as the dependent variable and condition as the independent variable shows no effect of disgust on the choice of the deceptive message ($X^2(1) = .332$, $p = .564$, and the sign of the difference is in the opposite direction). It is also interesting to note that in both conditions, more than half of the participants chose to send the truthful message. The percentage of truthful behavior in our results is comparable to other studies, which have used this same task (Gneezy, 2005).

Discussion

Our study 2 again considered the relationship between disgust and unethical behavior while using a different emotion elicitation technique and a different measurement of unethical behavior. Specifically, study 2 manipulated disgust using a video and measured unethical behavior by giving the participants an opportunity to increase their payment to the detriment of another participant through deceit. These were the same techniques used in study 1b in Winterich et al. (2014) which found strong support for a positive relationship between disgust and unethical behavior. However, the results from study 2 are consistent with the findings in our study 1: no relationship between disgust and unethical behavior.

In their third study, enumerated as study 2 in their paper, Winterich et al. (2014) replicated their results and examined whether a focus on self-protection functioned as a possible mediator in this relationship. They theorized that a feeling of disgust would elicit a focus on self-protection, leading to more unethical behavior. We conducted a replication of that study in Experiment 3.

Experiment 3

Experiment 3 replicates study 2 from Winterich et al. (2014), which was designed to directly examine the mediating role of self-protection. It uses yet another method to induce disgust, and a different task to measure self-interested unethical behavior.

Method

Participants and Design: We recruited 321 individuals (43.3% female; $M_{age} = 33.63$) from the United States to participate in this online study for payment through Amazon's Mechanical Turk website (MTurk; www.mturk.com). Participants were randomly assigned to either the Disgust or Neutral condition and were given the option to act unethically. The original study by Winterich et al. (2014) used online participants from a TRC survey panel (www.trchome.com) that we did not

have access to. Our sample size is, once again, over 2.5 times larger than the original sample of 120 participants. The study was pre-registered on OSF (osf.io/7gdxs) and used the exact materials and procedures provided by the original authors.

Materials and Procedure: First, participants completed a writing task adopted from Schnall et al. (2008). Those in the Disgust condition wrote about the most disgusting experience in their life, while those in the Neutral condition wrote about their typical evening. Once finished, participants completed a problem-solving task to measure unethical behavior and a self-reported measure of self-protection focus. These two tasks were counter-balanced, as in the original study. This was followed by an emotion manipulation check.

The self-protection focus items were adopted from De Dreu and Nauta (2009). Participants were asked to report, on a 7-point scale, their level of agreement "at this moment" with three specific self-protection statements. The statements are "protecting my needs is at the center of my focus", "I am more focused on protecting myself", and "I am concerned about protecting my own needs and interests" (Cronbach $\alpha = .946$).

Unethical behavior was measured using an anagram task. Participants were given three minutes to unscramble ten words. They were instructed to unscramble the words, and it was stressed that they must unscramble the words in the order in which they appear rather than skip around. Participants were further told that the purpose of the task was to test the effect of incentives on performance, and that there would be two possible incentive conditions. In the first condition, participants would receive 50 cents for each word unscrambled in the correct order. Participants in the second incentive condition would receive $3 if they correctly unscrambled the first 4 (or more) words and only $1 if they unscrambled fewer words. All participants were assigned to the second incentive condition, and the number of anagrams solved was self-reported by the

participants rather than determined by the computer, giving participants an opportunity to misreport without being monitored. It is worth noting that Winterich et al. (2014) used 'bonus points' instead of the monetary incentives we employed. This, as well as the mTurk subject pool, were the only deviations in our procedure from the original study.

Participants were unaware that the third word in the unscrambling task was unsolvable. Since participants needed to solve the first four words to get the higher reward of $3 rather than $1, this created a monetary benefit for participants to lie about solving the third word to get the reward. After the word jumble and self-protection measurement, participants completed the disgust manipulation check along with answering demographic questions and a suspicion probe which asked them what they thought was the purpose of the experiment.

