



“Macbeth Effect”: The link between physical cleanliness and moral judgement

Chayanit Trakulpipat^a, Juthatip Wiwattanapantuwong^{a,b,*}, Phot Dhammapeera^a, Arunya Tuicomepee^a

^a Faculty of Psychology, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

^b Graduate School of Arts and Letters, Tohoku University, Aoba-ku, Sendai, Miyagi 980-8576, Japan

Article Info

Article history:

Received 18 August 2020

Revised 20 October 2020

Accepted 30 November 2020

Available online 3 December 2021

Keywords:

Macbeth effect,
moral cleansing,
moral judgment,
physical cleansing,
systematic review

Abstract

Fourteen years ago, a series of studies by Zhong and Liljenquist (2006) revealed that threatened morality fuels physical cleansing. This so-called Macbeth effect demonstrated that washing one's hands protected against physical contamination and also alleviated guilt after unethical behaviour. This moral cleansing behaviour retrieved moral self-worth as a means to take responsibility for past misdeeds and bridged the gap between moral self-concepts and perceived self-imagery as a counter-balance to elicit well-being. Extant research on moral cleansing presents a huge gap in the literature. A systematic review was undertaken to examine empirical studies that addressed the link between physical cleanliness and morality. Results showed that physical cleansing and the feeling of cleanliness have the capability to ameliorate one's guilt after immoral behaviour, reduce prosocial behaviour by changing ethical standards and even promote a clean slate effect. However, failure studies of the Macbeth effect also exist due to disparities in culture, moral identity and methodological limitations. Future research scenarios are offered.

© 2021 Kasetsart University.

Introduction

Does physical cleansing remove more than dirt? The psychological link between physical cleanliness and morality has remained a controversial issue since an influential series of studies was first published by Zhong and Liljenquist in 2006. They determined that physical cleansing minimised the risk of infection and also helped to relieve one's guilt after immoral acts. This parodies the so-called Macbeth effect, as the female character of Shakespeare's Lady Macbeth who compulsively washes

her hands after inciting her husband to murder King Duncan, giving rise to an interesting aspect that physical cleansing may act as a substitute for moral purification in order to restore moral balancing (Sachdeva, Iliev, & Medin, 2009; West, & Zhong, 2015). This suggestion stimulated further research on both empirical behaviour and neural studies (e.g. Denke, Rotte, Heinze, & Schaefer, 2016; Gollwitzer & Melzer, 2012; Lee & Schwarz, 2010a; Lobel et al., 2015; Schaefer, 2019; Xu, Bègue, & Bushman, 2014). For example, a brain study conducted by Denke et al. (2016) investigated this phenomenon using functional magnetic resonance imaging (fMRI). To examine the Macbeth effect, participants were instructed to act immorally (telling a lie) or morally (telling the truth) and then asked to rate their yearning for numerous products (e.g. toothpaste, mouthwash, a battery or

* Corresponding author.

E-mail address: juthatip.w@chula.ac.th.

a tube). Results revealed that cleansing products were rated more desirable than others after indulging in unethical behaviour but not in the control group. This effect was stimulated by an active cortical network that involved the sensorimotor brain area while rating cleansing products but not when rating non-cleansing products (Schaefer Rotte, Heinze, & Denke, 2015; Tang et al., 2017). The authors explained this neuroscientific evidence by postulating that abstract thoughts concerning morality can be grounded as a concrete metaphor of sensory experience.

