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Book Review

Why torture doesn't work: The neuroscience of interrogation by Shane O'Mara

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Abstract

This book review summarizes Shane O'Mara's Why Torture Doesn't Work: The Neuroscience of Interrogation, which challenges the assumption that coercive interrogation produces reliable intelligence and evidence. Drawing on evidence from neuroscience, psychology, and biomedical research, O'Mara argues that torture and "enhanced interrogation techniques" (e.g., sleep deprivation, waterboarding, stress positions, temperature manipulation, and dietary restriction) impair core neurocognitive functions that required for accurate recall and coherent reporting. The book synthesizes findings on stress hormones and neural systems involved in memory and executive control, emphasizing the vulnerability of hippocampal-prefrontal processes under acute and chronic stress. It also reviews the limits of deception detection, including both behavioral cues and neuro-technologies, and explains why coercion increases compliance without improving informational accuracy, thereby increasing likelihoods of confabulation and false confession. In addition, O'Mara considers the negative psychological and neurological consequences for interrogators and outlines noncoercive alternative interrogation techniques based on rapport, structured interviewing, and environmental conditions that facilitate memory retrieval. Overall, the book argues that the effectiveness of interrogation should be evaluated as an empirically testable question of how coercion shapes memory and executive functions, rather than an intuitive assumption rooted in folk psychology.

Keywords: torture, interrogation, stress, memory, neuroscience, false confessions, deception detection, sleep deprivation

General Summary of "Why torture doesn't work"

"One of the most powerful arguments one can make against a practice is that it is self-defeating,given its own goals. This is a highly unusual book on torture—terrifically interesting."

—Henry Shue, Merton College, University of Oxford

Torture techniques, such as waterboarding, sleep deprivation, solitary confinement, food/dietary constraint, nudity, temperature manipulation, and highly stressful positions, were authorized and prevalently used as "effective" tactics by Central Intelligence Agency (CIA) in under Bush administration. They were legally documented as the "Torture Memo," which became public in 2009. However, a 6,700-page executive summary of CIA enhanced interrogation program was released in 2014 by the Senate Select Committee on Intelligence. Thisreport clearly demonstrated that the CIA's enhanced interrogation techniques (EIT) were far from effective in gaining accurate information or detainee's cooperation. It criticized those techniques as "deeply flawed," thereby leading to fake or undetermined information all the times. Furthermore, Glenn Carle, a former CIA interrogator, strongly argued that the informationobtained under extreme stress was suspicious and "polluted from the start and harder to verify." Consequently, the fundamental question about whether torture is a useful and productive method to elicit detainee's cooperation, reveal confidential and especially accurate information, and prevent terrorism under the "ticking time bomb" scenario (Note 1) becomes a central debate in 21st century. Neuroscientist Shane O'Mara's book challenges the normative assumption that torture or stressful interrogation techniques facilitate reliable information gathering. He proposes a counterintuitive idea that torture and duress significantly negatively influence human's emotions,

behaviors, and cognitive functions, especially for memory and thoughts. In order to support his argument, he provides evidences from several methodologically rigorous experiments in both psychology and neuroscience areas. He brings up and bridges the gap between what people think how and why torture works and what neuroscientific evidences actually show.

O'Mara's logic is clear: firstly, there is no evidence-based research on how reliable torture is as an interrogation method of extracting accurate information. Secondly, the CIA executive report and the "Torture Memo" have already demonstrated that torture, as well as EITs, is no more than "cargo cult science." Although it is based on intuition and folk psychology, EITs are complete failures. Finally, there are overwhelming literatures of human and animal experiments indicating the detrimental and counterfactual influences of torture and its byproduct of stress and pain. Therefore, O'Mara strongly claims that the effects of torture are exactly the opposite of what they are intended to be because it damages the brain in both psychological and neurological ways.

Furthermore, O'Mara backs up his conclusions from several perspectives. Initially, combining a variety of biomedical literatures, he indicates that torture has detrimental effects on long-term memory recollection. It not only makes detainee's memory recall less accurate, but also make them involuntarily confabulating entirely false ones. Even for those who are inclined to cooperate, once tortures, they are unable to provide useful information due to their pre- expected fear or previous experiences of torture. Then, he explores further into lie deception. He demonstrates that those trained interrogators and modern lie detection technologies are not better to detect lies than ordinary people, which is in a roughly 50-50 chance of accuracy. He refutes a well-known principle of lie detection: gaze aversion or eye movements to the right implies dishonesty and deception. Even fMRI lie detection, which shows that an increased blood flow in particular regions is associated with deception, cannot directly establish the causal relationship, thereby being unable to distinguish between accurate and false information. Counterfactually, thepolygraphs and other neuroimaging lie detection techniques largely compromise the quality and the accuracy of information that extracted by the interrogators.

In order to understanding the underlying neural mechanism of torture in depth, O'Mara argues that obviously, torture leads to stress, fear and pain. Exposure to both acute and chronic stress causes substantial impairments in human's cognitive functions and episodic memory recall. It is well-known that stress hormone, cortisol, damage normal physiological functions of brain cells, especially in hippocampus and prefrontal cortex. Basically, extreme stress makes detainee's brain automatically focus on immediate survival brain system, which is uncontrolled automatic and nonconscious. Likewise, painful experience activates the pain matrix (Note 2) in the brain. Dysfunctions of pain matrix significantly impair detainee's emotions, memories, and cognitions because the neural substrates of cognition and pain are correlated, and the two brain systems modulate one another reciprocally. Thus, increased pain tends to impair cognitive functions, in terms of memory, emotional regulation, and learning. In addition, fear often is the common method that is utilized by torture perpetrators, such as dentophobia, insectophobia, and claustrophobia. Studies of combat soldiers demonstrates that fear and its byproduct, phobic stress, dramatically disturbs neurogenesis in hippocampus, causes amygdala hypertrophy and hyperresponsivenss. Therefore, detainees under extreme stress, pain, and fear are incapable of conscious recall of episodic memory, let alone providing accurate and secret information.