Results

Manipulation Check: At the end of the survey, participants rated the extent to which they experienced a series of emotions on a 10-point scale. The exact wording was "please indicate the extent to which you experienced each of the feelings below while completing the life events memory task at the beginning of this survey." The scores for the same four words as in Study 1 were averaged together to obtain a composite measure of disgust (Cronbach $\alpha = .952$). Participants in the Disgust condition reported experiencing significantly more disgust than those in the Neutral condition ($M_{disgust} = 5.70$ vs. $M_{neutral} = 2.98$, $t(319) = 8.601$, $p < .0001$, $d = .961$). These results are similar to the manipulation check in the original study except for disgust being slightly higher in the neutral condition ($M_{disgust} = 6.01$ vs. $M_{neutral} = 1.31$, $t(116) = 11.20$, $p < .0001$). We averaged the six negative affect words ($\alpha = .76$) and three positive affect words ($\alpha = .83$) and found significantly more negative affect ($M_{disgust} = 5.10$ vs. $M_{neutral} = 4.33$, $t(319) = 3.171$, $p = .002$) as well as positive affect ($M_{disgust} = 4.73$ vs. $M_{neutral} = 3.39$, $t(159) = 4.462$, $p < .0001$) in the disgust condition.

Incidence of Self-Interested Unethical behavior: We used two measures of unethical behavior. The first is the measure used by Winterich et al. (2014). In their study, participants were considered engaging in unethical behavior when they reported three or more anagrams solved, which means that they reported solving the unsolvable anagram. As a second measure, we consider cases where participants reported 4 or more correctly solved anagrams – the minimum needed to receive the bonus – hence, a stricter measure of *self-interested* unethical behavior (a participant reporting unscrambling 3 anagrams is misreporting but is not benefiting financially from the misreporting).

We find no significant differences between the participants in the Disgust and Neutral conditions for both measures of unethical behavior. The percentage of participants that reported solving 3 or more anagrams is 81.6% and 78.7% in the Disgust and Neutral conditions respectively (compared to 52% and 27%, $X^2(1) = 7.65$, $p < .01$ for Winterich et al., 2014). A logistic regression testing for an effect of the experimental condition on the outcome variable is insignificant ($X^2(1) = .417$, $p = .518$). The percentage of participants reporting solving 4 or more anagrams is 74.3% and 71.0% for the Disgust and Neutral conditions respectively (non-significant, $X^2(1) = .448$, $p = .503$). Overall, these results again show no positive relationship between disgust and unethical behavior.

We also conduct a mediation analysis to test whether the relationship between disgust and unethical behavior is mediated by a focus on self-protection. The original paper of Winterich et al. (2014) used Model 4 in Preacher & Hayes (2004) Process Macro to test for mediation. This analysis violates some basic assumptions, because at the time the Process Macro was based on an OLS regression and was not suitable for a binary outcome variable like the unethical behavior measures here[4]. Therefore, we instead ran a mediation analysis using Mplus version 7.2 (Muthén

[4] The current version of PROCESS, which analyses dichotomous dependent variables using logistic regression, was released at a later date.

& Muthén, 2012) with a bootstrapped sample of 20,000 observations to create the confidence intervals and specifying a binary dependent variable. The results for the relationship between disgust and self-protection focus included zero in the 95% confidence interval (95% CI [-0.198, 0.504]), thus showing no relation between disgust and self-protection focus. It is interesting to note that the relationship between self-protection focus and unethical behavior was significant (95% CI [0.187, .537]), indicating that the mediator is related to unethical behavior, but we found no link between the independent variable and the mediator. In our study, induced disgust did not increase self-protection focus (M = 5.03 and M = 4.96 for Disgust and Neutral respectively). Furthermore, the bootstrap analysis indicated that self-protection focus did not mediate the relationship between disgust and unethical behavior because the confidence interval included zero (95% CI [-0.070, 0.203]) and the odds ratio for the indirect pathway included one (95% CI [.932, 1.225]). Overall, these results again show no positive relationship between disgust and unethical behavior, and no mediating role for self-protection focus.

