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The Paradox of Moral Cleansing: When Physical Cleansing Leads to
Increased Contamination Concerns

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Abstract

Background and objectives: Moral threats, including threats to moral self-worth, have been associated with contamination concerns. Paradoxically, although self-cleansing provides temporary relief, it can worsen feelings of contamination. Self-affirmation might be an effective strategy, especially following obsessive type cognitions (e.g., responsibility beliefs) when moral threats are reactivated.

Methods: In Experiment 1, participants recalled an immoral deed and then self-cleansed (using a handwipe), completed a control task, or self-affirmed. Contamination concerns were subsequently measured by a washing task. In Experiment 2, the same procedure was used but obsessive-type cognitions were activated by asking participants a series of questions about obsessive beliefs.

Results: As expected, relative to the control condition, both self-affirmation and self-cleansing resulted in less subsequent repeated washing behaviour in Experiment 1. In Experiment 2, when the immoral recall was followed by activation of obsessive-type cognitions, self-cleansing led to more guilt and repeated washing than self-affirmation and control. Rather than alleviating feelings of contamination, physical self-cleansing led to more contamination concerns and guilt when in the context of activated obsessive-type cognitions, possibly because it paradoxically makes (moral) cleanliness goals salient.

Limitations: Future research needs to test clinical populations, for whom contamination concerns are all the more central.

Conclusions: This research provides further evidence of the influence of moral threat in contamination concerns, and the limits of moral cleansing. Self-affirmation resulted in less contamination concerns under both a neutral condition and activated obsessive type cognitions.

The Paradox of Moral Cleansing: When Physical Cleansing Leads to Increased Contamination Concerns

Keeping one's body clean and healthy is a basic need in humans and animals alike. For some people, however, concerns relating to cleanliness and contamination can become excessive in the form of obsessive-compulsive disorder (OCD), a condition that affects about 2-3% of the population (Ruscio, Stein, Chiu, & Kessler, 2010; WHO, 1999). OCD is characterized by unwanted and intrusive thoughts, images or impulses (obsessions) that are often associated with repetitive behaviours or mental acts (compulsions) (APA, 2013). Typical compulsions include repeated and excessive checking and in particular, washing behaviours. An emerging construct in the aetiology of OCD and compulsive washing more generally is *mental contamination*, namely a sense of internal dirtiness that usually results from a perceived psychological or physical violation, such as a threat to one's sense of purity or moral self-worth (Coughtrey, Shafran, Knibbs, & Rachman, 2012; Elliott & Radomsky, 2009; Rachman, 2006; Rachman, 2013; Radomsky & Elliott, 2009; Waller & Boschen, 2015). The current research investigated strategies aimed at reducing such mental contamination, and their relative effectiveness, in particular, the extent to which cleansing behaviour actually provides relief.

Indeed, contamination concerns have been associated with challenges to one's perceived moral value even in non-clinical participants. For example, Doron, Sar-El, and Mikulincer (2012) conducted a series of experiments in which participants first completed a computerized task that provided negative feedback on their level of morality or in a control condition, their sports ability, or a neutral condition, no feedback. Suggestions of deficiency in the moral domain led to higher contamination concerns as indicated by higher self-reported urges to take action in response to contamination-related scenarios (e.g. '... you realize that you didn't wash your hands before handling meat...'). In a related study, healthy participants

who experienced moral self-threat scored higher in OCD-type cognitions as measured by the Obsessive Beliefs Questionnaire (OBQ; Abramovitch, Doron, Sar-El, & Altenburger, 2013). The authors argued that moral self-sensitivity is linked with various cognitive biases related to OCD. In a subsequent study, moral concerns related to deontological guilt (i.e., a feeling of having violated one's moral values) were particularly important contributors to both self-reported obsessions and compulsions (Mancini & Gangemi, 2015). These types of contamination concerns can manifest themselves in observable behaviour. For example, one study found that following a guilt induction (e.g., a threat to moral self-worth), participants engaged in more repeated washing behaviour when asked to clean a Plexiglas container, a carefully devised experimental task designed to measure obsessive-compulsive type related cleaning behaviour (D'Olimpio & Mancini, 2014, Experiment 2). Importantly, this study was conducted with non-clinical participants, suggesting that milder versions of mental contamination involved in the aetiology and maintenance of certain obsessions and compulsions are relevant in the absence of diagnosable OCD.