One of the intriguing chapters is his comprehensive explanations on the neurological mechanisms of sleep deprivation, a so-called white torture. By quoting several famous researchers' studies, O'Mara considers the sleep deprivation as a "cognitive pathology" because physiologically, it damages the hemostasis, cardiovascular system, immune system, and normal mental states. Especially, sleep deprivation impairs a detainee's ability to think about the past events, locations, and plans. The dose response model further points out that the greater the timeof sleep deprivation, the greater the induced cognitive deficits. Just as Alexander Solzhenitsyn (1974) states, "a person deprived of sleep acts half-consciously or altogether unconsciously, so that his testimony cannot be held against him." It is clear and scientifically shown that sleep deprivation as a core EIT only induce the superficial compliance, instead of the useful and veridical intelligence.

Moreover, O'Mara illustrates the inefficiency and the opposite outcomes of other torture techniques: waterboarding, temperature manipulations, and dietary restraints. The water obstruction prevents air

inhalation and causes carbon dioxide narcosis, thereby leading to the negative effects on memory functions and peripheral vasoconstrictions. The waterboarding techniques directly cause extreme panic and loss of consciousness. Additionally, carbon dioxide inhalation makes the amygdala induced acid-sensing ion channels (ASICs), which is the normal fear response. The ASICs negatively impact recall from episodic and long-term memory, mood, and other higher-levels of cognitive functions. Furthermore, manipulations of temperature— heating and cooling—offer metabolic and cognitive evidences of how it impairs human attention and memory. The thermal strain manipulations degrade episodic recall, even independent of motivations and compliances. Either cold or high temperatures show a significantly decreased performances in attention, logical reasoning, and working memory tasks. Moreover, dietary/caloric restraints negatively moderate the behaviors of neurons in orbitofrontal cortex, which exacerbate the cognitive deficits and psychomotor functions. These scientific researches prove that the "smoking gun" (Note 3) justification for implements of torture is totally based on nonsenseand wrong intuition.

The most surprising and utilitarian chapter is his explanations for torturers' behaviors andthe results of empathy gap. O'Mara cites both the famous Milgram's authority and the Zimbardo's Stanford prison experiments to illustrate that how normal students can obey theauthority and even be able to impose harsh and cruel treatments to their fellow students.

Numerous studies show that people with the tendency to hurt others often have empathy gaps. Those individuals do not have abilities to fully empathize with those who are harmed because their brains are able to distinguish their own pain and seeing other else in pain. Neurologically, anterior cingulate cortex (ACC) and insula show additional activation during pain inflicted on the self instead of others. People are able to intentionally create boundaries to prevent the pain transference from others to the self. It is precise to explain why policymakers are easily advocate for torture and how this "empathy gap" aggravates the inclination of torturing others because policymakers do not have the responsibility to carry out the EITs themselves. However, O'Mara creatively change the focus on the impact of torture/EITs on torturers who personally execute them. Coupling with numerous experiments and personal introspections, he argues that torturers do experience neurological and psychological damages, such as stress, anxiety, PTSD, and socialand cognitive impairments. Thus, the EITs and torture "is not cost-free, either monetarily or psychologically, either for the interrogator or for the person being interrogated."

Lastly, O'Mara concludes his book by providing several alternatives for compliance and information extractions. Even though he demonstrates that there are no universally and consistently successful interrogation approaches, he still proposes that less coercive interrogation techniques using psychological factors may work better to gathering accurate and useful information. To be more concise, the indirect approaches for interrogation may be more appropriate and effective for eliciting reliable information from detainees. Those interrogation approaches include virtual reality techniques, role-playing and narrative scripting, third-party observations and systematic structured interviews. Counterintuitively, he suggests that proper food, clothing, and certain control over the detainees themselves are more effective. Along with changes of interrogation techniques based on scientific experiments and human rights standards,O'Mara also claims that interrogators should be professionally trained and the layout of interrogation rooms matters.

The final metaphor in the book from O'Mara: "*We are, it seems, in a situation similar to what might be found in medicine if doctors were allowed to freely ignore everything that we havelearned from biology, physiology, and pharmacology over the past 100 years, instead relying on their hunches. It is the rough equivalent of evolving a cure for leukemia out of your own inner consciousness. Given what we know, given the stakes, given what we could discover, that is simply not good enough*." He persistently argues that torture and EITs are ineffective, morally unjustified, and even unpredictable in its consequences of neurocognitive mechanisms for obtaining intelligence. In 2015, the U.S. government pass the McCain-Feinstein Anti-Torture Amendment (Note 4)[4], which ensures that the state will neither endorse nor come back to Bush- administration's torture policies. O'Mara's book undoubtedly supports this policy by divulgating the inefficiency and inhumanity of torture as a tool of CIA's information extraction, according toa variety of evidence-based researches.

"With accurate and compelling neuroscience, this book will be valuable to individuals outside the neuroscience world—in politics, in the military—who should know the scientific basis of torture as they make and execute policy in this area."

—Howard Eichenbaum, Boston University

Critical Evaluation of the Book: Its Importance, Methodology, and Relevance to Neuroethics

Originality, importance and far-reaching impacts. The originality of the book manifests itself in terms of its counterfactual yet evidence-based argument: torture does not work for information gathering. It is practically worthless and morally disgraceful. Although torture's efficiency is constantly debated, it is still scientifically under-researched. O'Mara's arguments challenge the folk psychology of confession (Note 5), the normative understanding of interrogation, and the metacognition regarding to tick-time-bomb scenarios. The importance of the book cannot be underestimated and should be very seriously reviewed by politicians, militaries, and policymakers for future directions of interrogations.

