

Article

Catharsis and Media Violence: A Conceptual Analysis

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Abstract: The concept that doing something to “vent” aggression as a method of reducing aggressive feelings and behaviors, such as watching media violence or playing violent video games, continues to enjoy widespread public support despite a lack of empirical support. This article describes the historical origins of the concept and examines how well these conceptions fit with the modern usage of the aggression catharsis hypothesis. It is argued that there are four primary flaws with the catharsis hypothesis. First, the metaphor underlying Freud, Breuer, and Lorenz’s conception of aggression is flawed. Aggression is not a drive. Second, although Aristotle did use the term catharsis with relation to violent media (plays and poetry), he did not mean that viewing media violence can purge the viewer of aggressive feelings or behaviors. Furthermore, he describes several detailed requirements of plot and character that must be followed if his type of catharsis is to be achieved, and modern media violence does not meet these requirements. Third, the empirical support is not only lacking, a large empirical base contradicts the catharsis hypothesis. This is seen both in studies attempting to demonstrate catharsis directly and in the broader media violence literature. Fourth, human neuroscience contradicts the catharsis hypothesis. Learning is not hindered by viewing something one more time—it is improved. Taken together, it appears that there is no possible way that the aggression catharsis hypothesis can be accurate. It nevertheless continues to “feel” correct at a phenomenological level, and the reasons for this are discussed.

Keywords: catharsis; media violence; aggression

1. Introduction

There have now been hundreds of studies of the effect of media violence on viewers, and over a dozen meta-analyses of these studies. All of these meta-analyses, including those of the critics, tend to find almost identical results [1–16]. That is, they consistently find a small to moderate effect of media violence on aggressive thoughts, feelings, and behaviors. This empirical consistency has led several prominent public health organizations (e.g., the American Medical Association, the American Academy of Pediatrics, two U.S. Surgeons General, the American Psychological Association, the International Society for Research on Aggression, among others) to conclude that media violence is one causal risk factor for aggression. Nonetheless, despite this general consensus within the public health community, there is still a common belief that playing violent video games or watching violent TV/movies allows people to “vent” their aggressive inclinations and therefore behave less aggressively after playing/watching. This is known as the aggression catharsis hypothesis.

The aggression catharsis hypothesis is an elegant idea, and it has a long history—first being described by Aristotle, and then adapted by Freud for use in psychology. It is important, however, to note that there are several different uses of the term “catharsis” in modern psychology [17]. This article focuses specifically on the idea that “venting” aggression through exposure to media violence will reduce the risk of later aggressive behavior. It is important to note that we are not discussing therapeutic catharsis, in which allowing oneself to feel and express one’s feelings helps to maintain mental health. This clinical focus on the beneficial effects of expressing one’s emotions in a therapeutic context, thereby allowing oneself to avoid or resolve potential conflicts, has received empirical support [18–20]. This therapeutic use has sometimes included the idea of expressing aggression via a proxy, such as hitting a pillow to release the anger. Although not without controversy, there is some empirical support for the conception of catharsis as applied to the classic description of the frustration-aggression hypothesis [21]. When frustrated or provoked, aggression is primed and some aggressive response is given which reduces the aggressive feelings. Retaliating against a provoking agent can reduce aggressive feelings and subsequent aggressive actions [22]. Note that this conception—that revenge allows one to feel better—is distinctly different from the aggression catharsis hypothesis, that viewing others’ aggression (either in person or via the media) would reduce viewers’ aggressive feelings and behaviors. In contrast to the clinical and the vengeance conceptions, there has not been any strong evidence that aggression catharsis occurs. The goal of this article is to consider why the data do not seem to support the aggression catharsis hypothesis.

Before discussing the aggression catharsis hypothesis in detail, however, it is important to note some critical differences between these three conceptions of catharsis, as well as one important similarity. For both the clinical and vengeance models of catharsis, what brings about catharsis (a reduction in negative feelings) is an action on the part of the person. In contrast, the aggression catharsis hypothesis alleges that someone else’s action drains the viewer of his or her aggressive feelings. A second difference is that for both the clinical and vengeance models, the cathartic moment should happen at some point *after* the actor has already experienced the negative feelings. In contrast, the aggression catharsis hypothesis makes no assumption about whether the viewer is already feeling aggressive, but hypothesizes that viewing others’ aggression might first arouse and then vent the viewer’s aggressive feelings, or that it might even act as a buffer against the viewer’s future aggressive

feelings in other contexts. The point of similarity is that all three assume that there is a drive concept at its core. That is, they assume that there is some inherent motivation that causes tension to build, and that some action is therefore required to reduce the tension.

The aggression catharsis hypothesis (hereafter just discussed as the catharsis hypothesis) as it currently is discussed in public forums and some rare scientific papers argues that watching and role playing violence is cathartic—it allows us to vent some of the aggressive energy, leaving us emotionally calmed [23,24]. With regard to media violence, the catharsis hypothesis has been and continues to be popular, despite at least four critical flaws problems with it as it pertains to aggression and media violence.

2. Flaw 1: Aggression Is Not a Drive

Most of Freud's writing relevant to catharsis is about therapeutic catharsis. The concept appears early in the work of Freud because it is a therapeutic technique developed by Freud's mentor, Joseph Breuer. Psychoanalysis, the psychological perspective that Freud is professed as the 'father' of, is based on the idea that the human mind is made of conscious and unconscious parts. If a trauma is experienced, an emotional reaction occurs. This begets a drive to reduce the negative emotions. If we are not able to express the emotions, it can result in neuroses or hysterical behavior.

The blurring or loss of an affect of memory depends on a great many factors. In the first place, it is of great consequence whether there was an energetic reaction to the affectful experience or not. By reaction we here understand a whole series of voluntary or involuntary reflexes, ranging from crying to an act of revenge, through which according to experience affects are discharged. If the success of this reaction is of sufficient strength, it results in the disappearance of a great part of the affect. Language attests to this fact of daily observation, in such expressions as "to give vent to one's feeling," to be "relieved by weeping," etc. If the reaction is suppressed, the affect remains united with the memory ([25], p. 5).

Discharge of emotion is therefore an integral part in dealing with a trauma in a healthy manner. They continue, however:

The reaction of an injured person to a trauma has really only then a perfect "cathartic" effect if it is expressed in an adequate reaction like revenge. But man finds a substitute for this action in speech through which help the affect can well-nigh be ab-reacted (*abreagirt*). In other cases talking in the form of deploring and giving vent to the torments of the secret (confession) is in itself an adequate reflex. If such reaction does not result through deeds, words, or in the most elementary case through weeping, the memory of the occurrence retains above all an affective accentuation ([25], p. 5).

Several aspects are important to note. Although Breuer and Freud do use the example of "an act of revenge" as a possible reaction, it is effective only for "the disappearance of a great part of the *affect*". They do not discuss future behaviors, and in fact, it seems unlikely that Freud would consider behaving aggressively to be healthy. Second, they reference non-aggressive actions such as daily language and giving vent via words, but the focus is specifically on the discharge of the emotion already experienced, not the reduction of a future behavior. Finally, note how the word catharsis is placed in quotation marks, suggesting that they intend it to be taken metaphorically. They are not

suggesting that revenge is the path for catharsis, but instead focus on the therapeutic value of expressing strong emotions within the structured therapeutic setting.