This phenomenon is based on embodied cognition which can be shaped by perception through our bodies or the environment, while abstract cognitions are grounded in concrete bodily experiences and a conceptual metaphor assists to understand one domain of experience in term of another (Lakoff & Johnson, 1999). Numerous studies show that this perception is bound in everyday life and guides daily behaviour in an unconscious way. An example is the experienced temperature. Warmth can certainly affect the impression of other people. Thus, a person who holds a cup of hot tea is automatic metaphorically viewed as having a warm personality (Williams & Bargh, 2008). In terms of moral purity metaphor, purity is a dominant concept of morality (Haidt & Joseph, 2007). The demand for purification or cleansing of the dirty body after past misdeeds has been engraved in the canon of all major religious ceremonies for many centuries (e.g. baptism of Christianity, wudu of Islam and ablution of Buddhism and Hinduism, which suggests a deeply rooted connection between moral purity and physical cleanliness (Zhong & Liljenquist, 2006). Lobel et al. (2015) examined this symbolic purity and found that religious participants who felt clean after completing the actual ritual washing (Mikveh) decided to decrease donation because physical cleansing washed away their sin and reduced the need for prosocial behaviour, compared to religious participants who sensed being unclean and thus donated more money before ritual practice in order to perform good deeds for atonement. Similarly, Lee and Schwarz (2010a) discovered that participants desired to clean their dirty body parts (after conducting immoral acts) more than other cleaner body areas (not involving immoral acts). These study results implied that abstract concepts concerning purification and cleanliness are physically embodied in the form of physical cleansing activities.

Since the Macbeth effect was coined in 2006, several studies have examined new perspectives using different methods. Some found that cleansing reduced self-reported

moral emotions (e.g. guilt, regret and shame) after misbehaviours and reduced future prosocial behaviour due to perceived self-purification (Reuven, Liberman, & Dar, 2014; Xu, Begue, & Bushman, 2014), while others established that being clean through washing hands or living in a clean environment enhanced moral self-perception and rendered more severe moral judgment on others (Huangfu, Lv, Sheng, & Shi, 2017; Zhong, Strejcek, & Sivanathan, 2010). The act of cleansing can also generate a clean slate effect and open up new areas not previously related to morality (Lee & Schwarz, 2010b; Xu, Zwick, & Schwarz, 2012). These mixed outcomes show that, depending on situations, physical cleansing and a sense of being clean will work with different underlying processes, which may lead to different mental states and behaviours. Therefore, in order to find the link between morality and physical cleaning and the literature gap for future study in Thai culture, the research methodology in the Macbeth effect should be systematically reviewed.

Methodology

Search Strategy

In this paper, previous research documents on the Macbeth effect and physical cleansing were examined and reviewed systematically. Electronic searching of journal databases included Scopus, Science Direct and JSTOR by using the search terms “cleanliness” or “washing” or “physical cleansing” or “purify” or “cleanse” and “moral” or “morality” or “moral judgement”.

Inclusion Criteria

After removing duplicate papers, the inclusion criteria were as follows. First, we focused only on English-language journals published between 2006 and 2019 and then peer-reviewed empirical studies, psychological behaviour and neuroscientific experiments. After reviewing article titles and abstracts, published literature concerning therapy, history, religious studies, criminal studies and literature studies was excluded. Next, the methodology was deliberated in hard copy. To achieve an intimate test of the Macbeth effect, similar research experimental methods were included. (1) For initial variables, participants were required to undergo psychological experiences such as inducing guilt by recalling past misdeeds, priming the sense of clean/dirty or dissonance decision (2) the manipulated variable was in a cleansing-related form such as hand washing, vicarious cleansing and the other form of cleansing-

related and (3) the dependent variables measured the changes of participants' behaviours. Failed experimental studies and unrelated additional tasks besides the three listed above were excluded. Figure 1 shows a flow diagram of the systematic search.

Results

In total, 21 out of 296 published literatures detailing the association between physical cleanliness and morality met the above listed criteria. These 21 studies were categorised into three groups according to the results and research methodology as follows:

Guilt

Seven studies containing nine experiments presented empirical evidence that threatening moral purity activated a desire for physical cleansing (Table 1). To stain moral purity, recalling and describing past misdeeds (1, 3, 6), copying unethical stories (2, 4, 7–9) and playing a violent

video game (5) were used. Ratings of the desirability of cleansing products (2–9) and word completion tasks (1) were applied to investigate the thirst for purification.

Moral Judgment

Eighteen experiments from 11 studies have shown that ethical or immoral actions are correlated with an individual who sees themselves as a clean or dirty physical state. A person engaged in immoral actions would usually participate in ethical activities. A clean individual who regained purity from moral taint, on the other hand, decreased self-reported moral emotions and induced decreased prosocial behavior. In addition, cleansing showed the potential to elevate moral judgment on others. Hand washing (10–20), visualizations (22–23, 27), actual physical cleansing (24–25), visualizations (21, 26) were used to enhance moral purity (Table 2 and Table 3). Moral behavior assessment and being asked to volunteer were tested as the effects of being clean.