Back in 2009, the abusive reports of detainees at the Guantanamo Bay and the torture images from the "Dark site," Cobalt (Note 6), in Afghanistan are disclosed. These publicities trigger the U.S. government to decide that the responsibility of EITs from CIA should be moved to a new agency: High-Value Detainee Interrogation Group (HIG) (Note 7). The HIG primarily questions the practice of torture and other coercive interrogation techniques by CIA and proposes to completely replace them. Additionally, the HIG identifies and tries to fill the gap between professional research and interrogation's field. Obviously, O'Mara's book is a strong objection for torture and the EITs in both moral and neuroscientific manners. The book is valuable and convincing for governmental agencies and politicians because it includes numerous neurological, medical, psychological, and behavioral studies to support the uselessness of torture. It further supports the necessity and offers several future directions of neuro-psychological researches on interrogation techniques, social influence tactics, cognitive interviews, and lie deceptions.

Moreover, O'Mara's book inevitably contributes even much more under the Donald Trump's administration since Trump advocates EITs and torture and claims that CIA and intelligence professionals have told him it "absolute works." In his interview with ABC News, he argued that the U.S. must "fight fire with fire." When he was asked to whether he wanted to bring back torture techniques, Trump indicated that "[he wanted to] do everything within the bounds of what you're allowed to do legally. But do I feel it works? Absolutely I feel it works."

However, O'Mara refute President Trump's words by providing the neuroscientific evidences that torture is the worse method for reliable information gathering. Furthermore, the former counterintelligence special agent, Christopher Grisham, supports O'Mara's statement by telling CNN that actually 99% of interrogations are successful without EITs. Metin Basoglu, the head of the Trauma Studies at the Institute of Psychiatry of King's College London, also proves that torture is extremely traumatic and beyond the boundaries of law.

Besides the evidenced-based conclusions about the inefficiency of torture, O'Mara illustrates that in fact, torture negatively impacts the neuro-mechanisms of the retrieval of memory. Under the extreme stressful and torturous circumstances, detainees may be suggestible to either intentionally or unintentionally integrate lots of inaccurate information into memories, thereby leading to false confessions and confabulated memories. Several studies (Note 8) (Kassin & Kiechel, 1996; Russano et al., 2005) show that just simply accusing a person of a crime and claiming the presence of the criminal evidence are powerful enough for an innocent person to confess. Let alone under the torture. Consequently, the information obtained from tortured detainees is unreliable and has a high cost-to-benefit ratio.

Therefore, O'Mara's book sets off a crucial alarm bell for neuroscience's contribution to political agendas. Insights and evidence from the book could prevent the U.S. government from acting in vain and based on intuitions of torture. The book potentially becomes a solid reason of not repeating the previous mistakes and tragedies. O'Mara's alternative interrogation suggestions of non-torture techniques have already been praised by police officers and polygraph experts.

Three neuroscientific studies (Note 9) approve that conversations with detainees or lenient interrogation techniques are superior to torture. Although it is hard to have a conversation with a non-compliant detainee, the alternative non-torture interrogation approaches are still useful and viable for accurate information gathering.

Methodology and scientific evidences. The evidence-based experiments, biomedical and neuropsychiatric research, neuroimaging studies, and animal models are overwhelming and compelling in this book to investigate the detrimental effects of torture on people's memory, as well as higher-level cognitive functions, self-consciousness, confessing behaviors, emotions, and its aftereffects for both detainees and torturers. In each section, O'Mara cites a lot of methodologically rigorous studies with his rationale for why the chosen experiments support his arguments. Normally, he examines the impacts of torture from shallow to deep: from basic physiological features, to central nervous system, to different cerebral cortices, and finally to different hormones, chemicals, and neurotransmitters. Sometimes, he also includes the dynamicfunctional connectivity analyses.

Furthermore, the book combines qualitative and quantitative approaches together. The qualitative data, such as "Torture Memos," CIA Reports, and governmental agencies' quotes, provides detailed descriptions and facts of the "torture" phenomenon. The quantitative research, namely neuro-psychological experiments, surveys, and behavioral studies, along with statistical analysis, contributes to both correlations and causal relationships in depth. The mixed- methodology approaches offer a broader understanding on the effects of torture. The advantages from both methods make O'Mara's arguments more solid and reveal the diversity of the topic. To be more specific, O'Mara mentions the potential misinterpretations of p-value (statistical significance), the unreliability of the neuroscientific findings from small samples, and seven sins of memory (Note 10). Therefore, the empirical cases and evidence-based research from the book illustrate the imperativeness of applying alternative interrogation techniques, instead of torture.

Relevance to neuro-ethics. Torture is innately prohibited due to its inhumanity, cruelty, and immorality. Therefore, CIA's initial use of coercive interrogation techniques became an international controversy. However, several senior officials from American psychological Association (APA), including the Ethics director and the editor of the journal *Ethics & Behavior*,colluded with US. Department of Defense to provide an ethical protection for EITs and further minimize the ethical difficulty for psychologists' participations in those interrogation programs (Hoffman, 2015). Arrigo (2004) pointed out that deontology and normative virtue ethics were strongly against torture and the utilitarian values for governmental officials and the national security are still unclear. Moreover, Elkins (2015) even described that this collision is the greatest breach of scientific ethics in the history of psychology because torture and EITs are responsible for the breakdown from dynamic official agencies and moral rationales.

Additionally, Article 5 of the Universal Declaration of Human Rights clearly rules that "no one shall be subjected to torture or to cruel, inhuman or regarding treatment or punishment." Internationally, the United Nations Convention against Torture (UNCAT), the International Covenant on Civil and Political Rights (ICCPR), and Amnesty International organizations are all prohibited of torture and other malicious treatments for detainees. Later, the APA issued an apology for allowing CIA and other government agencies to use these unethical interrogation techniques, such as sleep deprivation, waterboarding, temperature manipulations, and diet restraints. In addition to APA's apology for these unethical conducts, O'Mara's book puts ethical issues aside and further investigates the efficacy and reliability of torture as an interrogation for information extraction. Altogether, torture is ethically, legally, and scientifically unreliable and invalid.