An extensive body of social psychology research has also demonstrated a link between physical and moral purity such that judgments about other people's moral transgressions are influenced by experimentally induced feelings of cleanliness and disgust (e.g., Schnall, Benton, & Harvey, 2008; Schnall, Haidt, Clore, & Jordan, 2008; for reviews, see Chapman & Anderson, 2013; Lee & Schwarz, 2016; Schnall, 2017). Guilt associated with one's own moral transgressions can be alleviated by physical cleansing, a phenomenon termed *moral cleansing* (Zhong & Liljenquist, 2006¹; for a review see West & Zhong, 2015), indicating that physical cleansing can provide relief from guilt and therefore (at least

¹ Fayard and colleagues (2009, Study 1) did not observe a heightened desire to cleanse after an unethical recall in a replication study that asked participants to fill out 67 items about conscientiousness (i.e., being proper and organized) before the guilt induction. This methodological difference may explain the discrepant finding (see Lee & Schwarz, 2016). Study 2 also failed to replicate the effect of cleansing reducing moral emotions following an unethical recall. However, others have argued that failed replications may highlight the cultural and context-dependency of these phenomena (Gómez, Diaz, & Marrero, 2011; Kaspar & Teschlade, 2018).

temporarily) restore a sense of moral purity. Interestingly, threatened morality also has detrimental effects on executive control (e.g., response inhibition) and self-cleansing reduces this effect (Kalanthoff, Aslan, & Dar, 2017). Moreover, moral cleansing effects have been shown to be even more pronounced in patients with OCD (Reuven, Liberman & Dar, 2013). Overall, in both clinical and non-clinical populations, there appears to be a conflation of bodily contamination and moral contamination, whereby the goal of moral purity is pursued via bodily purity.

There are, however, limits to the extent to which physical self-cleansing can restore moral value following a moral threat. Indeed, it has long been established that repeated washing and checking can in fact exacerbate and maintain anxiety associated with feelings of contamination (Hodgson & Rachman, 1972). For example, although temporary relief may be felt after self-cleansing, feelings of contamination often spontaneously decay over time, and repeated washing may prevent this decay by maintaining the contamination concern (Coughtrey, Shafran, & Rachman, 2014; Kozak & Foa, 1997), or by preventing the learning of new non-threat associations (e.g., Jacoby & Abramowitz, 2016). Thus, paradoxically, although physical self-cleansing sometimes brings temporary relief from challenges to self-worth, it has the potential to exacerbate mental contamination by continuing to make contamination concerns all the more salient, possibly because the cleansing goal is activated yet again (see Förster, Liberman, & Friedman, 2007).

A more adaptive way of dealing with challenges to moral self-worth might include an affirmation of core values of the self (Cohen & Sherman, 2014). Indeed, Critcher and Dunning (2015) demonstrated that self-affirmation expands the self-concept, rendering threats to the self as proportionally less significant. That is, threats to the self were less encompassing because such a perspective reduces defensiveness. Self-affirmation of positive self-qualities has also been shown to lead to a reduction of prosocial behaviour, as if people

feel licensed to refrain from moral behaviour when their self-worth has been established in a non-moral domain (Sachdeva, Iliev, & Medin, 2009). Similarly, self-affirmation eliminates the threat posed by physically disgusting but harmless taboo violations (Mooijman & Van Dijk, 2015). The current research therefore tested whether self-affirmation might constitute an alternative and potentially more effective route than self-cleansing to re-establish self-value in the face of moral threat.

Experiment 1

As noted above, previous research has established that moral threats can lead to increased OCD-related behavioural tendencies, including cleansing and washing behaviour as an attempt to alleviate one's sense of moral violation (D'Olimpio & Mancini, 2014; Doron et al., 2012; Zhong & Liljenquist, 2006). We tested whether in the face of moral threat self-affirmation is as effective in reducing subsequent cleansing desires as self-cleansing, or a neutral control task. Using the paradigm developed by Zhong and Liljenquist (2006), we first induced moral guilt in all participants by asking them to recall a time when they had engaged in immoral behaviour. Some participants were then given the opportunity to self-cleanse by using a hand-wipe (an established method of moral cleansing; Lee & Schwartz, 2011), while others affirmed core values of the self. In a third neutral condition participants instead wrote about their typical journey to work (adopted from Schnall, Roper & Fessler, 2010). As a behavioural measure of subsequent contamination concerns, participants were instructed to clean a Plexiglas container that had been prepared to be dirty, an experimental task established by D'Olimpio and Mancini (2014). We hypothesised that self-affirmation would be at least as effective as self-cleansing in decreasing contamination concerns.