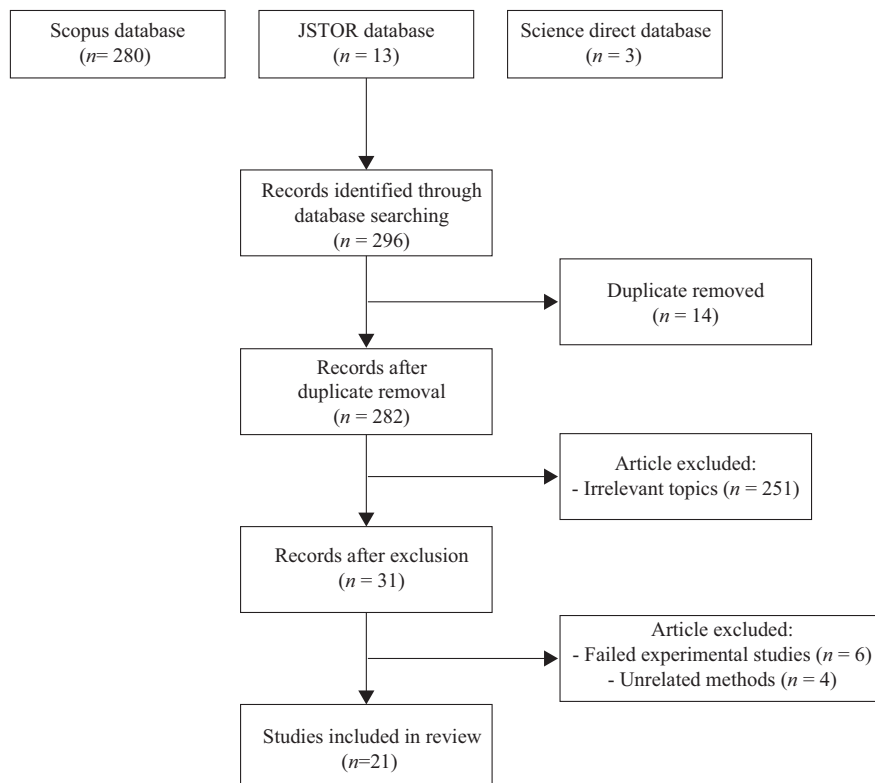


Figure 1 A flow diagram of the systematic search

Table 1 Empirical studies examining participants' morality threatened by unethical behaviours and the need for physical cleanliness

No	Year	Authors(study)	Participants	Threatening moral purity	Outcome
1	2006	Zhong & Liljenquist (study 1)	Undergraduate student ($n = 60$)	Recall and report unethical deeds	Number of cleansing-related words during word completion tasks
2	2006	Zhong & Liljenquist (study 2)	Undergraduate student ($n = 27$)	Read and hand-copy unethical stories	Desire for cleansing products
3	2006	Zhong & Liljenquist (study 3)	Undergraduate student ($n = 32$)	Recall and report unethical deeds	Preference for antiseptic cleansing wipes than pencils
4	2010	Lee & Schwarz	Undergraduate student ($n = 87$)	Read and copy stories by written or verbal means	Desire for cleansing products related to dirty body parts
5	2012	Gollwitzer & Melzer	Undergraduate student ($n = 70$)	Playing violent video games	Choosing cleansing-related products
6	2015	Lee et al. (study 3)	Chinese college student ($n = 73$)	Recall and report unethical deeds	Rated face cleansing products higher than the others
7	2015	Schaefer et al.	Not shown ($n = 35$)	Read and copy unethical stories by written or verbal means	Stimulated somatosensory cortex involving hand and mouth area while choosing cleansing products in unethical groups
8	2016	Denke et al.	Not shown ($n = 37$)	Read and copy unethical stories by written or verbal means	Activated somatosensory cortex with primary sensory area and premotor cortex (BA6) while choosing cleansing products but not in the unethical group
9	2019	Schaefer	German college student ($n = 58$)	Read and hand-copy ethical or unethical stories	Engineering students chose cleansing-related products more than social science students