The focus on therapeutic catharsis of emotion notwithstanding, Freud did seem to hint at aggression as a drive that needed venting. After World War I, Freud questioned how such horrors could come to pass. Based on his training in neurophysiology, Freud assumed that organisms constantly strive to reduce tension [26]. He reasoned that humans must have an instinctual aggression drive, which he titled “Thanatos”. In his conception, Thanatos was a drive toward self-destruction, constantly in struggle with “Eros”, a drive toward life.

Freud recognized the aggressive nature of mankind early in his career: “The very emphasis of the commandment *Thou shalt not kill* makes it certain that we spring from an endless ancestry of murderers, with whom the lust for killing in their blood, as possibly it is to this day with ourselves” ([27], p. 312). As Freud wrestled with the concept of an aggressive drive, he never labeled it ‘hate’ or ‘aggression’, but ended up redefining his concept of a drive: “It seems, then, that an instinct is an urge inherent in organic life to restore an earlier state of things” ([28], p. 43). From this, he deduced, “the aim of all life is death” ([28], p. 46).

Despite this conclusion, Freud seemed somewhat uncomfortable with the concept of Thanatos, which he never actually named in writing. He would use the term death drive or destructive drive in writing, and only ever used the term Thanatos in conversation, thus symbolically never committing himself to this theory. Nonetheless, he was convinced that drives originate within the organism and can build until the drive energy is expended/reduced in some way [29]. The death drive is ultimately self-destructive, but because it is balanced against Eros or libido, it needs alternatives to satisfy it other than death. Freud posited two alternatives: displacement and catharsis. Displacement helps to explain why we aggress toward others. We displace, or redirect, our aggressive energies toward others rather than ourselves. His letter to Albert Einstein on the inevitability of war (1963; cited in [26]) may have the clearest description:

“The death instinct turns into the destructive instinct if...it is directed outwards, on to objects. The living creature preserves its own life, so to say, by destroying an extraneous one.... [I]f these forces are turned to destruction in the external world, the living creature will be relieved and the effect must be beneficial. This would serve as biological justification for all the ugly and dangerous impulses against which we are struggling.”

The second approach for reducing the death drive is through catharsis. That is, by viewing others’ aggression, either in real life, sports, or through media depictions of violent action, the viewer will have his or her aggressive drive reduced vicariously and in a socially acceptable manner. A. A. Brill, who introduced Freudian psychoanalysis to the United States, for example, recommended (among other things) attending prize fights once a month to reduce the aggressive drive for optimal mental health [17]. Note that this approach includes one aspect of the standard media aggression catharsis hypothesis—it assumes that viewing someone else’s aggression can drain the viewer of their aggressive drive.

This aggressive drive concept was further developed by ethologist, Konrad Lorenz, who studied the evolutionary bases for behaviors in several species. He described how complex social behaviors in species could be described by a surprisingly small number of instinctive drives [30]. He specifically argued that aggression is a drive that builds up (in humans as in other animals) and ultimately needs to

be released. In fact, he argued that modern man's problem was that he didn't have sufficient opportunity to release it in a healthy way.

Knowledge of the fact that the aggression drive is a true, primarily species-preserving instinct enables us to recognize its full danger: it is the spontaneity of the instinct that makes it so dangerous. If it were merely a reaction to certain external factors, as many sociologists and psychologists maintain, the state of mankind would not be as perilous as it really is, for, in that case, the reaction-eliciting factors could be eliminated with some hope of success. It was Freud who first pointed out the essential spontaneity of instincts, though he recognized that of aggression rather late... ([31], pp. 49–50).

Another variant of what can be meant by catharsis came out of this drive-based approach—the idea that releasing one's aggression against a proxy can similarly reduce the aggressive drive pressure. That is, by punching a pillow (or playing a violent video game), for example, one will feel better and be less likely to aggress against the provocateur, as described by Lorenz:

A human example is furnished by the man who is very angry with someone and hits the table instead of the other man's jaw because inhibition prevents him from doing so, although his pent-up anger, like the pressure within a volcano, demands outlet ([31], p. 170).

If this concept of aggression being a drive were correct, then as Lorenz makes clear, aggression can be conceptualized by a hydraulic metaphor. The pressure to aggress builds and builds until it must be released, either by aggressing against the self or others. This assumption is so crucial to the concept of aggression catharsis that Feshbach noted, “Without a drive concept, a mechanism of catharsis would appear to have little meaning” ([17], p. 92).

Despite all this agreement, the data do not seem to fit Freud's and Lorenz's drive theory of aggression. Most people go their whole lives without ever engaging in violence, either toward others or themselves. Furthermore, when one compares aggression to other true biological drives, such as eating, drinking, and sleeping, it becomes evident that aggression is not similar. With a true drive, pressure builds to engage in an activity, and when we engage in that activity, the pressure is reduced (for a time). Under this hydraulic metaphor, if the pressure is not “vented” then the system explodes. True human drives *do* fit this model. If we do not eat, we get hungrier and hungrier; if we still do not eat, we die. If we do not drink, we get thirstier and thirstier; if we still do not drink, we die. Aggression does not fit this biological drive pattern. If we do not behave aggressively, we do not get more aggressive, nor do we die for lack of aggression. Therefore, if aggression is not a drive, then catharsis does not happen, or at the very least is a superfluous concept. If aggression is, as modern psychologists believe, a combination of learned, biological, and situational factors, the concept of catharsis does little to add to an understanding of the development of aggression.

3. Flaw 2: Modern media violence is not Aristotelian

The idea of catharsis as the “venting” of a drive isn't what the term meant when it was initially applied to media and media violence. The term catharsis (κάθαρσις) was discussed by Aristotle in the *Poetics*. The earlier Platonic view of music, plays, and poetry was that they held a dangerous power, because they could indulge the emotions. Because media often described acts of morally inferior

people making unwise choices, and that viewers received pleasure from watching them, this could inculcate poor values (c.f., [32], 424a–424e and 598b–608e).

“For they must beware of change to a strange form of music, taking it to be a danger to the whole...”

“Yes,” I said, “since it’s considered to be a kind of play and to do no harm.”

“It doesn’t do any either,” he said, “except that, establishing itself bit by bit, it flows gently beneath the surface into the dispositions and practices, and from there it emerges bigger into men’s contracts with one another...” ([32], p. 102).

Aristotle shared the Platonic goal of creating men of good character, but he disagreed that shielding people from poetry (which included music and plays, the mass media of his time) was a valuable method for achieving it. He agreed that poetry had powerful emotional effects, but did not feel that emotions were of low character or to be necessarily avoided. The emotional effects of media were a key point for him. In the *Poetics*, he includes catharsis in his definition of a tragedy:

A tragedy, then, is the imitation of an action that is serious and also, as having magnitude, complete in itself; in language with pleasurable accessories, each kind brought in separately in the parts of the work; in a dramatic, not in a narrative form; with incidents arousing pity and fear, wherewith to accomplish its catharsis of such emotions ([33], 1449b).

It is unclear from this mention of catharsis that Aristotle really means something about the viewer [34,35]. Because he seats catharsis within the definition of tragedy, and the *Poetics* is about literary critique, he may intend catharsis only to mean the pleasure that is received from having a play reach its appropriate conclusion. Dramatic tension is built up in and during the play, and catharsis is achieved for the story by reaching a resolution that feels satisfying. Given, however, that he references specific emotions being aroused, it is perhaps more likely that he does mean something about the viewer.

Assuming it is about the viewer, it is critical how one translates the word κάθαρσις. Traditionally, scholars have tried to find a direct and literal translation, and have used either purgation or purification. The purgation interpretation is rooted in medical usage of healing or curing the body and purification is an interpretation in a moral sense of cleansing the spirit.