Deontology vs. utilitarianism. Torture and ticking-bomb scenarios fit into the deontology vs. utilitarianism debate. Basically, the question is that whether there any situation that can justify obtaining the life-and-death information by any means necessary, especially coercive and torturous methods. The BBC Radio 4 program, *TheMoral Maze* (Note 11), supports the utilitarianism, rather than deontology, of the applications of torture. The program questions the ethical and legal prohibitions of torture for national security. However, O'Mara simply puts the neuroscientific evidences on the table, clearly pointing out that even assuming that torture works, it would take days

and weeks for gathering reliable information. By that time, the so-called bombs would have already exploded. Consequently, either deontology or utilitarianism cannot justify torture as an interrogation technique.

Ethics & morality challenge. Torture inevitably challenges the normative ethics and morality because torture is cruel and damaging to both torturers and detainees. The following chart shows the fundamental difference between ethics and morality (It is important to distinguish the two concepts in order to make my point).

	Ethics	Morality
Definition	The guiding rules of behaviors based on a particular group, culture or society; a standard code of right or wrong	Principles of individual judgments of right or wrong. It is a personal guideline of dos and don'ts
From where	Social system/external	Individual/internal
Why do it	Because a society prohibits or supports the acts, such as conventional morality	A person's internally belief of what is right or wrong
The "Gray" area	A person strictly following ethical principles may not have any morals at all	A person may violate the societal rules to maintain moral integrity
Acceptability	Governed by professional, legal, and societal agencies	Morality may transcend culture norms

Because torturers are not abnormal or psychopathy and they are just normal people, applying torture potentially violates their internal morality and general societal ethics. In an artificial psychology experiment, participants are able to administrate light-threatening electric shocks for punishments in order to obey the authority. One point is that the volunteer participants may know that they are in an experiment and the shocks may not be administrated. These obedience experiments show similar findings according to replications in different countries and by different forms. In reality, the torturers or CIA agencies have to perform coercive techniques (torture and violence) on detainees due to the governmental instructions during the time of war. The torturers are more likely to resolve and reconcile their cognitive or emotional dissonance (Note 12) based on national or international justifications. From the official governor's perspective, the torturers usually consider themselves as national guardians and dedicated patriots who try to save the ignorant majority from violence and war on terror (Dorfman, 2004). Although some anecdotes irrefutably show that normal people from Nazi Germany to U.S. detainees in Iraq and Afghanistan are able to disclose information and acts of violence or antisocial behaviors with no internal moral conflicts. However, it does not camouflage torture's physical and psychological damages. Admittedly, even dangerous and despicable terrorists have basic human rights. Terrorist attacks are condemned due to its violent and inhuman means. Whereas, the goals of terrorist organizations are usually similar to the "settled governments" (Blanchard, 2005). Additionally, it is necessary to recapitulate from Rory Brown's paper on the morality of torture (2007): (a) torture puts the right of life at threat, even for dangerous terrorists; (b) it dehumanizes terrorists and victims under political radicalization. Every individual should be entitled to not be tortured and maintain human dignity; (c) "the moral purity of society" is polluted by the possibility of torture because people's subjective understandings of citizenship and civilization are largely influenced by their governments; (d) the international relations and international law may be jeopardized and break the peacekeeping commitments.

Different perspectives of torture debates. The debates of using torture as an interrogation method consist of diverse responses, such as moral absolutism, necessity defense, self-defense, political absolution, trials on acts, ex post ratification, torture warrant system, and Nelsonian blindness. The following chart gives more details.

Theories	Explanations
Moral absolutism	Torture is intrinsically wrong and cannotbe justified in any situations
Necessity defense	If torture is the only way to save lives, the government may take this last resort
Self-defense	An agency can use torture as an extensionof the concept of self-defense to excuse orjustify his conduct
Political absolution	People who torture in ticking-bomb situations should be politically absolved for their crime after the event
Trials on the morality of acts	The torturers should have trials, in which juries decide the morality and culpabilityof their actions
Ex post ratification	Governmental agency can step outside of the legal system and has extralegal actions,which can be excused ex post
Torture warrant system	All torture warrants should be public withwritten analyses to justify the use
Nelsonian blindness	The 9/11 attack creates the collective fear, which consequently foster the enemies/detainee-indifferences and acceptability of extreme maltreatments

It is worth noting that each theory has its own strengths and weaknesses. But all these theories are from the third party, neither the perpetrators or official agencies nor the terrorists. After all, even torture has been done, the third party, the normal people, cannot punish heroes who have to break the law to protect the U.S. state. The ethical and legal dilemma exists: the officials defend the nation vs. the legal system defend the law. The mutatis mutandis logic, which indicates "the necessary changes having been made" when people discussing counterfactuals, may resolve the dilemma. But the liability of torture is still undetermined. I strongly align with Craig's points (2001) that the detainee's damages resulted from torturers should be evaluated and compensated by the public.

Detailed summary for each chapter with neuroscientific evidences:

How the Brain Supports Memory and Executive Functions?

O'Mara established the correlations between brain areas and the neural processes of procedural learning and different types of memories by amnesia patients and lesion studies. EEG studies showed that memory and learning were linked with hippocampus (temporal lobe), amygdala, thalamic nuclei, mammillary nuclei, and prefrontal cortex. Then he cited Hebb's rule to explain memory consolidations, which emphasized the importance of synaptic changes and the neuron's coactivity. Therefore, stress, injury, infection, and other damages can disturb memory coding, consolidation, and retrieval because these brain circuits interconnected, co- regulated, and paralleled with each other.

Additionally, he pointed out that memory can be consciously or unconsciously reconstructed based on different situations. Daniel Schacter's book, *The Seven Sins of Memory* (2001), supported his argument by indicating that memory could be distorted over time since people tended to remember the gist of a memory instead of its full details accurately. Both the "confident but not consistent" nature of flashbulb memory and the high possibility of false memory led to the misinformation effect (Note 13), which meant that a memory could be contaminated orimplanted by post-event information or psychological priming. One of the remarkable experiments was done by Charles Morgan et al. (2006) among military personnel. Even the memories of these highly trained and professional soldiers were significantly compromised and impaired under sleep deprivation, showing significant errors in eyewitness identifications and memory tasks. Specifically, sensory deprivation research illustrated that sleep deprivation damaged the hippocampal-anterior thalamic pathway for human's episodic memory and had negative impacts on synaptic plasticity, as well as a loss of memory. Furthermore, the resulted psychopathology from torture and extreme stress for terrorists, such as PTSD, caused substantial

distortions in the content of memory recall and dysfunctions in cognitions.