Method

Sample Size Considerations. In the experiment after which our work was modelled, among 44 participants divided into three conditions, D'Olimpio and Mancini (2014) observed an effect size of $\eta^2_p = .39$. Based on this effect size, we used G*Power (Faul et al., 2007) to conduct an a priori power analysis to determine the sample size necessary for an ANOVA, with a power estimate of .80 and an alpha of .05. The analysis indicated that a total sample of 21 (i.e., 7 per condition) would be sufficient to detect a difference among three conditions. Nonetheless, because this was our first study in this line of work we aimed for a larger sample and therefore tested about 2.5 times the recommended number. The final sample size followed pragmatic considerations, by attempting to test as many participants as feasible during the academic term and through University-based poster and web-based recruitment advertisements.

Participants and Design. 54 undergraduate and community participants (56% female), aged 18 to 59 ($M=22.90$; $SD=7.20$), were recruited to take part in a study ostensibly examining 'autobiographical memories and sensory motor skills' and reimbursed with £3 and a lottery scratch-card. Participants were randomly assigned to one of three conditions: self-cleansing ($n=18$), self-affirmation ($n=18$), and control ($n=18$). Ethics approval for both experiments was provided by the University's Department of Psychology Ethics Committee.

Materials.

Guilt recall task. The guilt recall involved producing a written narrative as used in previous studies (e.g., Reuven et al., 2014; Zhong & Liljenquist, 2006). Participants described in detail an unethical behaviour and any associated reactions. To facilitate open disclosure, participants were assured that information would be kept completely confidential, and the experimenter provided privacy by waiting outside the room while they completed the task. As a means of providing additional control for potential variation in guilt recalls, a blind coder subsequently rated the narratives for (a) deontological guilt, defined as a feeling of

violating one's moral rules (D'Olimpio & Mancini, 2014; Prinz & Nichols, 2010) and (b) and overall unethical quality, coded from 1 (none present) to 7 (very high).

Cleaning task. This behavioural task was originally developed by D'Olimpio and Mancini (2014) as a behavioural measure of spontaneous contamination concerns. Participants were asked to clean a transparent and colourless 20 x 20 cm open Plexiglas container, placed about 20 cm in front of them on a table. As a cover story, participants were told that we were assessing their sensory-motor skills and habits by observing how they manipulate and go about physically cleaning the container. The container had ten surfaces (inside and outside) that could be cleaned. Small 3 x 3 cm coloured stickers were attached to certain surfaces to facilitate subsequent coding of task completion. Similar to the original task, a box containing cleaning products was also placed on the table including gloves, tissues, Q-tips, paper towels, spray cleaner, leather cloth, cotton cloth, and various sponges (Figure 1). A video camera behind the table recorded performance. Participants were requested to clean the container as they wished and without time constraint, and to do so until they felt the task was complete to their satisfaction.

Figure 1. Experimental setting and materials.



Following D'Olimpio and Mancini (2014), video recordings were coded by two independent judges blind to condition for (a) repeated washing (i.e., number of times returned to wash a previously cleaned surface); (b) washing time; and (c) number of surfaces washed. Because intraclass correlations were very high (number of surfaces washed: .970; repeated washing: .978; completion time: .999), the two raters' scores were averaged.

Procedure. Participants were invited to a 30-minute study purportedly examining autobiographical memories and sensory-motor skills, and tested individually. Following written consent, they all completed the unethical (guilt) recall task and then were assigned to one of the three conditions. The self-affirmation manipulation was modelled after previous studies (see Jordan & Monin, 2008; Schnall & Roper, 2012, for full details) and involved writing about a recent experience in which the participant demonstrated personally valued qualities, timed to 8 minutes. The control manipulation involved writing about the typical journey from home to the university or work (see Schnall & Roper, 2012, for details), also timed to 8 minutes.