Although most people tend to interpret Aristotelian catharsis as a purgation, this interpretation seems particularly awkward, especially in the light of his broader writings. What would it mean to purge emotions of fear or pity? He notes that these emotions need to be aroused by the play, which is the opposite of removing them (more will be said about these emotional requirements later). Aristotle was almost certainly not referring to merely eliminating particular emotions through tragedy. If his broader goal is to create moral and just people, then removing pity seems to be antithetical to that end. Translating catharsis as *purification*, in contrast, fits very well with Aristotle’s goal to create men of good character. In this context, purification is part of the process of finding the middle between emotional extremes. This middle way, or mean, is a core foundational aspect of virtue to Aristotle. As he states in the *Ethics*:

[V]irtue must have the quality of aiming at the intermediate. I mean moral virtue; for it is this that is concerned with passions and actions, and in these there is excess, defect, and the intermediate. For instance, both fear and confidence and appetite and anger and pity and in general pleasure and pain may be felt both too much and too little, and in both cases not well; but to feel them at the right times, with reference to the

right objects, towards the right people, with the right motive, and in the right way, is what is both intermediate and best, and this is characteristic of virtue. Similarly with regard to actions also there is excess, defect, and the intermediate. Now virtue is concerned with passions and actions, in which excess is a form of failure, and so is defect, while the intermediate is praised and is a form of success; and being praised and being successful are both characteristics of virtue. *Therefore virtue is a kind of mean*, since, as we have seen, it aims at what is intermediate ([33], 1106b, 13–28, italics added).

We can now understand better what Aristotle means when he says a tragedy can “accomplish its catharsis of... emotions” ([33], 1449b). By demonstrating the damage that unbridled emotions can have, viewers can learn about the dangers. By feeling extreme emotions that are aroused by the tragedy, it allows one to experience them in a third-person manner, such that the viewer will not act upon them and therefore act unvirtuously. This ability to feel the extremes and view the consequences acted out by an actor or poet allows the viewer to begin to find the mean between the extremes.¹

Assuming for now that Aristotle was accurate, he makes it clear that the story must be told in a very specific manner in order to help viewers find the middle path via catharsis. Four requirements are described below (although there are more):

(A) The plot must be constructed according to very specific rules:

“...the Plot must be not simple but complex; and further, that it must imitate actions arousing fear and pity...It follows, therefore, that there are three forms of Plot to be avoided. (1) A good man must not be seen passing from happiness to misery, or (2) a bad man from misery to happiness. The first situation is not fear-inspiring or piteous, but simply odious to us. The second is the most untragic that can be; it has no one of the requisites of Tragedy; it does not appeal to the human feeling in us, or to our pity, or to our fears. Nor, on the other hand, should (3) an extremely bad man be seen falling from happiness into misery. Such a story may arouse the human feeling in us, but it will not move us to either pity or fear; pity is occasioned by undeserved misfortune, and fear by that of one like ourselves....There remains, then, the intermediate kind of personage, a man not preeminently virtuous and just, whose misfortune, however, is brought upon him not by vice and depravity but by some error of judgment...The perfect Plot, accordingly, must have...the change in the hero’s fortunes...from happiness to misery; and the cause of it must not lie in any depravity, but in some great error on his part” ([33], 1452b 30–1453a 16).

(B) For catharsis to occur, two critical emotions *both* must be aroused, fear and pity. Aristotle notes that these can be aroused by either Plot or Spectacle (e.g., special effects), but he also makes it clear that the feared action doesn’t need to be seen. It can happen off stage. Furthermore, he states that Spectacle is less artistic and could be used just to “put before us that which is merely monstrous” ([33], 1453b 9) and not productive of fear and pity.

(C) Beyond inducing fear and pity, however, he notes that it is critical *how* the “tragic pleasure” of fear and pity are aroused. The conflict should arise *between friends* (rather than among enemies or combatants) for it to be truly tragic and arouse the proper emotions. Furthermore, the conflict

¹ In addition, it is possible that Aristotle also means something about the aesthetic experience of viewing a well-constructed play. For example, he calls the arousal of pity and fear the “tragic pleasure.” Some authors have argued that catharsis may therefore be interpreted largely as an aesthetic response to the play itself or to the joy of learning from it [36,37].

should arise out of a mistake, not from any hostile intent. Aristotle notes that if the plot is not constructed carefully and correctly, it gets the wrong emotional responses, such as shock and revulsion [38].

(D) Fourth, the characters must be of a certain type to get the right kind of response for achieving catharsis.

“In the Characters there are four points to aim at. First and foremost, that they shall be good...what a personage says or does reveals a certain moral purpose; and a good element of character, if the purpose so revealed is good....The second point is to make them appropriate. The Character before us may be, say, manly; but it is not appropriate in a female Character to be manly, or clever. The third is to make them like the reality....The fourth is to make them consistent and the same throughout; even if inconsistency be part of the man before one for imitation as presenting that form of character, he should still be consistently inconsistent....The right thing, however, is in the Characters just as in the incidents of the play to endeavor always after the necessary or the probable....Tragedy is an imitation of personages better than the ordinary man...” ([33], 1454a 15–1454b 9).

Therefore, to arouse fear and pity, the characters must be noble, good, appropriate, realistic, and consistent. The importance of this can be seen when we revisit Aristotle’s broader theory of emotions. Aristotle felt that emotions were important in making correct decisions and in forming a good character. As quoted above from the *Ethics*, he makes it clear that it is important to learn to feel the correct emotion the correct amount at the correct time toward the correct object [38]. Furthermore, it is important to feel the emotions lightly. If one feels them too strongly, we will make inappropriate decisions, which will injure our character. For example, the person who feels too much fear is a coward and the person who feels too little is foolhardy.

One of the main factors in building good character is to develop the settled disposition to feel emotion correctly [38]. We become good by habitually doing good, so by feeling emotions correctly (the mean between the extremes), we make correct decisions, and do the right things. In the *Ethics*, Aristotle notes that finding the mean between the extremes is difficult, and is grasped by perception, not by reasoning. For this reason, plays and poetry have an ability to help viewers perceive the feelings and their meaning in a way that rational cognition cannot.

To Aristotle, poetry (including music, speeches, and plays) has the educative function to form good character. By representing pitiable and terrifying events, tragedy arouses pity and fear, giving these emotions harmless exercise, helping the viewer learn how to find the mean in their emotional responses, and thus become more virtuous in their characters. With this relief comes the cathartic pleasure.

Aristotle also suggested that catharsis can be achieved through comedy (although his book on comedy has been lost). What we do know from his extant writings is that for it to work, comedy needs to be based on the ridiculous, which he defined as a kind of error neither painful nor destructive. If injuries are sustained (physical, emotional, or psychological), the injuries must have been done in ignorance, without harmful intent. Returning to the translational issue of purgation versus purification, it makes little sense to say that comedy *purges* us of pleasure or humor. It seems much more likely that he means one could *purify* the extremes of passions (emotions) and actions by witnessing absurdities.

If we take this analysis as the starting point for understanding catharsis, it is clear that modern media violence could not achieve the catharsis of aggression. Aristotle repeatedly notes that catharsis requires feelings of fear and pity. Considering violent action/adventure movies from an Aristotelian

perspective, there is certainly much Spectacle and its attendant fear response, but there is usually no pity aroused. Instead, most violent media arouse fear and revenge motivations, or fear and anger. The “bad guy” does something bad, the “good guy” fights with him, and ultimately wins. We do not pity either character, although we may feel fear or shock. If we consider violent video games, the player is rewarded for committing the violence, and feelings of anger, hostility, and enjoyment are aroused. Thus, modern media violence is not designed in the ways necessary to produce the cathartic emotions.