Detailed summary for each chapter with neuroscientific evidences:

Can We Use Technology to Detect Deception?

Obtaining information from enemies is difficult. let alone reliable and accurate ones. Firstly, a trained interrogator could not tell if an individual lied based on so-called eye gaze directions and facial muscle movements. Secondly, the traditional polygraphs, which assumed that people would sweat and have increased heart rates under intense questioning and trying tolie, were also unreliable. Lastly, modern lie detectors based on EEG, MRI, and fMRI were stillnot better.

There were several limitations of lie detection techniques. First, they required complicated and strict statistical analyses and experimental designs, namely controls of temporalsequence, size of the voxels, etc. Secondly, it was hard to establish direct relationships between neural activities and the phenomenon of lying, especially the contents of lies. Thirdly, the false- positive rate was extremely high and the replications were rare. Fourthly, the neuroimaging lie detectors were based on average brain neural activities. Thus, it could not be represented for individual brains and there was no reliable indicator of base rates. Fifthly, human beings, especially for trained individuals, were good at lying and capable of making up complex lies.

“Lying is an emergent and spontaneous behavior.” Lying had an evolutionary benefit, which developed as early as three years old. A behavioral study pointed out the importance of education styles on children’s lying behaviors. Lying was evidenced by the absence of a behavioral signal instead of a presented one. Coupling with previous chapter, human’s cognition and memory was negatively influenced by torture and unconscious revision, thereby leading to lies and false confessions. As lie detections were not reliable for extracting information, researchers and policymakers turned their attentions to “truth serums (Note 14),” which might be psychoactive and hypnotic-induced agents for the compliance. Although there were several experiments researching on the chemical components of “truth serums,” O’Mara argued that these studies were non-blinded and nonsystematic. “The truth serum is a fool’s errand… [and] have absolutely no existence in reality.” The logic was as simple as Pavlov’s classical conditioning: if I talk, the torture would stop. “Speech acts signal periods of safety.” This situation virtually guarantees the confession, either true or not.

Detailed summary for each chapter with neuroscientific evidences:

What Do Stress and Pain Do to the Brain?

Torture released stress hormones and activated the pain matrix. Stress hormones elicited the survival mechanism from automatic nervous system, the fight-or-flight response. In addition, stress and pain activated different sensory receptors (Note 15), which performed different functions and neurotransmissions to higher level cortical processing. Interestingly, the book offered several strategies, which were based on the neurotransmissions between synapses and the pain gates in the thalamus, to reduce the experiences of pain, such as simply swearing and attention redirection strategies. Studies of individuals with chronic pain and severe stress clearly demonstrated that pain and stress significantly impaired cognitive functions, episodic memory, and emotion regulations. Especially, stress hormones had detrimental effects on hippocampal formation, thereby leading to the inabilities of memory retrievals.

Torture methods, such as dental pain, cramped confinement, and straitjacket, induced the fear from detainees and the sense of fear was supposed to facilitate memory recall and confessions according to folk psychology. However, medical research showed that physiological impacts from oxygen restrictions and psychological impact from fear and threats significantly reduced cognitive functions involving planning, intentions, and other complicated behaviors.

Stress not only inhibited the neurogenesis of useful synapses, but also caused the growth of adrenal glands and amygdala. In return, the enlargement of adrenal glands secreted more stress hormone and the amygdala hyper-responsiveness led to post-traumatic stress disorder (PTSD). Furthermore, animal models from rats and monkeys emphasized that stress, caused by sleep deprivations and waterboarding, impaired the visual-spatial cognition and working memories. High dopamine and norepinephrine

released by stress in the prefrontal cortex (PFC) also inducedcognitive dysfunctions.

Nothing could be more convincing than analyzing the impacts of torture on tortured survivors. The aftereffects of torture made the survivors suffer from psychological and physiological discomforts, as well as negative intergenerational effects. Kolassa et al. (2007) especially argued that the electric oscillations in a torture survivor's brain were significantly different and slow with normal people's, particularly in insula, temporal, and frontal cortex. Interestingly, the CIA's interrogation methods misapplied the learned helplessness theory, whichassumed that a real or perceived absence of control over the situation would result in a "debility-dependent-dread" states in detainees (Martin Seligman, 1975). Rather, the imminent threats triggered the stress, fear, and pain matrix, especially the periaqueductal gray area, thus overriding the conscious mechanism and inhibiting the cerebral cortical processing.

Detailed summary for each chapter with neuroscientific evidences:

What Does Sleep Deprivation Do to the Brain?

Sleep deprivation, so-called white torture, caused profound perceptual and cognitive distortions. In summary, sleep deprivation led to proportional decreases in all psychological states and several neurological dysfunctions, particularly in dorsolateral prefrontal cortex, ACC, MPFC, and amygdala. Normatively, "Your memory is degraded dramatically, your ability to control your own emotions is degraded, your ability to make good judgments is degraded, your ability to deploy attention is degraded, your ability to simply think straight is degraded. These are all the things that you wanted to perform normally during an interrogation" (O'Mara, 2017). Resonated with previous chapter, June Pilcher and Allen Huffcutt (1996) used the statistical aggression and meta-analysis to demonstrate that acute or chronical sleep deprivations led to significantly increased levels of stress hormones, cognitive deficits, including memory recalls, decision makings, and verbal fluencies, and bad immune systems. Therefore, sleep deprivationscould be an excellent tool to induce amnesia and even permanent memory losses.