The self-cleansing manipulation followed earlier studies (Cougles, Goetz, Hawkins, & Fitch, 2011; Lee & Schwarz, 2010; Zhong & Liljenquist, 2006), which involved using a cleansing wipe. Participants were told: 'next we have the sensory-motor skills task, during which you'll be using your hands. It's important your hands are clean for this task. We therefore need to ask you to first clean your hands with one of these wipes,' at which time the experimenter offered a cleansing wipe. Then participants completed the outcome measure, namely the cleaning task. Participants were subsequently debriefed and asked regarding guesses of the study hypothesis. Nobody reported any insight.

Results

We first tested whether participants showed comparable levels of guilt following the unethical recall. Unexpectedly, there was a statistical trend for a difference in deontological guilt as reflected in the blindly coded narratives, $F(2,51)=2.97, p=.060, \eta^2_p=.104$ (control: $M=3.28, SD=1.32$; self-affirmation: $M=4.22, SD=1.35$; self-cleansing: $M=4.22, SD=1.35$). Therefore all subsequent analyses were conducted with deontological guilt as a covariate. Importantly, there was no difference in the overall unethical quality of the recalls, $F(2,51)=1.09, p=.344, \eta^2_p=.041$, nor in age ($p=.10$) or gender ($p=.50$).

Cleaning Task. One outlier was removed (i.e., 115 repeated washings) following the outlier labelling rule (Hoaglin, Iglewicz, & Tukey, 1986). Because we assume that the three outcome variables all capture the same underlying construct, we formed a composite score by summing the three variables' z-scores.² As expected, an ANCOVA with deontological guilt as covariate revealed a main effect of condition on the composite washing score, $F(2,48)=5.504, p=.007, \eta^2_p=.187$ (see Table 1). A post-hoc Fisher's least significant difference (LSD) test indicated less washing in the self-affirmation and self-cleansing conditions when compared to the control condition, $p=.018, d=.65$, and $p=.002, d=.94$, respectively.

Looking more specifically at the individual variables, an ANCOVA revealed a main effect of condition on *repeated washing* (i.e., number of times returned to wash a previously cleaned surface), $F(2,48)=9.490, p=.0003, \eta^2_p=.283$. A post-hoc Fisher's LSD test indicated less washing in the self-cleansing and self-affirmation conditions when compared to the control condition, $p=.0008, d=1.30$, and $p=.005, d=0.83$, respectively, consistent with D'Olimpio and Mancini's (2014) results. Importantly, self-cleansing and self-affirmation did not differ, $p=.16$ (see Table 1).

² The three washing task scores were significantly correlated but the magnitude of this correlation differed (repeated washing & washing time: $r=.697, p<.0001$; repeated washing & number of surfaces washed: $r=.534, p<.0001$; washing time & number of surfaces washed: $r=.382, p=.005$). We therefore report both the composite score, but additionally also the individual measures.

Table 1. Outcome variables for Experiment 1

	Control M (SD) (n=18)	Self-cleansing M (SD) (n=18)	Self-affirmation M (SD) (n=18)
Composite Washing Score	1.24 _a (2.78)	-.984 _b (1.84)	-.397 _b (2.21)
Repeated Washing	36.00 _a (17.31)	18.53 _b (7.92)	24.38 _b (9.59)
Time Spent Washing (ms)	449.42 _a (259.47)	303.11 _b (129.82)	342.47 _b (146.87)
Number of Surfaces Washed	9.25 _a (1.40)	8.56 _a (1.89)	8.50 _a (2.03)

Within each row, values with different subscripts are significantly different ($p < .05$).

When quantifying contamination concerns in the form of *time spent washing*, the pattern was similar, $F(2,49)=4.94$, $p=.011$, $\eta^2_p=.168$. Post-hoc analyses indicated that the control condition resulted in more time spent washing (in seconds) than the self-cleansing and affirmation conditions, $p=.004$, $d=.71$, and $p=.023$, $d=.51$, respectively. The self-cleansing and the self-affirmation conditions, however, did not significantly differ, $p=.50$.

We also examined the *number of container surfaces washed*. There was no effect, $F(2,49)=1.12$, $p=.334$, $\eta^2_p=.044$. This likely was due to the fact that responses were close to ceiling, with 56% participants having washed every single surface, with an overall sample mean of 8.77 ($SD=1.79$) out of 10 surfaces total.