Arousing fear and pity alone, however, is not sufficient—they must be aroused by an undeserved misfortune to a noble person. In most action/adventure movies, the “bad guy” is shown to deserve what he gets, and the “good guy” usually isn’t the person who has the tragic thing happen to him. Furthermore, the tragic thing is supposed to be created by the hero’s error, not by any depravity. In most action/adventure movies and almost all horror films, the horrible actions are caused by a depraved individual. Furthermore, the tragic occurrence is supposed to happen between friends or family members, who do not intend any harm, but have harm occur through error. Aristotle clearly states that the plot must be constructed thus if catharsis is to be achieved—the injuries must come from accidents or errors, and be between friends. If bad things happen to the bad guy, that’s justice, which produces a positive feeling rather than fear and pity.

Note also that in most of today’s comedy shows, much of what passes for funny are people being sarcastic or hitting each other, rather than being mistakes “not productive of pain or harm to others”. ([33], 1449a 35–36). In violent video games, the plot usually tends to justify the violent actions. When the plot does not justify the actions (c.f., the *Grand Theft Auto* game series), the motivations for violence tend to be due to what Aristotle would consider depravity, or at least are not out of error while trying to achieve moral good.

In summary, although Aristotle was indeed discussing catharsis occurring from viewing media (including both violent and humorous media), modern media violence does not follow the rules necessary for catharsis to occur. They do not follow the correct Plots nor do they engage the correct emotions to achieve catharsis. It should also be noted, however, that the likely accurate Aristotelian definition of catharsis as purification is not what is usually meant by the modern aggression catharsis hypothesis, which assumes that viewing violence purges the viewer of aggression (as in the hydraulic metaphor discussed earlier). Therefore, Aristotle did not mean catharsis as a reduction in aggressive feelings or behaviors, and even if he had, modern media violence are not constructed in the way to achieve it.

4. Flaw 3: Lack of Empirical Evidence for Catharsis

If the aggression catharsis hypothesis were valid, we should be able to find reliable, robust, and replicable scientific evidence that it occurs as predicted. Unfortunately, this is not the case. The third critical flaw with the catharsis hypothesis is that there is almost no scientific evidence for it, whereas there is a great deal of scientific evidence for the opposite hypothesis. There have been hundreds of studies of media violence—most of which could be interpreted as studies of catharsis. As noted earlier, meta-analyses consistently show significant effects of media violence exposure on increased aggressive thoughts, feelings, and behaviors. If catharsis occurred even some amount of the time after viewing media violence, then we would not expect the meta-analyses to be so consistent. We do not

mean to say that there cannot be benefits from playing violent video games or watching violent media. Several studies, for example, have found striking improvements in visual perception skills after playing violent games [39–42]. In addition, the American military use violent video games as training tools for soldiers [43]. Some studies have found little effect of playing violent games on aggressive behavior [44]. Nonetheless, studies with null results are included in meta-analyses, and still the meta-analytic consensus is that hundreds of studies demonstrate that people become *more* aggressive after consuming media violence, not *less*.

Because this area has been studied in such detail for over 50 years now, we know a great deal about how media violence can influence the risk of later aggressive behaviors. It is outside of the scope of this article to describe the multiple mechanisms, but several excellent reviews exist [45–56]. In short, the majority of theoretical and empirical work has documented that the reason media violence can increase aggression is because humans learn. We can learn simply from watching someone else behave, including seeing whether they are rewarded or punished for their behavior [57]. As we watch more examples of aggressive thinking, feeling, and behaving, we extract scripts and gain expectations about how people interact [7]. We become desensitized, and feel that aggression is more acceptable [53,58]. Then once we are provoked, we are more willing to respond in an aggressive manner. This set of theories and findings have been well-tested and verified in these hundreds of studies, yet they continue to often be misunderstood by a common reductive error—that they suggest a mechanistic view. It is not the case that media violence researchers believe that viewing media violence necessarily causes aggressive behaviors. Instead, most understand the multi-causal nature of aggression, where media violence is simply one of about 100 known risk factors for aggression [59]. When it is present, the odds of responding aggressively to a provocation increase in a predictable way, and when it is removed, the odds of aggression decrease in a predictable way.

In addition to studies of media violence, there have been several studies specifically designed to test whether aggressive behavior reduces or increases later aggression. As early as 1973, Albert Bandura had already summarized the research and called for a moratorium on catharsis theory. In their seminal review of the catharsis hypothesis, Geen & Quanty [26] demonstrated that, at best, aggression may produce decreased physiological arousal under specific conditions. But even when physiological arousal decreases after aggression, later aggressive behavior does not. Although there were a handful of studies that suggested behavioral catharsis may occur, these studies had methodological problems and are open to other interpretations. When the studies were replicated with appropriate controls, the results tended to be the opposite—that aggressive behavior leads to increased aggressive behavior. After reviewing all the evidence, they stated, “...therefore, we must conclude that the notion of catharsis has not been confirmed...” ([26], p. 33).

Although researchers have continued to try to find new ways to test the catharsis hypothesis, the newer research has continued to demonstrate a lack of support for it. For example, Bushman and his colleagues have conducted several studies designed specifically to find catharsis [60–63]. In one pair of studies, they tested how people respond to information about the catharsis hypothesis [62]. In Study 1, participants were randomly assigned to read one of three fake newspaper articles, one reporting on a study saying that venting anger is effective, one reporting a study saying venting anger is pointless, or a neutral article. The participants were further randomly assigned to be praised or insulted. After being praised or insulted, they rated how much they wanted to do each of 10 activities, such as watching a

comedy or hitting a punching bag. The pro-catharsis article increased desire to hit the punching bag, and angering the participants increased the effect. In one respect, there is no surprise here—the media telling you that catharsis is good makes you want to seek it out, especially when you feel angry. In a second study, participants were randomly assigned to read one of the three newspaper articles again, and then a confederate insulted and angered all of the research participants. Half were then given an opportunity to punch a punching bag for 2 minutes or sat and did nothing for 2 minutes. Participants were then given a chance to hurt the student who had angered them. Contrary to the catharsis hypothesis, those who punched the punching bag showed *higher* aggression to the confederate than participants who did not use the punching bag. The participants, however, reported pleasure at hitting the bag. In fact, those who reported the greatest enjoyment at hitting the bag also were the most aggressive toward the confederate later. Furthermore, if participants had read the pro-catharsis article, they were more aggressive toward the confederate. The authors concluded that the “results contradict any suggestion that hitting the punching bag would have beneficial effects because one might feel better after doing so (which is what advocates of catharsis often say)...People did indeed enjoy hitting the punching bag, but this was related to more rather than less subsequent aggression toward a person... hitting a punching bag...increases rather than decreases subsequent aggression” ([62], pp. 372–373).

A good skeptic, however, might argue that hitting the punching bag and sitting quietly are not equivalent. Perhaps hitting the bag increases physiological arousal, which is also known to increase the risk of aggressive behavior. In a separate study, participants again were insulted and angered, and then randomly assigned to either (a) sit quietly, (b) hit a punching bag while thinking about getting physically fit, or (c) hit a punching bag while thinking about the student who had insulted them. Participants were then given an opportunity to hurt the student who had insulted them. If they sat doing nothing, they calmed down and were the least aggressive. If they ruminated on the offense while hitting the punching bag, they were the most aggressive. If they hit the bag but thought about fitness, they were in-between the other two conditions [60]. Thus, although the physiological arousal from exercise may have increased aggressive responding relative to sitting quietly, trying to get anger out by punching the bag while thinking about being angry again increased rather than decreased subsequent aggressive behaviors.