A Clean-slate Effect

Cleansing and non-moral related behaviour is reflected in Table 4. A total of 11 experiments in five studies showed that cleansing manipulation was severed as an eliminated inclination component. It distinguishes the identity of the past from the current identity and makes the prior priorities less important than the current objectives. This clean-slate effect results in reduced post dissonance decision (28–30), improved (or worsened) performance (31–33) and misbehavior reduction. To examine this idea, choosing two conflicting choices freely (28–30, 34–38), or continuously winning/losing in games (31–33) were used and followed by cleansing-related manipulation.

Discussion and Conclusion

This systematic review aimed to address the association between physical cleansing and morality. Twenty-one studies demonstrated evidence supporting the Macbeth effect. Results indicated that several psychological experiences can be affected by the manipulation of

physical cleansing such as guilt reduction, improved moral self-standard, reduced dissonance decision and self-encouragement from consecutive winning or losing of games.

Why does physical cleansing make us feel better or instigate behaviour change? It is possible that unethical behaviours make people feel disgusted with themselves. Basile et al. (2011) claimed that the induction of deontological guilt stimulated the brain area called the insula cortex, which is implicated when people feel disgust (Moll et al., 2008). This emotion is reputed to serve as a behavioural immune system that cleanses the body when facing something dirty (Schaller & Duncan, 2007). For example, eating rotten food stimulates the insula cortex with a feeling of disgust that induces vomiting (Eskine, Kaciniak, & Prinz, 2011). Thus, for success in the Macbeth effect experiment, Xu et al. (2014) suggested that inducing a strong guilt feeling as an initial variable was important. Recalling past misbehaviours committed against a beloved or important person that violated their golden rules (D'Olimpio & Mancini, 2014) often induced a drastic feeling.

Table 2 Empirical studies examining hand washing manipulation and moral-related behaviours

No	Year	Authors (study)	Participants	Evaluating moral behaviours	Hand washing manipulation	Outcome
10	2006	Zhong & Liljenquist (study 4)	Undergraduate student (<i>n</i> = 45)	Being asked to volunteer	Wiping	Reduced moral emotions and prosocial behaviours
11	2008	Schnall, Benton, & Harvey (study 2)	Undergraduate student (<i>n</i> = 44)	Rated 6 moral dilemma behaviours	Washing	Rated immoral actions as less wrong
12	2010	Zhong, Strojcek, & Sivanathan (study 1)	Undergraduate student (<i>n</i> = 58)	Rated 6 moral social issues in a new clean room	Washing	Increased severity of moral judgment
13	2011	Helzer & Pizarro (study 1)	Undergraduate student (<i>n</i> = 52)	Political attitudes	Hand gel	More politically conservative
14	2011	Helzer & Pizarro (study 2)	Undergraduate student (<i>n</i> = 61)	Political attitudes and rated 12 moral behaviours	Washing	Harsher moral judgment and being more politically conservative
15	2013	Cramwinckle, De Cremer, & Van Dijke (study 2)	Undergraduate student (<i>n</i> = 93)	Bonus	Wiping	Reduced the amount of bonus for unethical subordinates
16	2014	Xu, Begue, & Bushman	Adult (<i>n</i> = 65)	Being asked to volunteer	Hand washing vs visual	Both reduced self-guilt and volunteer behaviour
17	2014	Reuven, Liberman, & Dar	Patient with OCD (<i>n</i> = 29)	Being asked to volunteer	Wiping	Reduced moral emotions and prosocial behaviour
18	2015	Lee et al. (Pilot study)	Chinese student (<i>n</i> = 105)	Recall past misdeed and rated self-moral emotions	Hand vs face washing	Face washing reduced moral emotions more than hand washing
19	2015	Lee et al. (study 1)	Chinese student (<i>n</i> = 95)	Being asked to volunteer	Hand vs face washing	Face washing reduced volunteer behaviour more than hand washing
20	2018	Kaspar & Teschlade (study 1)	German (<i>n</i> = 119)	Rated 12 good and bad actions	Wiping	Reduced bad actions in the future