Discussion

Experiment 1 showed that relative to a control condition, both self-cleansing and self-affirmation resulted in less repeated washing after a moral self-threat. While we did not find a difference in total number of surfaces washed, this may be due to a ceiling effect. Overall, both physical self-cleansing and self-affirmation satisfied the cleansing goal to a comparable extent.

Experiment 2

One key feature of the contamination subtype of OCD and compulsive washing behaviours more generally involves chronically activated cognitions related to mental and physical contamination in the midst of repeated washing. A widely influential behavioural theory argues that compulsions, such as repeated washing, maintain fears of contamination because they prevent habituation to the anxiety-provoking obsessions (Hodgson & Rachman, 1972). More recent evidence also suggests that repeated cleansing can maintain the cognitive components of mental contamination (Coughtrey, Shafran, & Rachman, 2014; Rachman, 2006). While self-cleansing sometimes brings temporary relief, it has the potential to worsen contamination concerns by making these cognitions more salient. We hypothesized that self-cleansing would be particularly maladaptive once obsessive cognitions are activated.

Experiment 2 explored whether self-affirmation is more beneficial than self-cleansing in the context of activated obsessive-type cognitions because they often relate to heightened (e.g., moral) responsibility. As a way of making salient an array of obsessive cognitions, participants received an OCD questionnaire including obsessive beliefs about responsibility, perfectionism and uncertainty, threat overestimation, and importance and control of thoughts (e.g., 'having nasty thoughts means I'm a terrible person') (Moulding et al., 2010). Based on the clinical literature, we expected that in the context of such concerns, self-cleansing would be less effective in reducing mental contamination and guilt when compared to self-affirmation and a control condition. In other words, whereas Experiment 1 showed that self-cleansing (and self-affirmation) reduced subsequent cleaning and checking behaviour relative to a control condition, this relief provided by self-cleansing is expected to be transient and potentially reactivated by related cognitions. In contrast, because it concerns the root cause of a compromised moral self-value, we expected self-affirmation to better address guilt and subsequent contamination concerns.

One methodological point warranted consideration. In Experiment 1, after the guilt induction, participants in the self-cleansing condition had used the wipe and then immediately moved on to the next task, while other participants engaged in the self-affirmation or control task, respectively. These latter procedures took 8 minutes. One potential problem was that self-cleansing using the wipe took less time, usually not more than one minute, and was therefore shorter than the other two conditions. Thus, for Experiment 2 we added another manipulation that controlled time elapsed across all conditions, such that for half the participants each condition took precisely 3 minutes. Participants in the self-cleansing condition subsequently also completed the control task, extending the manipulation to roughly 3 minutes as well. This not only equalized time elapsed across all experimental conditions, but also inserted a brief distraction activity for participants who had used the wipes. The experimental design therefore involved condition (self-affirmation, self-cleansing, control) and manipulation duration (equalized; not equalized).

Method

Sample Size Considerations. Based on the repeated washing results of Experiment 1, a total sample size of 42 participants would be sufficient to detect a difference, with 80% power and an alpha of .05, with 6 cells (i.e., 3 conditions, plus equalized and not equalized timing). Because Experiment 2 sought to make salient obsessive cognitions, a new and relatively subtle manipulation, we aimed for a larger sample and therefore tested 3 times this number. The final sample size again was the result of pragmatic considerations, following the aim of maximizing data collection during the term.

Participants and Design. 127 undergraduate and community participants (74% female), aged 18 to 58 ($M=23.41$; $SD=6.37$), were recruited and reimbursed as in Experiment 1. They were randomly assigned to one of three conditions: self-cleansing ($n=43$), self-affirmation ($n=43$), and control ($n=41$). Half of the participants received the equalized

manipulation duration (3-minutes per condition), whereas the others received the same duration as in Experiment 1.

Materials.

Guilt recall and cleaning task. Both tasks were identical to Experiment 1. Videos of the cleaning task for the first 54 participants were coded by two raters. Intraclass correlations were very high: a) repeated washing (.948); b) washing time (.998); and c) number of surfaces washed (.975). As such, and similar to Experiment 1, the two raters' scores were averaged and the remaining videos were coded by one rater.