Two aspects seem fairly clear from the empirical work on catharsis. First, when people believe in it, it does influence their choices and behaviors. This is seen in at least two different ways. When presented with the argument that venting aggression is a good way to reduce aggression, people believe it and seek out ways to do it. For example, in a study similar to those reported above, participants were randomly assigned to read a fake newspaper article that either refuted the catharsis hypothesis, supported it, or was unrelated to it, and then all were insulted and angered. After being angered, they read descriptions of eight video games and rated how much they wanted to play them. Angered participants who read the pro-catharsis argument wanted to play the violent video games the most [64]. In a second study, rather than manipulating belief in catharsis using the newspaper article, they measured pre-existing belief in catharsis, and then insulted half of the participants. People with a stronger belief in catharsis had a stronger desire to play the violent video games overall, but the effect was especially pronounced for people who believe in catharsis and who had also been angered. Even critics of the media violence literature find similar results, that people who have greater belief in catharsis also have greater preference for violent video games [65]. Other studies have confirmed that

people who believe in catharsis do sometimes aggress against others in an attempt to improve their mood [61].

The second major empirical finding is that media violence is not cathartic, in the sense of reducing the risk of aggression. If it were, then the relation between media violence exposure and aggressive thoughts, feelings, and behaviors would be the opposite of what has been found in studies conducted over the past 50 years. For example, after being randomly assigned to play a violent or non-violent video game, people *could* behave less aggressively after playing the violent game. The preponderance of the evidence, however, shows the opposite pattern—people are more likely to behave more aggressively [52,66–69].

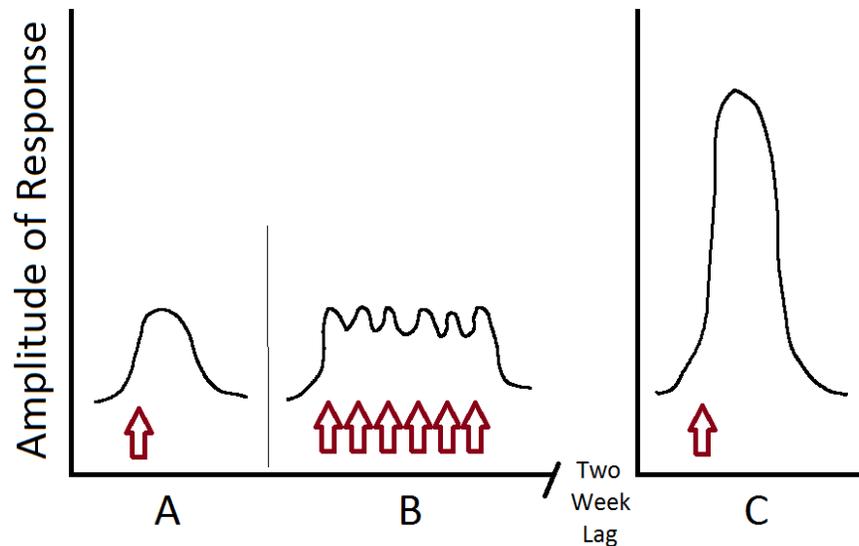
Geen [70] summarized the aggression catharsis literature in several areas: symbolic catharsis, such as viewing violence in the media or viewing aggressive sports, fantasizing about aggression, aggressing against inanimate objects, and aggressing against the antagonist. In every case, the weight of empirical evidence is against the theory of behavioral catharsis. That is, viewing, thinking about, or performing aggressive acts tends to increase later aggressive behavior, not reduce it.

5. Flaw 4: The Brain Becomes What the Brain Does

It is perhaps ironic that although the early psychological belief in catharsis comes from biological theories, the most devastating flaw in the catharsis hypothesis comes from modern biological neuroscience. Although this is no place for a detailed description of neural network development, it is clear from what we know about the brain that the aggression catharsis hypothesis cannot be true. Neurons communicate with each other by releasing neurotransmitters into the synapses, and the neurotransmitters bind to receptors in the receiving neurons. Learning is the process of making particular neural pathways work more readily than they did before. This is typically accomplished by increasing the strength of synaptic communication, rather than by creating new neurons or new connections. Synaptic communication is usually increased by (1) upregulation of neurotransmitters by the presynaptic neuron; that is, increasing the amount of neurotransmitter released into the synapse; by (2) upregulation of receptors by the postsynaptic neuron; that is, increasing the amount of receptors on the receiving neurons, or by (3) making the receptors on the postsynaptic neuron more responsive. Learning, at the neural level, can be shown in the process of long-term potentiation (LTP). When a neuron is stimulated, it has an electrical response, which can be measured and is depicted in Figure 1.

When the neuron is stimulated (for example, if one hears the word “arrow”), it shows an electrical response of a certain magnitude (represented as the height/amplitude of the wave in Figure 1A). If the neuron is stimulated the same way repeatedly as shown in Figure 1B (e.g., hearing “arrow, arrow, arrow, arrow, arrow”), it has that response repeatedly. This repeated stimulation causes long-term changes in the neuron (generally considered to be permanent, although forgetting does occur), in which the next time the neuron is stimulated, it will now have a much greater response. As shown in Figure 1C, upon hearing the word “arrow” again, the amplitude of the response has now significantly changed. This can happen even if there is a substantial time delay between points B and C (up to weeks). The neuron is now much more likely to respond than it used to. The odds that a given stimulus (“arrow”) will cause an action potential have changed long-term. Simply put, learning has occurred.

Figure 1. Long-Term Potentiation at the Neural Level: (A) Neural response to a single stimulation. (B) Neural response to repeated stimulation. (C) Neural response to a single stimulation two weeks after repeated stimulation.



This makes a great deal of intuitive sense when we consider one common way to remember a telephone number. We read it or repeat it several times. After seeing it enough times, we no longer need to continue—we have learned it. As Donald Hebb is often quoted as stating in 1949, “the neurons that fire together, wire together”.² Each additional repetition of seeing something burns it deeper into the brain.

If the aggression catharsis hypothesis were true, seeing the telephone number one more time should make us *less* likely to remember it—it should take it away from us. But in fact, repeating experiences is one of the most effective ways to learn something. It turns out your grandmother was a great neuroscientist... practice *does* make perfect! Therefore, if one plays a violent video game in which one practices aggressive thoughts, feelings, and responses, it *cannot* lead to lowered aggressive thoughts, feelings, or responses over the long term. Interestingly, even Aristotle knew this, as he realized that we become good by practicing being good.

“[S]tates of character arise out of like activities. This is why the activities we exhibit must be of a certain kind; it is because the states of character correspond to the difference between these. It makes no small difference, then, whether we form habits of one kind or of another from our very youth; it makes a very great difference, or rather *all* the difference.” ([33], 1103b 21–26).