Furthermore, the mechanism of this effect may also be manipulated at the construal level. Individuals normally evaluate distant objects or events as construed abstractly, whereas those proximal are construed concretely (Trope & Liberman, 2010). This tendency produces myopic or shortsighted distanced objects rather than near ones (Mehta, Zhu, & Meyers-Levy, 2014). Thus, the connotation is that the concrete experience of washing the hands could blur the perceived morality (i.e. abstract) and cause vague distance information. This psychological myopic could also cause moral

inconsistency and dishonest behaviour and explain why people feel less guilty and change their moral self-standards, and the other behaviours.

However, failure studies of this phenomenon remain active and alive (Earp et al., 2014; Fayard et al., 2009; Gámez, Díaz, & Marrero, 2011; Siev, Zuckerman, & Siev, 2018). For example, Earp et al. (2014) failed to replicate the original work of Zhong and Liljenquist (2006). The meta-analysis study of Siev, Zuckerman and Siev (2018) also revealed both successful and failed studies. The authors argued that this could happen within

Table 3 Empirical studies examining cleansing-related manipulation and moral-related behaviours

No	Year	Authors (study)	Participants	Cleansing-related manipulation	Evaluating moral behaviours	Outcome
21	2008	Schall, Benton, & Harvey	Undergraduate student ($n = 40$)	Cleanliness-related word scramble	Rated 6 moral dilemma behaviours	Giving the less severity of immoral actions
22	2010	Zhong, Strejcek, & Sivanathan (study 2)	Not shown ($n = 323$)	Copy clean stories	Rated 16 moral social issues	A clean person increased the severity of moral judgements
23	2010	Zhong, Strejcek, & Sivanathan (study 3)	University student ($n = 136$)	Copy clean stories	Rated moral self and 16 moral social issues	Seeing themselves cleaner than others and increased the severity of moral judgements
24	2015	Lobel et al., (study 1)	Israeli ($n = 30$)	Taking a shower	Cheating behaviour	Increased cheating behaviour
25	2015	Lobel et al., (study 2)	Israeli ($n = 147$)	Ritual bathing (Mikveh)	Donation	Reduced donations
26	2017	Huangfu et al.	Employees ($n = 59$)	Clean environment	Rated counterproductive work behaviour (CWB)	Increased the severity of moral judgements
27	2018	Kaspar & Teschlade (study 2)	German ($n = 683$)	Read clean stories	Rated 12 good and bad actions	Increased rating for good actions

certain conditions. The obvious problem that causes failure could be cultural differences and moral identity because most studies were conducted in Western countries and failed to represent this effect in other cultures (Gámez, Díaz, & Marrero, 2011). In Asia, only one study in China conducted this experiment and presented that face cleansing is a symbol of the Macbeth effect in Chinese culture (Lee et al., 2015). Moreover, moral identity should not be overlooked because individuals have a moral self-concept (Jia & Krettenauer, 2017; Schaefer, 2019). A same situation may invoke an act of contrition in a certain culture but not happened within the other. We suggest that methodology limitation should take this into account before designing the experiment.

The empirical question of culture-specifics remains wide open. In Thailand, no empirical study has investigated this effect. Even though Buddhism is the main religion in Thailand, ablution in Thai culture has a different meaning as the concept that sin cannot be washed away. Thai ablution is normally used for improving positive mental health (e.g. having a good fortune) while suffering from anxiety but not for purification after immoral behaviour. Hence, we assume that physical cleansing may not be an embodied form of Thai culture but could be a different embodied form such

as making merit. Hence, we believe that the Macbeth effect possibly existed in Thai culture but could occur in a different form and vary in psychological function (e.g. improve self-confidence).

Most importantly, in 2020, the COVID-19 pandemic has now spread all around the world. Physical cleansing has assumed a new trend of being uncontaminated (Ong et al., 2020). This situation could bias the Macbeth effect experiment. However, behaviour change in morality or prosocial behaviour is interesting and should be considered in the context of the pandemic.