Obsessive Beliefs Questionnaire (OBQ-20). The OBQ-20 (Moulding et al., 2010) is an abbreviated version of the Obsessive Beliefs Questionnaire-Revised with acceptable psychometric properties (OCCWG, 2005; Tolin, Worhunsky, & Maltby, 2006). It contains statements about beliefs and appraisals associated with OCD, which are important in a cognitive model of the development and maintenance of obsessional problems (OCCWG, 2001). The questionnaire includes four subscales: 1) responsibility (e.g., 'if I don't act when I foresee danger, then I am to blame for consequences'); 2) threat overestimation (e.g., 'harmful events will happen unless I'm careful'); 3) perfectionism/uncertainty (e.g., 'I should be upset if I make a mistake'); and 4) importance/control of thoughts (e.g., 'having nasty thoughts means I'm a terrible person'). Items are rated on a 7-point Likert-type scale ranging from 1 ('disagree very much') to 7 ('agree very much').

Self-Reported Guilt. Embedded among filler items to minimize demand characteristics, guilt was assessed as one item of the Positive and Negative Affective Scale (PANAS; Watson, Clark, & Tellegen, 1988), rated from 1 ('very slightly or not at all'), to 5 ('extremely').

Procedure. As in Experiment 1, following written consent, participants first received the guilt induction and then completed either the self-affirmation, self-cleansing, or control manipulation. Activation of obsessive cognitions in the form of the OBQ-20 came next, followed by self-reported guilt and then the outcome measure, washing of the Plexiglas container. At the end, participants were debriefed and asked regarding guesses of the study hypothesis. Nobody reported any insight.

Results

As a first step we confirmed that the guilt induction was equally effective across conditions. Indeed, the narratives did not differ in deontological guilt, $F(2,124)=.738, p=.480, \eta^2_p=.012$, or unethical quality, $F(2,124)=.005, p=.995, \eta^2_p=.000$. We also established that individual differences in OCD-type cognitions as assessed by the OBQ-20 did not vary across conditions, $F(2,123)=1.94, p=.148, \eta^2_p=.031$ (control: $M=70.75, SD=20.99$; self-cleansing: $M=78.07, SD=18.76$; self-affirmation: $M=70.67, SD=19.91$). Furthermore, there were no group differences in age ($p=.48$) or gender ($p=.66$) or the OBQ-20 ($p=.15$). Thus we achieved successful random assignment to the experimental conditions.

Guilt. An important consideration was whether in the context of activated obsessive cognitions the different manipulations would lead to different levels of guilt. Indeed, there was a significant main effect of condition, $F(2,121)=3.09, p=.049, \eta^2_p=.049$. A post-hoc Fisher's LSD analysis indicated that self-cleansing resulted in more guilt than self-affirmation, $p=.021, d=.51$, and a trend when compared to the control condition, $p=.059, d=.34$ (see Table 2).

Table 2. Outcome variables for Experiment 2.

	Control M (SD) (n=41)	Self-cleansing M (SD) (n=43)	Self-affirmation M (SD) (n=43)
Guilt	1.59 _{a,b} (0.87)	1.91 _a (0.99)	1.49 _b (0.63)
Composite Washing Score	-.557 _a (2.08)	.634 _b (2.09)	-.314 _a (2.17)
Repeated Washing	24.21 _a (9.86)	30.39 _b (13.54)	24.80 _a (12.23)
Time Spent Washing (ms)	365.20 _a (193.91)	429.86 _a (283.11)	352.66 _a (191.67)
Number of Surfaces Washed	8.27 _a (1.99)	9.16 _b (1.51)	8.61 _{a,b} (1.94)

Within each row, values with different subscripts are significantly different ($p < .05$).

Cleaning Task. Two outliers were removed (i.e., 80 and 83 repeated washing) according to the outlier labelling rule (Hoaglin et al., 1986). Again a composite washing score was formed by summing the three variables' z-scores.³ Consistent with the findings on guilt, an ANOVA with condition (self-cleansing, self-affirmation, control and manipulation duration (equalized, not-equalized) as factors revealed a main effect of condition on the composite washing score, $F(2,113)=3.361$, $p=.038$, $\eta^2_p=.056$. A post-hoc test indicated more washing in the self-cleansing condition when compared to the self-affirmation and control conditions, $p=.041$, $d=.44$, and $p=.019$, $d=.57$, respectively. In detail, an ANOVA with condition and manipulation duration revealed a statistical trend for a main effect of condition on *repeated washing*, $F(2,115)=2.91$, $p=.059$, $\eta^2_p=.048$. A post-hoc test indicated that the self-cleansing condition resulted in more such washing than the self-affirmation and control conditions, $p=.044$, $d=.43$, and $p=.035$, $d=.52$, respectively. There was also a statistical trend for an effect of condition on number of surfaces washed, $F(2,115)=2.62$, $p=.077$, $\eta^2_p=.044$, with the self-cleansing condition cleaning more surfaces than the control condition, $p=.026$,