There is beginning to be some research demonstrating that many of the same regions of the brain are active whether the learning is occurring by doing or by watching someone else. In one fMRI study, for example, participants had to learn to choose which of two abstract fractal stimuli would give a reward 80% of the time. They did this through repeated trials, and either getting rewarded or punished

² In fact, what he really postulated was: “When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A’s efficiency, as one of the cells firing B, is increased.” ([71], p. 62).

after each trial. In other conditions, they could also learn from seeing someone else on a TV screen make similar decisions and the outcomes of those decisions. Brain regions active in learning occurred in both cases, with the authors concluding, “it is evolutionarily efficient for general learning mechanisms to be conserved across individual and vicarious” learning ([72], p. 14435). Similarly, an fMRI study comparing personal trial-and-error learning with learning by observing others also found that many of the same brain regions were activated during both types of learning [73]. These types of studies are further evidence that watching someone else behave aggressively in the media will not reduce learning. Instead, it demonstrates that we can learn very well just by watching a violent movie or by playing a violent video game.

One implication is that the consequences of violence shown in the media matter. There is nothing inherently wrong with witnessing an act of violence in the media, if what is learned is how horrible and damaging it is to both the victim and the aggressor. Unfortunately, only 3% of American television shows have an anti-violence theme [74], and most violence shown in the media is not punished, and much of it (especially in video games) is rewarded [75,76].

In addition, the timing of repetition can matter greatly for learning. Studies on neural change demonstrate what most teachers have known for decades—“cramming” does not work as well as practicing some each day. For example, in studies of sea slugs (who have large neurons, making them easier to study), a single session of 10 learning trials leads to a short-term memory lasting for several minutes. If this is repeated four times at intervals across hours or days, then a long-term memory is produced that lasts weeks [77]. Massed practice at one time produces robust short-term memory, but distributed practice is better for long-term memory. If we consider media violence, seeing something only once will cause some short-term learning effects and may cause some long-term learning, but not nearly as well as if it is seen repeatedly at spaced intervals. Thus, playing a violent game repeatedly cannot reduce learning of aggressive ways of thinking, feeling, and behaving. Furthermore, when people practice similar but not identical things, this helps learning to generalize to novel situations [56]. Because people tend to watch more than one violent show, movie, or game, from a learning perspective, this can only help to teach the common underlying message that aggression is acceptable in a way that is most likely to transfer to the “real” world.

6. Why Does the Catharsis Hypothesis Continue to Seem Possible?

Given the lack of evidence for catharsis and the considerable weight of evidence against it, it may be surprising that it is still such a popular concept. It seems likely to be a popular concept for a couple of reasons. First, given that people enjoy watching media violence, admitting that it might be risky or harmful would likely cause a great amount of cognitive dissonance. It is easier to dismiss the possibility of harm than it is to modify our habits. Second, it seems to fit our phenomenological experience.

As noted by Bushman *et al.* [62], when angered, behaving aggressively feels pleasurable. This may be misinterpreted by people to suggest that they would behave less aggressively, when in fact aggressive behavior is more likely (perhaps partly because we believe we will feel better afterwards). In addition, viewing media violence or playing a violent video game can indeed provide short-term enjoyment or distraction from a difficult situation. In this sense, then, media violence can reduce the immediate risk of aggression, because if I leave a frustrating situation and go home to play a violent

video game, I am using the media to help cope with my difficult feelings at that moment. Using media as a distraction or coping technique is not, however, the same thing as reducing my tendency to respond aggressively (the catharsis hypothesis). It is removing myself from the situation, which could equally be done by going for lunch. “Releasing” the aggression by practicing aggressive scripts while consuming media violence does not lower later odds of aggression when provoked.

This demonstrates two important differences between the historical and therapeutic meanings of catharsis and the modern meaning of aggression catharsis through media violence. Freud, Aristotle, Lorenz, Feshbach, *etc.* discuss catharsis as being primarily about emotion, not behavior. In Aristotle’s view, provoking fear and pity can help us to balance our own emotions. In Freud’s view, if we can release our emotions, it will reduce our mental distress and hysteria. In Lorenz’s view, when provoked, we have this emotional energy that needs release. For these writers the primary focus is on our release and understanding of emotion. In contrast, people who claim that watching media violence will reduce their aggressive behavior are focused almost entirely on behaviors. Therefore, even if Freud was correct that releasing pent-up emotion is good for mental health (and this seems generally true), he didn’t say that it means one won’t behave aggressively.

A second difference between the original conceptions and the media violence and aggression catharsis hypothesis is about timing. The original conceptions largely focus on what to do with aggressive feelings that one is having right now. For example, the frustration-aggression hypothesis describes that when angered, doing something aggressive (e.g., yelling at someone) can reduce the aggressive feelings one is *currently* having. In contrast, the typical argument about media violence catharsis is that by playing a violent video game now, it will reduce my aggressiveness at some point in the future. As demonstrated above in the discussion of empirical evidence, this does not seem to happen. Furthermore, the belief that consuming media violence reduces aggression itself may amplify the effect of media violence. For example, in a study of 607 8th and 9th grade American students, those who played more violent video games had higher hostile attribution biases, higher hostile personalities, and got in more physical fights [78]. We noticed, but never previously published this additional finding: Students who reported that they play video games to release their anger are significantly more likely to get into physical fights, even after controlling for age, sex, personality trait hostility, hostile attribution bias, and amount of violent video games played ($\beta = 0.12, p < 0.05$). Therefore, the belief that one can achieve lower aggression through media violence more likely puts one at greater risk for aggression.

Another reason the belief persists is that it feels right—specifically because of how the body reacts to media violence. For example, people often say they get an “adrenaline rush” when they play violent video games. They are exactly correct. There is evidence that violent video games result in increased physiological arousal, including increased heart rate, blood pressure, and release of glucocorticoids and catecholamines (adrenaline, nor-adrenaline, cortisol, and testosterone) into the blood stream. These are aspects of the physiological “fight or flight” system. That is, even though you know it’s “just” a game, your body reacts as if you were in a real fight. This is part of why media violence is so exciting and fun to watch—it makes us feel alive and excited. The problem is that this stress response is an acute response system, not a chronic system. It is designed to turn on when you are being chased by the tiger so that you can fight stronger, run faster, and bleed less. However, after about five or ten minutes, you should have either gotten away or gotten killed. The stress response was not designed to

stay active for hours, but when playing a violent video game, it can. Once we stop playing, however, our bodies are exhausted and need to rest. This feeling tired or “spent” makes us feel like we are now relaxed and we likely interpret that to mean that catharsis has occurred and that we would act less aggressively. In fact, all it means is that our bodies are tired of the stress we have put on them from playing a violent game that increases heart rate, blood pressure, and stress hormone levels. If someone provoked us right after playing, the research shows, we would be more likely to have an aggressive response rather than less likely, despite feeling as though we are relaxed. This is due to having spent hours priming aggressive thoughts, feelings, and attitudes, and (often) having them reinforced by the game.

7. Conclusions

Although the aggression catharsis hypothesis has great appeal and popular support, the evidence suggests that it is not a valid concept in psychology: (1) Aggression is not a drive that must be vented, so the underlying Freudian assumption is incorrect. (2) Even if we accept that Aristotle meant something about purging negative emotions through viewing media violence, modern media violence is not constructed in the way he said is necessary to achieve catharsis. Furthermore, purification is likely a much more correct way of translating κάθαρσις than is purgation, so even if Aristotle was entirely correct, viewing media violence would not reduce aggressive feelings but instead should teach us the dangers of acting on them (assuming the media portrayed it correctly and did not glamorize the violence). (3) In the hundreds of studies of media violence, catharsis has not been shown to work—rather the opposite has been demonstrated repeatedly. Furthermore, studies specifically designed to demonstrate catharsis have also failed to support it. (4) Finally, given the way the brain works, catharsis does not even make sense. We do not become less likely to learn something by practicing it, reading it, or seeing it one more time. Every repetition *increases* learning.