In summary, physical cleansing may remove more than dirt. Cleansing has the power to ameliorate guilt, increase moral self-standards, help to resolve dissonance and improve decision-making and reassurances; however, it also reduces prosocial behaviour. Thus, although cleansing may promote self-improvement it can negatively impact social relationships.

Conflict of Interest

There is no conflict of interest.

Table 4 Empirical studies examining cleansing-related manipulation and non-moral related prosocial behaviours

No	Year	Authors (study)	Participants	Manipulations /choices	Cleansing-related manipulation	Outcome
28	2010b	Lee & Schwarz (study 1)	University student (n = 40)	The chosen CDs had been changed	Hand washing	Reduced post decision dissonance
29	2010b	Lee & Schwarz (study 2)	University student (n = 85)	The chosen jams had been changed	Wiping hands	Reduces the expected taste of chosen over rejected jam
30	2012	De Los Reyes et al.	University student (n = 48)	The chosen pens had been changed	Wiping hands	Perceived less quality of the rejected pen
31	2012	Xu, Zwick, & Schwarz (study 1)	University student (n = 5)	Recall a case of financial good and bad luck	Wiping hands	Increased risky (or non-risky) financial choice in a hypothetical option
32	2012	Xu, Zwick, & Schwarz (study 2)	College student and staff (n = 147)	Consecutive winning and losing of a gamble	Washing hands	Increased (or decreased) amount of bet in the final betting round
33	2013	Kaspar	Not shown (n = 98)	Failing an anagram test	Hand washing	Improving performance
34	2018	Kim, Kim, & Park (study 1)	Not shown (n = 114)	Healthy vs unhealthy food	Reading clean stories	Increased healthy eating behaviour
35	2018	Kim, Kim, & Park (study 2)	Not shown (n = 175)	Healthy vs unhealthy food	Nonvisual hand washing	Increased healthy eating behaviour
36	2018	Kim, Kim, & Park (study 3)	Not shown (n = 42)	Meat-size options	Wiping hands	Reduced the amount of unhealthy food
37	2018	Kim, Kim, & Park (study 4)	Not shown (n = 51)	The preferred amount of healthy and unhealthy food	Visual hand washing	Reduced the amount of unhealthy food (not healthy food)
38	2018	Kim, Kim, & Park (study 5)	Not shown (n = 121)	A genuine vs counterfeit T-shirt	Visual body cleansing	Decreased buying of a counterfeit T-shirt

References

- Basile, B., Mancini, F., Macaluso, E., Caltagirone, C., Frackowiak, R. S., & Bozzali, M. (2011). Deontological and altruistic guilt: Evidence for distinct neurobiological substrates. *Human Brain Mapping*, 32(2), 229–239. doi: 10.1002/hbm.21009
- Cramwinckel, F. M., De Cremer, D., & van Dijke, M. (2013). Dirty hands make dirty leaders?! The effects of touching dirty objects on rewarding unethical subordinates as a function of a leader's self-interest. *Journal of Business Ethics*, 115(1), 93–100. doi: 10.1007/s10551-012-1385-4
- De Los Reyes, A., Aldao, A., Kundey, S. M., Lee, B. G., & Molina, S. (2012). Compromised decision making and the effects of manipulating physical states on human judgments. *Journal of Clinical Psychology*, 68(1), 1–7. doi: 10.1002/jclp.20851
- Denke, C., Rotte, M., Heinze, H. J., & Schaefer, M. (2016). Lying and the subsequent desire for toothpaste: activity in the somatosensory cortex predicts embodiment of the moral-purity metaphor. *Cerebral Cortex*, 26(2), 477–484. doi: 10.1093/cercor/bhu170
- D'Olimpio, F., & Mancini, F. (2014). Role of deontological guilt in obsessive-compulsive disorder-like checking and washing behaviors. *Clinical Psychological Science*, 2(6), 727–739. doi: 10.1177/2167702614529549
- Earp, B. D., Everett, J. A., Mada, E. N., & Hamlin, J. K. (2014). Out, damned spot: Can the “Macbeth Effect” be replicated?. *Basic and Applied Social Psychology*, 36(1), 91–98. doi: 10.1080/01973533.2013.856792
- Eskine, K. J., Kacini, N. A., & Prinz, J. J. (2011). A bad taste in the mouth: Gustatory disgust influences moral judgment. *Psychological Science*, 22(3), 295–299. doi: 10.1177/0956797611398497
- Fayard, J. V., Bassi, A. K., Bernstein, D. M., & Roberts, B. W. (2009). Is cleanliness next to godliness? Dispelling old wives' tales: Failure to replicate Zhong and Liljenquist (2006). *Journal of Articles in Support of the Null Hypothesis*, 6(2), 21–30. doi: 10.1.1.214.2427&rep=rep1&type=pdf
- Gámez, E., Díaz, J. M., & Marrero, H. (2011). The uncertain universality of the Macbeth effect with a Spanish sample. *Spanish Journal of Psychology*, 14(1), 156–162. doi: 10.5209/rev_SJP.2011.v14.n1.13
- Gollwitzer, M., & Melzer, A. (2012). Macbeth and the joystick: Evidence for moral cleansing after playing a violent video game. *Journal of Experimental Social Psychology*, 48(6), 1356–1360. doi: 10.1016/j.jesp.2012.07.001