Discussion

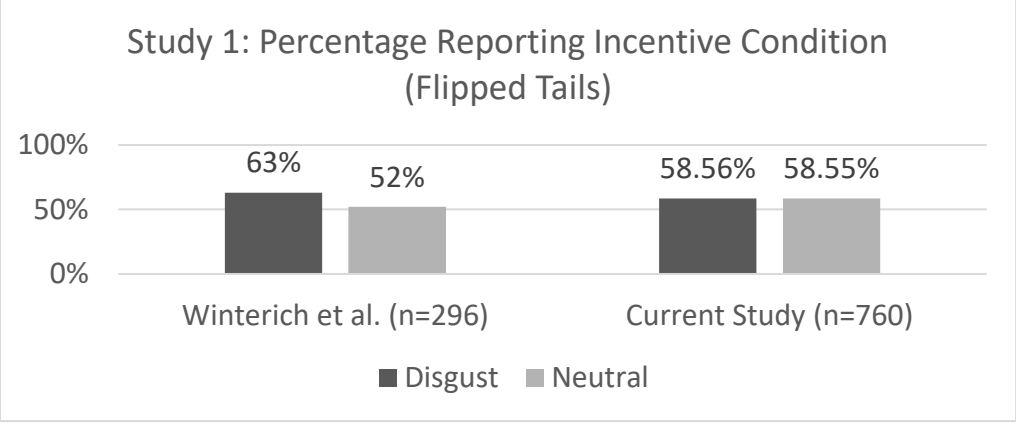
In this third study, we are again unable to detect a significant effect of disgust on ethical behavior. The pattern that emerges here is similar to the other two studies. There is a considerable degree of unethical behavior (much higher than observed in the original study, possibly due to the different online participant pool), though it is far from universal. However, more importantly, the degree of unethical behavior does not depend on whether or not disgust was induced, or on the mediating effect of self-protection focus.