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Conflicts of Interest

The author declares no conflict of interest.

References and Notes

1. Allen, M.; D'Alessio, D.; Brezgel, K. A meta-analysis summarizing the effects of pornography II: Aggression after exposure. *Hum. Comm. Res.* **1995**, *22*, 258–283.
2. Anderson, C.A. An update on the effects of playing violent video games. *J. Adol.* **2004**, *27*, 113–122.
3. Anderson, C.A.; Bushman, B.J. Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychol. Sci.* **2001**, *12*, 353–359.

4. Anderson, C.A.; Shibuya, A.; Ihori, N.; Swing, E.L.; Bushman, B.J.; Sakamoto, A.; Rothstein, H.R.; Saleem, M. Violent video game effects on aggression, empathy, and prosocial behavior in eastern and western countries: A meta-analytic review. *Psychol. Bull.* **2010**, *136*, 151–173.
5. Andison, F.S. TV violence and viewer aggression: A cumulation of study results. *Public Opin. Quart.* **1977**, *41*, 314–331.
6. Bushman, B.J.; Anderson, C.A. Media violence and the American public. *Am. Psychol.* **2001**, *56*, 477–489.
7. Bushman, B.J.; Huesmann, L.R. Short-term and long-term effects of violent media on aggression in children and adults. *Arch. Pediatr. Adolesc. Med.* **2006**, *160*, 348–352.
8. Ferguson, C.J. Evidence for publication bias in video game violence effects literature. *Aggr. Viol. Beh.* **2007**, *12*, 1–33.
9. Ferguson, C.J. The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *Psychiat. Quart.* **2007**, *78*, 309–316.
10. Ferguson, C.J.; Kilburn, J. The public health risks of media violence: A meta analytic review. *J. Pediatr.* **2009**, *154*, 759–763.
11. Hearold, S. A synthesis of 1043 Effects of Television on Social Behavior. In *Public Communication and Behavior*; Comstock, G., Ed.; Academic Press: New York, NY, USA, 1986; Volume 1, pp. 65–133.
12. Hogben, M. Factors moderating the effect of television aggression on viewer behavior. *Comm. Res.* **1998**, *25*, 220–247.
13. Paik, H.; Comstock, G. The effects of television violence on antisocial behavior—a meta-analysis. *Comm. Res.* **1994**, *21*, 516–546.
14. Savage, J.; Yancey, C. The effects of media violence exposure on criminal aggression: A meta-analysis. *Crim. Justice Behav.* **2008**, *35*, 772–791.
15. Sherry, J.L. The effects of violent video games on aggression. *Human Comm. Res.* **2001**, *27*, 409–431.
16. Wood, W.; Wong, F.; Chachere, J. Effects of media violence on viewers' aggression in unconstrained social interaction. *Psychol. Bull.* **1991**, *109*, 371–383.
17. Feshbach, S. The catharsis hypothesis, aggressive drive, and the reduction of aggression. *Aggr. Behav.* **1984**, *10*, 91–101.
18. Kennedy-Moore, E.; Watson, J.C. How and when does emotional expression help? *Rev. Gen. Psychol.* **2001**, *5*, 187–212.
19. Pennebaker, J.W. Writing about emotional experiences as a therapeutic process. *Psychol. Sci.* **1997**, *8*, 162–166.
20. Pennebaker, J.W.; Kiecolt-Glaser, J.K.; Glaser, R. Disclosure of traumas and immune function: Health implications for psychotherapy. *J. Consult. Clin. Psychol.* **1988**, *56*, 239–245.
21. Dollard, J.; Doob, L.; Miller, N.; Mower, O.H.; Sears, R. *Frustration and Aggression*; Yale University Press: New Haven, CT, USA, 1959.
22. Doob, A.N.; Wood, I. Catharsis and aggression: The effects of annoyance and retaliation on aggressive behavior. *J. Pers. Soc. Psychol.* **1972**, *22*, 156–162.
23. Campbell, A. *Men, Women, and Aggression*; Basic Books: New York, NY, USA, 1993.
24. Durkin, K.; Barber, B. Not so doomed: Computer game play and positive adolescent development. *J. Appl. Dev. Psychol.* **2002**, *23*, 373–392.

25. Breuer, J.; Freud, S. *Studies in Hysteria*; Nervous and Mental Disease Publishing Company: New York, NY, USA, 1936.
26. Geen, R.G.; Quanty, M.B. The Catharsis of Aggression: An Evaluation of a Hypothesis. In *Advances in Experimental Social Psychology*; Berkowitz, L., Ed.; Academic Press: New York, NY, USA, 1977; Volume 10, pp. 1–37.
27. Freud, S. Thoughts for the Times on War and Death. In *Sigmund Freud, M.D., LL.D.: Collected Papers*; Jones, E., Ed.; The Hogarth Press and the Institute of Psycho-Analysis: London, UK, 1915; Volume IV.
28. Freud, S. *Beyond the Pleasure Principle (The Standard Edition)*; W.W. Norton & Company: New York, NY, USA, 1990; originally published in 1920.
29. Lind, L. Thanatos: The drive without a name: The development of the concept of the death drive in Freud's writings. *Scand. Psychoanal. Rev.* **1991**, *14*, 60–80.
30. Burkhardt, R.W. Konrad Lorenz. In *Encyclopedia of Animal Behavior*; Breed, M.D., Moore, J., Eds.; Academic Press: New York, NY, USA, 2010; pp. 298–303.
31. Lorenz, K. *On Aggression*; Methuen & Co: London, UK, 1966.
32. Bloom, A. *The Republic of Plato*; Basic Books, Inc.: New York, NY, USA, 1968; p. 487.
33. McKeon, R. *The Basic Works of Aristotle*; Random House: New York, NY, USA, 1941; p. 1487.
34. Brown, L.A. Aristotle on Greek Tragedy. Available online: http://larryavisbrown.homestead.com/Aristotle_Tragedy.html (accessed on 13 September 2013).
35. Kitano, M. Aristotle's theory of comedy. *Bull. Gunma Prefect. Women's Univ.* **2001**, *22*, 193–201.
36. Nussbaum, M. *Fragility of Goodness*; Cambridge University Press: New York, NY, USA, 1986.
37. Golden, L. Mimesis and Katharsis. *Classic. Philol.* **1969**, *64*, 145–153.
38. Janko, R. *Introduction from Aristotle's Poetics*; Hackett Publishing: Cambridge, MA, USA, 1987.
39. Green, C.S.; Bavelier, D. Action video game modifies visual selective attention. *Nature* **2003**, *423*, 534–537.
40. Green, C.S.; Bavelier, D. Action-video-game experience alters the spatial resolution of vision. *Psychol. Sci.* **2007**, *18*, 88–94.
41. Green, C.S.; Bavelier, D. Effect of action video games on the spatial distribution of visuospatial attention. *J. Exp. Psychol. Hum. Percept. Perform* **2006**, *32*, 1465–1478.
42. Green, C.S.; Bavelier, D. Enumeration versus multiple object tracking: The case of action video game players. *Cognition* **2006**, *101*, 217–245.
43. Ubi Soft. Ubi soft licenses Tom Clancy's rainbow six rogue spear game engine to train U.S. Soldiers. Available online: http://corp.ubisoft.com/pr_release_010829a.htm (accessed on 12 February 2002).
44. Ferguson, C.J.; San Miguel, C.; Hartley, R.D. A multivariate analysis of youth violence and aggression: The influence of family, peers, depression, and media violence. *J. Pediatr.* **2009**, *155*, 904–908.
45. Maier, J.A.; Gentile, D.A. Learning Aggression through the Media: Comparing Psychological and Communication Approaches. In *The Psychology of Entertainment Media: Blurring the Lines between Entertainment and Persuasion*, 2nd ed.; Shrum, L.J., Ed.; Taylor & Francis: New York, NY, USA, 2012; pp. 267–299.
46. Anderson, C.A.; Bushman, B.J. Human aggression. *Ann. Rev. Psychol.* **2002**, *53*, 27–51.