- Haidt, J., & Joseph, C. (2007). The moral mind: How five sets of innate intuitions guide the development of many culture-specific virtues, and perhaps even modules. *The Innate Mind*, 3, 367–391. doi: 10.1093/acprof:oso/9780195332834.003.0019
- Helzer, E. G., & Pizarro, D. A. (2011). Dirty liberals! Reminders of physical cleanliness influence moral and political attitudes. *Psychological Science*, 22(4), 517–522. doi: 10.1177/0956797611402514
- Huangfu, G., Lv, F., Sheng, C., & Shi, X. (2017). Effect of workplace environment cleanliness on judgment of counterproductive work behavior. *Social Behavior and Personality: an International Journal*, 45(4), 599–604. doi: 10.2224/sbp.6083
- Jia, F., & Krettenauer, T. (2017). Recognizing moral identity as a cultural construct. *Frontiers in Psychology*, 8, 412. doi: 10.3389/fpsyg.2017.00412
- Kaspar, K. (2013). Washing one's hands after failure enhances optimism but hampers future performance. *Social Psychological and Personality Science*, 4(1), 69–73. doi: 10.1177/1948550612443267
- Kaspar, K., & Teschlade, L. (2018). Does physical purity license moral transgressions or does it increase the tendency towards moral behavior? *Current Psychology*, 37(1), 1–13. doi: 10.1007/s12144-016-9483-6
- Kim, J., Kim, J. E., & Park, J. (2018). Effects of physical cleansing on subsequent unhealthy eating. *Marketing Letters*, 29(2), 165–176. doi: 10.1007/s11002-018-9458-5
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought* (Vol. 640). New York, NY: Basic books.
- Lee, S. W., & Schwarz, N. (2010a). Dirty hands and dirty mouths: Embodiment of the moral-purity metaphor is specific to the motor modality involved in moral transgression. *Psychological Science*, 21(10), 1423–1425. doi: 10.1177/0956797610382788
- Lee, S. W., & Schwarz, N. (2010b). Washing away postdecisional dissonance. *Science*, 328(5979), 709. doi: 10.1126/science.1186799
- Lee, S. W., Tang, H., Wan, J., Mai, X., & Liu, C. (2015). A cultural look at moral purity: Wiping the face clean. *Frontiers in Psychology*, 6, 577. doi: 10.3389/fpsyg.2015.00577
- Lobel, T. E., Cohen, A., Kalay Shahin, L., Malov, S., Golan, Y., & Busnach, S. (2015). Being clean and acting dirty: The paradoxical effect of self-cleansing. *Ethics & Behavior*, 25(4), 307–313. doi: 10.1080/10508422.2014.931230
- Mehta, R., Zhu, R., & Meyers-Levy, J. (2014). When does a higher construal level increase or decrease indulgence? Resolving the myopia versus hyperopia puzzle. *Journal of Consumer Research*, 41(2), 475–488. doi: 10.1086/676968
- Moll, J., de Oliveira-Souza, R., & Zahn, R. (2008). The neural basis of moral cognition: Sentiments, concepts, and values. In A. Kingstone & M. B. Miller (Eds.), *Annals of the New York Academy of Sciences*. 1124, (161–180). doi: 10.1196/annals.1440.005
- Ong, S. W. X., Tan, Y. K., Chia, P. Y., Lee, T. H., Ng, O. T., Wong, M. S. Y., ..., Marimuthu, K. (2020). Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *Jama*, 323(16), 1610–1612. doi: 10.1001/jama.2020.3227