Moreover, Olivier Van Reeth analyzed the interactions between sleep deprivation and other stressful interrogation techniques. The result showed that the combinations between several torture techniques caused an abnormal hypothalamus-pituitary-adrenal (HPA) secretory activity. Therefore, sleep deprivations only induced some forms of superficial compliance, but it had negative impacts on intentional memory recalls. To some extent, it might also lead to visual and auditory hallucinations, which were useless for gathering reliable intelligence from detainees.

Detailed summary for each chapter with neuroscientific evidence:

Drowning, Cooling, Heating, and Starving the Brain

President Trump labeled waterboarding as a "just short of torture." However, O'Mara (2017) argued that waterboarding was the worst of torture techniques that detainees could be subjected to. The loss of breath that caused by waterboarding attached the metabolism and threated the basic functions for being alive, such as heart rate and blood pressure. The network of brain areas influenced by extremely uncontrolled panic and feelings of doom included primary and supplementary motor cortex, and cerebellum. The restrictions of oxygen led to the loss of consciousness, let alone for reliable memory recalls. One interesting example was the analysis of cold-water face immersion (CWFI). It caused hyperventilation (increased rate of breathing) and bradycardia (slowing the heart rate), thus having detrimental effects on parasympathetic nervous system. The after-effects of CWFI were also profound. The brain's cognitive functions would need a significantly long time to be restored. In addition to oxygen restrictions, the high concentrations of carbon dioxide further impaired detainees' episodic memories. Adam Ziemann et al. (2009) introduced the amygdala expresses acid-sensing ion channels (ASICs) for fear responses. Inhalation of CO2 reduced the brain pH and led to fear responses in rats.

Consequently, the interactions between neural networks and chemicals exponentially reduced the detainee's ability of memory retrievals.

Temperature manipulation was "another metabolic tool" for affecting human behaviors and negatively altering cognitive functions. It was also another misguided torture method. An infamous example, the Saltpit at Bagram in Afghanistan, perfectly illustrated the negative impacts of temperature

manipulations on memory, response time, and learning. Instead, this technique even showed the opposite effects as supposed by CIA agents. Similarly, calorie restrictions caused deficits in cognition, mood, and psychomotor system. Mary Beth Spitznagel et al. (2009) demonstrated that there was a cumulatively negative effect of combining either two or more torture techniques on the detainee's cognition.

Detailed summary for each chapter with neuroscientific evidences:

Why Does a Torturer Torture?

The process, in which a normal person became a torturer, involved three elements: ideology/ de-individualization, obedience, and approval. Firstly, institutional context was a powerful tool for an individual to override their own ethical standards. Secondly, an individual tended to obey the authority. Lastly, the torturer was highly likely to receive peer supports and authority's approvals. The famous Stanley Milgram's obedience and Zimbardo's Prison studiesclearly illustrated that people were able to bend their conscience under the commands of authority across many cultures.

Furthermore, torturers are normal people, instead of cruel or sadistic individuals. Performing coercive interrogations, torturers themselves suffered from physiological and psychological discomforts, such as depression, anxiety, PTSD, and impaired social functions. Because torturers were also capable of mentalizing the painful experiences suffered by detainees. However, several experiments showed that people could differentiate the pain from self with that from others. Although pain activated ACC and anterior insula, only pain, experienced by the self, showed additional activations in "pain matrix." Additionally, there was an empathy gap "helping" torturers to justify their torture behaviors and solve their internal conflicts because torturers did not directly experience the stress and the pain. The third party, the governmental agencies and policymakers, often underestimated the intensity and the severity of the pain resulted from torture and stepped away from the front line. Thus, the third party or senior officersdid not have direct responsibility and guilt for imposing the torture. The empathy gaps not only explained a torturer's behavior, but also influenced the relevant policies.

But all in all, just as Jane Mayer, the author of *The Dark Side*, said "you can do your bestto justify it, but it's well outside the norm."

Detailed summary for each chapter with neuroscientific evidences:

Why Torture? Why Not Talk?

Analyzing the patterns of self-disclosure under normal situation offered valuable perspectives on the development of new effective interrogation techniques. Many experiments argued that self-disclosure required a high level of self-monitoring and concentration. in addition, talking about the self or offering information highly activated the reward brain circuitsinvolving nucleus accumbens. It was well-known that reciprocal supports, interpersonal trust, environmental safety, and mild stress all facilitated memory recall and information gathering based on several psychological and psychiatric literatures.

Governmental agencies had to put aside the confirmation bias (Note 16) of torture or EITs and embraced other more effective and humane approaches for reliable information extractions.

New methods	Underlying mechanism or benefits
Virtual-reality-based approach	Allow detainees to overcome the barriers of recall and engage in free expression in a safe and controlled environment
Role-playing and narrative scripting	Allow detainees to guide their own narratives or questions based on certain protocols
Third-party observation	Allow third-party officers to analyze and determine the quality and the reliability of the obtained information
Big data approach	A large amount of coded and analyzed data will be helpful forpredictions and generate interrogation-training lessons.

Applied behavioral analysis or "ABC" approach	Antecedents of the behaviors, the Behavior itself, and the Consequences from the behaviors. This psychiatric approach can be transferred into interrogation context and allow officers to understand detainees' behaviors in depth.

Empirical research on interrogation clearly suggested that noncoercive techniques were always superior to torture. The interrogation was an interaction between social and cognitive contexts. For interrogators, they should be relatively older, better-educated, more experienced, more curious, more competent, and highly trained. There was even a need for building a supportive relationship between interrogators and detainees. The layout of the interrogation roomalso mattered, such as the doorways could be considered as event boundaries for terrorists.

Furthermore, the interrogation skills or toolkits should be developed based on scientific experiments by psychiatric or medical professions. The toolkits also needed to include practicalmethods for torturers to minimize their stress and psychological discomforts.