³ Correlations between measures were: repeated washing & washing time: $r=.485$, $p<.0001$; repeated washing & number of surfaces washed: $r=.349$, $p<.001$; washing time & number of surfaces washed: $r=.213$, $p=.019$.

$d=.50$. Compared to repeated washing, effects for this variable were likely weaker because 66% participants washed every surface, with an overall mean of 8.69 ($SD=1.85$) out of 10 surfaces total. In contrast to Experiment 1, there was no effect of condition on washing time, $F(2,117)=1.55$, $p=.216$, $\eta^2_p=.026$.

Supplementary Analyses. In the previous analyses, there were no significant interactions between condition and manipulation duration (equalized vs. not equalized) on any of the dependent variables (i.e., repeated washing, surfaces washed, washing time, and guilt), all p 's $< .37$, suggesting that for the effect to occur it did not matter whether manipulations were timed to last 3 minutes or not. Unexpectedly there was a main effect of manipulation duration (equalized vs. not equalized) on one outcome variable: time spent washing. That is, participants in the equalized duration condition generally spent more time (measured in seconds) washing ($M=426.10$, $SD=235.92$) than participants in the not equalized duration condition ($M=326.30$, $SD=206.81$), $F(2,117)=6.01$, $p=.016$, $\eta^2_p=.049$. Because the equalized duration condition had less time elapse following the guilt induction (i.e., only 3-minutes vs. 3-to-8 minutes), this finding is consistent with the notion of spontaneous decay of contamination over time (Coughtrey et al., 2014) because increased time passed after the guilt induction reduced the urge to engage in cleaning.

Discussion

Experiment 2 sought to examine whether self-cleansing exacerbates guilt as well as contamination concerns in the context of activated obsessive cognitions. As expected, self-cleansing was less effective than the self-affirmation manipulation and control conditions when it came to subsequent washing behaviour, especially repeated washing and number of surfaces cleansed; for the number of surfaces that were washed the patterns was weaker but in the same direction. Importantly, and as expected, these findings are in stark contrast to Experiment 1 where both self-cleansing and self-affirmation led to significantly *less*

contamination concerns than the control condition. In Experiment 2, once obsessive cognitions had been activated, self-cleansing led to more guilt and contamination concerns as demonstrated by *increased* repeated washing relative to both self-affirmation and a neutral control task. This demonstrates the paradox of self-cleansing: It may be an effective way to ‘morally cleanse’ in a vacuum (Experiment 1), but may lead to *increased* contamination when in the context of relevant cognitions that may arise (Experiment 2). Overall, self-cleansing may have paradoxical effects, depending on the cognitive state of the individual.

Although the outcome variables all point in consistent directions in Experiment 2, it should also be noted that while self-cleansing led to significantly greater guilt, it led to statistical trends for higher contamination concerns as measured by the washing task. The slightly less strong pattern for the cleaning task in Experiment 2 is probably due to the greater delay between the guilt recall and the cleaning task because in contrast to Experiment 1 participants completed the OBQ-20 and the PANAS before moving on to the main variable of interest, the cube cleaning task. This aspect of the results further supports the notion that mental contamination spontaneously wears off as a function of the passing of time (Coughtrey et al., 2014).

General Discussion

Two experiments tested the effects of self-cleansing and self-affirmation on contamination concerns following a need to morally cleanse. Experiment 1 revealed that following the guilt recall, self-cleansing led to less spontaneous washing behaviours compared to a control condition. Importantly, as expected, self-affirmation of personal values also led to less subsequent repeated washing. Experiment 2 supported the notion that self-cleansing increases contamination concerns when in the context of obsessive cognitions. That is, self-cleansing led to greater guilt and repeated washing behaviour than the self-affirmation

condition, suggesting that the presence of relevant cognitions plays a critical role in determining whether moral cleansing actually relieves or worsens contamination concerns.