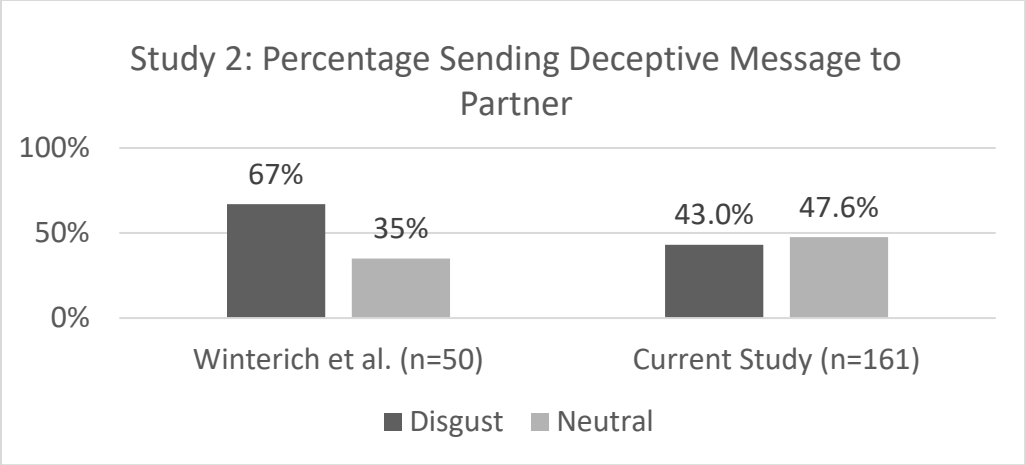
General Discussion

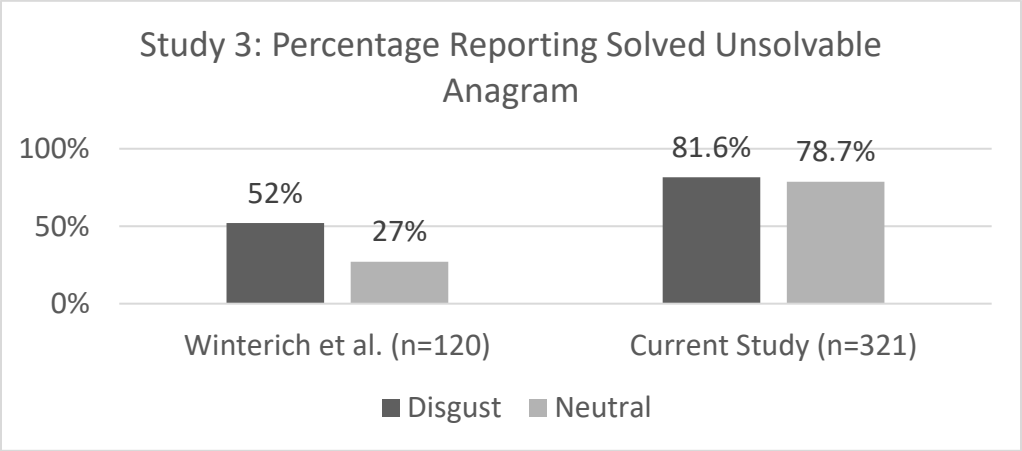
The idea that a state of disgust leads to self-interested unethical behavior has intuitive appeal. A specific state of disgust might trigger a response, in which one emphasizes self-protection, even if it involves compromising ethical principles. This means that it would not be surprising to detect a negative relationship between disgust and ethical behavior, and indeed the work of Winterich et al. (2014) reports the presence of this link. However, our replication of their study fails to detect any relationship between disgust and unethical decisions. We find no difference in the frequency of unethical behavior between the disgust-induced conditions and the neutral conditions in any of the three separate studies that we have conducted.

Figure 1 contrasts the results obtained by Winterich et al. (2014) and those we observed in our study. There are three panels in the figure, each corresponding to one of the studies we have conducted. In each panel, the data of Winterich et al. are given on the left and our data are shown on the right. The Figure reveals that there is a consistent difference between the Disgust and Neutral conditions in the Winterich et al. study, while there is no effect of condition in ours.

Figure 1: Percentage of Participants behaving unethically in the three studies, in comparison with Winterich et al. (2014)







The Top, Middle, and Bottom panels correspond to studies 1, 2, and 3, respectively. The two bars on the left are the data from Winterich et al. (2014) and those on the right are from our replications. The Disgust (Neutral) condition is shown in dark (light) gray. In each of the three studies, the figure shows sizable differences between the two conditions in the Winterich et al. original experiment, and very small (and insignificant) differences in our replication.

The comprehensive design of Winterich et al. (2014), with multiple means of inducing disgust and multiple measures of unethical decisions, means that a failure to replicate their results must fail to do so under each of the different independent paradigms, a tall order. Failure to find the effect that they report in only one of the three replications, therefore, would not be very convincing evidence that the positive relationship between disgust and unethical behavior is not

general. Although we have attempted to replicate the procedures of Winterich et al. as faithfully as possible, using materials and procedures provided by the original research team, we have not found an association between disgust and unethical behavior in *any* of the three studies we have conducted. A power analysis shows that, given our sample sizes (all at least 2.5 times larger than the original samples, as recommended by Simonsohn, 2015), we would be able to detect a medium-sized effect at $\alpha = .05$ with probability 1, .97, and .99, in each of the three studies, respectively; and a small-sized effect at $\alpha = .05$ with probability of .79, .24, and .43 in each of the three studies, respectively. An additional power analysis, using the actual effect sizes obtained by Winterich et al. and our sample sizes, result in anticipated power of .79, .98, and .99, in our three studies. Using this power calculation, the probability that we would not find a significant difference between the Disgust and Neutral conditions in any of the studies at all, if the actual effect sizes are those reported by Winterich et al., is quite remote – only .004%. However, this is the pattern that we observe.

If our results are indicative of the nature of the relationship between disgust and unethical behavior (or a lack of such a relationship), then the recommendation in Winterich et al. (2014) that unethical behavior can be attenuated by reducing sources of disgust is not justified on the basis of this line of research. We believe that the nature of the relationship between disgust and unethical behavior is an open question, but with the available evidence weighing in favor of a hypothesis of no systematic relationship.

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