Updated literatures summary of the current topic

1. Ethically investigating torture efficacy: A new methodology to test the influence of physical pain on decision-making processes in experimental interrogation scenarios

By Shannon C. Houck & Lucian Gideon Conway III (2015)

Contribution to the topic. This study used a mock interrogation scenario to examine the impact of physical pain on people's secret information retrievals. Participants were asked to keep secret information while their hands were put in the cold water. A confederate, as an opponent, asked the participants to reveal the information. The participants chose to offer false, true, or combined information to their opponent. The result was consistent with previous research.

Participants were more likely to give false information when their hands were in the cold water.And the effect was more pronounced when the water temperatures became colder.

This study involved a methodologically advanced experiment. Without challenging the ethical issues, the physical pain experiments provided a clear and easily understandable result, indicating the ineffectiveness of imposing pain for information extractions among normal participants. It was plausible to draw a further conclusion that for those dangerous and mission-oriented detainees with special trainings and unwillingness to cooperate, the torture techniques involved in physical pain were not useful for obtaining reliable and veridical information.

2. Erroneous assumptions: Popular belief in the effectiveness of torture interrogation.

By Ronnie Janoff-Bulman (2007)

Contribution to the topic. This paper did not include any experiments. However, it cited several rigorous researches to analyze the psychological errors and judgmental biases in our basic understandings of how torture worked. If O'Mara could include this short article, it would be clearer and more structured to point out the psychological factors in misapplying tortures.

1. Compliance vs. accuracy: misperceiving the goals of interrogation

- The effectiveness of information gathering should be measured by the accurate and reliable information obtained, instead of superficially behavioral compliance. Bennett (2006) argued, "beyond the moral imperative, the competent interrogator avoids torture because it is counter-productive and unreliable."

2. Social influence for "humans" and torture for the "dehumanized"

- People wrongfully assumed that soft or humane techniques were for goodpeople, and the cruel and harsh techniques were for enemies. However, people had to acknowledge that the enemies were also human beings withneeds, motives, desires, and weaknesses.

3. The limits of prediction and self-reflection: underestimating resistance
   - People overestimated the causal role of salient factors in predictions. Inevitably, agencies focused on the physical pain resulted from torture and assumed pain would break the detainees. However, there were other less obvious factors, such as cognitive dissociations, contributing to strong resistance, instead of submission.
4. Efficacy as vengeance
   - The success of interrogations was wrongfully measured by how much wehurt, punished, and dominated the enemies.

3. Support for coercive interrogation among college students: Torture and the ticking bomb scenario

By Robert J. Homan & Michael J. Witkowski (2011)

Contribution to the topic. Obviously, this article, under the consequentialist vs. deontologist debate, challenged O'Mara's main argument of the uselessness and the counter- productivity of torture. Over two hundred college students were asked the degree of coercive interrogation methods, including torture, that they would accept in response to the scenarios including criminal offenders and terrorists. Surprisingly, the result showed that 61% of participants approved a certain degree of torture. Furthermore, the researchers used the degree of support for torture to form a general coercion scale, which aimed to measure people's attitudes toward the War on Terror. A high score was correlated with a belief that torture was useful for information gathers, whereas a low score was correlated with a belief that Arab Muslims were unfairly targeted and the torture was unreliable.

This article showed that even though neuroscientific studies already indicated the uselessness of torture, a large number of lay people and even normal college students still held a naïve belief of torture. Therefore, it was urgent to educate and change the belief of torture interrogation for both the public and governmental agencies.

4. International law, constitutional law, and public support for torture

By Adam S. Chilton & Mila Versteeg (2016)

Contribution to the topic. Although torture is unethical and counterproductive, torture for interrogation was still used and believed by CIAs and supported by certain policymakers.

Several research tried to empirically examine the effectiveness of international and domestic legal inhibitions of torture from the observational data. However, the results were mixed.

Therefore, this article could complement O'Mara's book by providing useful methods to inhibittorture. The research explored one possible mechanism that could be useful for torture inhibitions: "dampening public support for torture." By surveying the public support for international and constitutional law for torture inhibitions, the researchers found that "a bare majority" of participants supported the use of torture. Even telling the participants that torture violated the international and constitutional law, the researchers still found no significant decrease in the participant's support. This experiment revealed the ineffectiveness of the legal inhibitions of torture. Including this research would help O'Mara to point out the cruel reality and facilitate to bridge the gap between academic research and practices. It was necessary to translate academic research into practices and policies.

5. Experimental investigation into the validity of confessions obtained under sodium amytal narcosis.

By Gerson MJ & Victoroff VM (1984)

Contribution to the topic. This article was kind of old. But it would offer more scientific evidence in understanding the "truth serum" in interrogations because the "truth serum" was an interesting topic in practices. The researchers conducted amytal interviews with 17 neuropsychiatric patients. The participants were semiconscious and still be able to speak when being questioned. During the interview, participant's discretion was significantly reduced.

The researchers tried to manipulate the conscious states of participants in order to make themselves mention the charges against them by their own. However, the valuable interrogationperiod only lasted for 5-10 minutes a time, although it could be re-induced by more amytal.

Another problem was that sometimes there was still no way for interrogators to distinguish truth from confabulation, even under narcotic drugs. Therefore, the research on "truth serum" seemedmeaningless and useless for information gathering, thereby being stopped a decade ago.

6. Restoring Acid-Sensing Ion Channel-1a in the Amygdala of Knock-Out Mice Rescues Fear Memory but Not Unconditioned Fear Responses

By Coryell et al. (2008)

Contribution to the topic. One new neurological mechanism I noticed in the book was the acid-sensing ion channels (ASICs), which was important in lots of functions in the central and peripheral nervous systems, such as memory, emotions, and pain. The researchers found that ASICs particularly controlled the inhibitory synaptic activities in the hippocampus. The data indicated that inhibition of ASICs caused a significant increase in the inhibitory post-synaptic currents. This effect had important implications in people's pain perception and memory.

Together with *in vivo* knockout animals, these studies pointed out the impacts of ASICs on detecting, modulating, and sensitizing the pain perception by primary and secondary sensory cells. The human experiments were also consistent with the ASICs role in nociception. These data potentially provided neurological evidences for the inducement and the treatment of pain.