- Reuven, O., Liberman, N., & Dar, R. (2014). The effect of physical cleaning on threatened morality in individuals with obsessive-compulsive disorder. *Clinical Psychological Science*, 2(2), 224–229. doi: 10.1177/2167702613485565
- Sachdeva, S., Iliev, R., & Medin, D. L. (2009). Sinning saints and saintly sinners: The paradox of moral self-regulation. *Psychological Science*, 20(4), 523–528. doi: 10.1111/j.1467-9280.2009.02326.x
- Schaefer, M. (2019). Morality and soap in engineers and social scientists: the Macbeth effect interacts with professions. *Psychological Research*, 83(6), 1304–1310. doi: 10.1007/s00426-017-0937-8
- Schaefer, M., Rotte, M., Heinze, H. J., & Denke, C. (2015). Dirty deeds and dirty bodies: Embodiment of the Macbeth effect is mapped topographically onto the somatosensory cortex. *Scientific Reports*, 5, 18051. doi: 10.1038/srep18051
- Schaller, M., & Duncan, L. A. (2007). The behavioral immune system: Its evolution and social psychological implications. In J. P. Forgas, M. G. Haselton, & W. Von Hippel (Eds.), *Evolution and the social mind: Evolutionary psychology and social cognition* (pp. 293–307). New York, NY: Psychology Press.
- Schnall, S., Benton, J., & Harvey, S. (2008). With a clean conscience: Cleanliness reduces the severity of moral judgments. *Psychological Science*, 19(12), 1219–1222. doi: 10.1111/j.1467-9280.2008.02227.x
- Siev, J., Zuckerman, S. E., & Siev, J. J. (2018). The relationship between immorality and cleansing: A meta-analysis of the Macbeth Effect. *Social Psychology*, 49(5), 303. doi: 10.1027/1864-9335/a000349
- Tang, H., Lu, X., Su, R., Liang, Z., Mai, X., & Liu, C. (2017). Washing away your sins in the brain: physical cleaning and priming of cleaning recruit different brain networks after moral threat. *Social Cognitive and Affective Neuroscience*, 12(7), 1149–1158. doi: 10.1093/scan/nsx036
- Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, 117(2), 440–463. doi: 10.1037/a0018963
- West, C., & Zhong, C. B. (2015). Moral cleansing. *Current Opinion in Psychology*, 6, 221–225. doi: 10.1016/j.copsyc.2015.09.022
- Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, 322(5901), 606–607. doi: 10.1126/science.1162548
- Xu, H., Bègue, L., & Bushman, B. (2014). Washing the guilt away: Effects of personal versus vicarious cleansing on guilty feelings and prosocial behavior. *Frontiers in Human Neuroscience*, 8, 97. doi: 10.3389/fnhum.2014.00097
- Xu, A. J., Zwick, R., & Schwarz, N. (2012). Washing away your (good or bad) luck: Physical cleansing affects risk-taking behavior. *Journal of Experimental Psychology: General*, 141(1), 26–30. doi: 10.1037/a0023997
- Zhong, C. B., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science*, 313(5792), 1451–1452. doi: 10.1126/science.1130726
- Zhong, C. B., Strejcek, B., & Sivanathan, N. (2010). A clean self can render harsh moral judgment. *Journal of Experimental Social Psychology*, 46(5), 859–862. doi: 10.1016/j.jesp.2010.04.003