In Experiment 2, both self-affirmation and the control condition of thinking about one's typical journey to work had similar effects. Thus, different types of activities can serve as a buffer against a moral cleansing motive, rather than self-affirmation being required. Perhaps more importantly, because self-cleansing led to increased contamination concerns and guilt in the context of relevant cognitions, it indicates another reason why physical self-cleansing is a maladaptive strategy of moral cleansing. Indeed, previous research has established that *repeated* physical self-cleansing may maintain contamination concerns. This is likely the case because self-cleansing prevents habituation or the learning of new non-threat associations (Jacoby & Abramowitz, 2016; Kozak & Foa, 1997).

The present research shows that the self-cleansing does not need to be repeated at all in order to pose problems –i.e., the use of a single hand wipe was sufficient to be maladaptive, even in a non-clinical sample. Thus, although physical self-cleansing sometimes brings temporary relief from challenges to self-worth, it has the potential to exacerbate feelings of contamination by continuing to make contamination concerns all the more salient. Overall, perhaps the most important conclusion from our work is that self-cleansing is particularly detrimental, not only because it hinders habituation, but because of its interaction with related cognitions. Indeed, D'Olimpio and Mancini (2014) have similarly reasoned that, in a vicious cycle, observing one's self-cleansing behaviour could imply feelings of guilt which would worsen contamination: "I clean repeatedly and I feel benefit from washing behaviour. So, it has to mean that I need to wipe because I'm dirty. I did not touch any physical contaminants, so I'm morally dirty." The current results suggest that such a cycle may be prompted in the context of OCD-related concerns. These findings are also consistent with earlier suggestions of self-perception (Bem, 1972) that lead people to infer their

thoughts and feelings from bodily changes and outward behaviours (e.g., Schnall, Abrahamson, & Laird, 2002; Schnall & Laird, 2003; for a review, Laird & Lacasse, 2014).

The findings from two experiments provide a compelling picture regarding the role of self-cleansing in the context of moral guilt in non-clinical participants. However, several limitations are worth considering. Although the current findings are consistent with a wide body of evidence demonstrating that a moral threat can lead to contamination concerns, they do not indicate that a moral threat is necessarily a component in the aetiology and symptomatology of OCD, because not all subtypes of OCD involve mental contamination. Therefore, the current findings extend primarily to mental contamination, also an important component of the contamination subtype of OCD (Rachman, 2006).

Given the results of the current research we can speculate about the underlying link of mental contamination and moral self-worth in normal as well as in disordered populations. One possibility is that physical cleanliness has a signal function in social contexts because it could be seen as a reflection of close social relationships (Schnall, 2011). More specifically, throughout much of evolution grooming processes were a social activity, such that individuals would take turns in removing impurities from each other's skin or fur (Dunbar, 1996), an activity that in primates takes up as much as 20% of their time (Dunbar, 1993). This not only served to ensure physical cleanliness, but has social consequences due to close contact: Time spent in grooming within social networks is associated with time spent helping those individuals (Seyfarth & Cheney, 1984). Thus, it is conceivable that in humans in the face of moral threat physical cleansing can be seen as an attempt to demonstrate to others that one is a good cooperative social partner after all, a possibility that may be worth testing in future work.

Apart from theoretical implications, the current research may also have consequences for clinical disorders such as OCD. Future research needs to test clinical populations, for

whom contamination concerns are all the more central and therefore the magnitude of the effect more substantial. Moral emotions, in particular guilt, play an important role in obsessions and compulsions and therefore may have important implications for potential treatments. Indeed, current treatments focus on breaking the connection between maladaptive behaviours and resulting anxiety. Novel treatment approaches might also consider directly targeting subjectively perceived deficiencies in moral value and resulting mental contamination. More importantly, these paradoxical effects of self-cleansing provide a fascinating theoretical challenge, demonstrating an important development to the current understanding of moral cleansing.

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Highlights

- Self-affirmation and self-cleansing reduce contamination concerns following guilt
- Following obsessive-type cognitions, self-cleansing raises contamination concerns
- Results highlight the potential for detrimental effects of moral self-cleansing

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