In addition, the amygdala induced ASICs played a crucial role in fear memory, fear response, and fear behaviors. Previous research (Coryell et al., 2008) pointed out that the basolateral amygdala was the site in which ASICs contribute to fear memory because the role of ASICs in synaptic plasticity for memory consolidations. The medial amygdala and dorsal periaqueductal gray also were the sites of ASICs for the response of elicited fear. However, the research distinguished the fear memory and the fear response by arguing that different ASICs pathways mediated different processes. Their data further showed that the strength of fear memory could be more severe than the initial prediction of fear. These findings would potentially have implications in PTSD and other psychological disorders resulted from torture.

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Notes

Note 1. "Ticking-time-bomb" metaphor, which is coined by Jeremy Bentham in his article *Means of extraction for extraordinary occasions*, is used for torture justification (Brown, 2007). The scenario assumes that a person has information about an imminent terrorist attack and the person is in the hands of authorities or governmental agencies. Only if the person is torture, he will disclose the information to forestall the attack. Should he be tortured? There are two arguments emerging over this philosophical debate: the pro- vs. anti-torture in emergencies.

Note 2. Pain matrix is a brain network that is activated by unpleasant and intense stimuli. It includes the anterior cingulate cortex, thalamus, insula, primary and secondary somatosensory cortex, and certain brain areas associated with movement, such as cerebellum, and the secondary motor cortex.

Note 3. "Smoking gun" is a reference to a fact that serves as conclusive evidence of a crime or similar act, just short of being caught in the action. Its meaning evolves in the use of completely unrelated to criminal activity. For example, scientific evidence that is highly suggestive in favor of a particular hypothesis is sometimes called smoking gun evidence.

Note 4. The McCain-Feinstein amendment is designed to ensure that all agencies and departments use lawful, effective interrogation techniques that will enhance our national security and reflect American values. It 1) codifies the Army Field Manual (AFM) on Human Intelligence Collector Operations as the standard for national security interrogations across the government; 2) requires that the International Committee of the Red Cross (ICRC) be provided notification of and access to detainees in a timely manner when they are taken into U.S. custody; and

3) mandates a review of the Army Field Manual to ensure that its interrogation approaches are lawful, humane, and effective. By restricting government agencies and departments—including the Central Intelligence Agency (CIA)—to the interrogation approaches listed in the AFM, the McCain-Feinstein amendment ensures that the abusive approaches that some call "enhanced interrogation" cannot be authorized.

Note 5. Folk psychology and folk neurobiology advocate and motivate the EITs and coercive interrogation techniques. Both believe that detainees are motivated to reveal information and become more obedient in order to end the suffering interrogation.

Note 6. The Afghanistan detention location is known as "Cobalt," the "Dark Prison," the "Salt Pit," and a "dungeon." At this site, the lights are never turned on. Agency records say that one of the detainees housed at Cobalt, Mustafa al-Hawsawi, is diagnosed with chronic hemorrhoids, an anal fissure, and symptomatic rectal prolapse. And nude detainees walk around as a form of humiliation. They are placed in rooms with temperatures as low as 59 degrees Fahrenheit. Loud music plays constantly.

Note 7. The High-Value Detainee Interrogation Group (HIG) is a three-agency entity (multiagency organization)—FBI, Central Intelligence Agency (CIA), and the Department of Defense (DoD)—in 2009. The HIG brings together intelligence professionals to conduct interrogations that protects

national security and that are consistent with the rule of law. It oversights through the National Security Council, Department of Justice, and Congress. And the interrogation practices are based on scientific research and usually consist of a team leader, interrogators, analysts, subject matter experts, linguists, and other personnel as needed.

Note 8. Kassin & Kiechel (1996) designed an experiment: participants were asked to type words but the computer would crash if they hit the "Alt" key. Then the computer crashed on its own and participants were told that they were responsible. Surprisingly, a great number of participants confess to this imaginary crime and even claimed that they had known they did it.

Russano et al. (2005) found that when participants were accused of cheating, they were more likely to confess if the authority indicated that the wrongdoings were not that bad and offered deals. In general, the use of crime deductions and the offer of lenient deals increased the rate of both true and false confessions.

Note 9. a) Moston & Engelberg (1993) found that conversations with detainees resulted in only 5% refutations. b) Robin et al. (1997) indicated that 40% of what we revealed is relevant to self, thus refusing to self-disclose is very difficult. c) Tamir & Mitchell (2012) indicated that nucleus accumbens was activated for disclosure and people found disclosure intrinsically rewarding.

Note 10. Bridget Murray (2003) described seven problematic statements of memory, which were largely divided into 2 categories: sins of omission (i.e. forgetting) and sins of commission (i.e. distorted memory recall and false memory).

Note 11. The Moral Maze is a BBC broadcast since 1990. The panel discusses the moral and ethical aspects of recent news and stories.

Note 12. Cognitive dissonance: refers to a situation involving conflicting attitudes, beliefs or behaviors. This produces a feeling of discomfort leading to an alteration in one of the attitudes, beliefs or behaviors to reduce the discomfort and restore balance etc.

Note 13. Misinformation effect: when people who witness an event are later exposed to new and misleading information about it, their recollections often become distorted.

Note 14. Truth serum: it occurred to Robert House, a Dallas obstetrician, that a similar technique might be employed in the interrogation of suspected criminals. He interviewed criminals under scopolamine in order to obtain secret information. The detailed summary discussed by CIA in the following link: https://www.cia.gov/library/center-for-the-study-of-intelligence/kent-csi/vol5no2/html/v05i2a09p_0001.htm

Note 15. These sensory receptors include exteroceptive receptors, interoceptive receptors, proprioceptive receptors, nociceptors, mechanoreceptors, and muscle and tendon mechanoreceptors.

Note 16. Confirmation bias, also called believe your own pet hypothesis or myside bias, means the tendency to interpret new evidence as confirmation of one's existing beliefs or theories.