47. Anderson, C.A.; Bushman, B.J. The effects of media violence on society. *Science* **2002**, *295*, 2377–2378.
48. Anderson, C.A.; Gentile, D.A.; Buckley, K.E. *Violent Video Game Effects on Children and Adolescents: Theory, Research, and Public Policy*; Oxford University Press: New York, NY, USA, 2007.
49. Carnagey, N.L.; Anderson, C.A. Theory in the Study of Media Violence: The General Aggression Model. In *Media Violence and Children: A Complete Guide for Parents and Professionals*; Gentile, D.A., Ed.; Praeger: Westport, CT, USA, 2003; pp. 87–106.
50. Anderson, C.A.; Huesmann, L.R. *Human Aggression: A Social-Cognitive View*; Hogg, M.A., Cooper, J., Eds.; Sage Publications: Thousand Oaks, CA, USA, 2003.
51. Huesmann, L.R. Psychological processes promoting the relation between exposure to media violence and aggressive behavior by the viewer. *J. Soc. Issues* **1986**, *42*, 125–139.
52. Huesmann, L.R.; Eron, L.D. *Television and the Aggressive Child: A Cross-National Comparison*; L. Erlbaum Associates: Hillsdale, NJ, USA, 1986.
53. Huesmann, L.R.; Guerra, N.G. Normative beliefs and the development of aggressive behavior. *J. Pers. Soc. Psychol.* **1997**, *72*, 1–12.
54. Bandura, A. *Social Learning Theory*; Prentice Hall: Englewood Cliffs, NJ, USA, 1977.
55. Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*; Prentice-Hall: Englewood Cliffs, NJ, USA, 1986.
56. Gentile, D.A.; Gentile, J.R. Violent video games as exemplary teachers: A conceptual analysis. *J. Youth Adol.* **2008**, *9*, 127–141.
57. Bandura, A. Influence of models' reinforcement contingencies on the acquisition of imitative responses. *J. Pers. Soc. Psychol.* **1965**, *1*, 589–595.
58. Bartholow, B.D.; Bushman, B.J.; Sestir, M.A. Chronic violent video game exposure and desensitization to violence: Behavioral and event-related brain potential data. *J. Exp. Soc. Psychol.* **2006**, *42*, 532–539.
59. Gentile, D.A.; Bushman, B.J. Reassessing media violence effects using a risk and resilience approach to understanding aggression. *Psychol. Pop. Media Cult.* **2012**, *1*, 138–151.
60. Bushman, B.J. Does venting anger feed or extinguish the flame? Catharsis, rumination, distraction, anger, and aggressive responding. *Pers. Soc. Psychol. Bull.* **2002**, *28*, 724–731.
61. Bushman, B.J.; Baumeister, R.F.; Phillips, C.M. Do people aggress to improve their mood? Catharsis beliefs, affect regulation opportunity, and aggressive responding. *J. Pers. Soc. Psychol.* **2001**, *81*, 17–32.
62. Bushman, B.J.; Baumeister, R.F.; Stack, A.D. Catharsis, aggression, and persuasive influence: Self-fulfilling or self-defeating prophecies? *J. Pers. Soc. Psychol.* **1999**, *76*, 367–376.
63. Bushman, B.J.; Bonacci, A.M.; Pedersen, W.C.; Vasquez, E.A.; Miller, N. Chewing on it can chew you up: Effects of rumination on triggered displaced aggression. *J. Pers. Soc. Psychol.* **2005**, *88*, 969–983.
64. Bushman, B.J.; Whitaker, J.L. Like a magnet: Catharsis beliefs attract angry people to violent video games. *Psychol. Sci.* **2010**, *21*, 790–792.
65. Ferguson, C.J.; Olson, C.K.; Kutner, L.A.; Warner, D.E. Violent video games, catharsis seeking, bullying, and delinquency: A multivariate analysis of effects. *Crime Delinquen.* **2013**, in press.

66. Anderson, C.A.; Berkowitz, L.; Donnerstein, E.; Huesmann, L.R.; Johnson, J.D.; Linz, D.; Malamuth, N.M.; Wartella, E. The influence of media violence on youth. *Psychol. Sci. Pub. Interest.* **2003**, *4*, 81–110.
67. Singer, D.G.; Singer, J.L. *Handbook of Children and the Media*, 2nd ed.; Sage: Thousand Oaks, CA, USA, 2012.
68. Strasburger, V.C.; Wilson, B.J. Television Violence. In *Media Violence and Children: A Complete Guide for Parents and Professionals*; Gentile, D.A., Ed.; Praeger: Westport, CT, USA, 2003; pp. 57–86.
69. Huesmann, L.R.; Moise-Titus, J.; Podolski, C.-L.; Eron, L.D. Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977–1992. *Devel. Psychol.* **2003**, *39*, 201–221.
70. Geen, R.G. *Human Aggression*, 2nd ed.; Open University Press: Buckingham, UK, 2001.
71. Hebb, D.O. *The Organization of Behavior: A Neuropsychological Theory*; Taylor & Francis: New York, NY, USA, 1949.
72. Burke, C.J.; Tobler, P.N.; Baddeley, M.; Schultz, W. Neural mechanisms of observational learning. *Proc. Natl. Acad. Sci. USA* **2010**, *107*, 14431–14436.
73. Monfardini, E.; Gazzola, V.; Boussaoud, D.; Brovelli, A.; Keysers, C.; Wicker, B. Vicarious neural processing of outcomes during observational learning. *PLOS One* **2013**, *8*, e73879.
74. Smith, S.L.; Wilson, B.J.; Kunkel, D.; Linz, D.; Potter, W.J.; Colvin, C.M.; Donnerstein, E.; Bernhardt, J.M.; Brown, J.D.; Golden, S.; et al. *National Television Violence Study*; Sage Publications: Thousand Oaks, CA, USA, 1997; Volume 3.
75. Bartholow, B.D.; Dill, K.E.; Anderson, K.B.; Lindsay, J.J. The Proliferation of Media Violence and Its Economic Underpinnings. In *Media Violence and Children: A Complete Guide for Parents and Professionals*, Gentile, D.A., Ed.; Praeger Press: Westport, CT, USA, 2003; pp. 1–18.
76. Gentile, D.A.; Anderson, C.A. Violent Video Games: The Newest Media Violence Hazard. In *Media Violence and Children: A Complete Guide for Parents and Professionals*; Gentile, D.A., Ed.; Praeger: Westport, CT, USA, 2003; pp. 131–152.
77. Kandel, E.R.; Kupfermann, I.; Iversen, S. Learning and Memory. In *Principles of Neural Science*, 4th ed.; Kandel, E.R., Schwartz, J.H., Jessell, T.M., Eds.; McGraw-Hill: New York, NY, USA, 2000; pp. 1227–1246.
78. Gentile, D.A.; Lynch, P.J.; Linder, J.R.; Walsh, D.A. The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *J. Adol.* **2004**, *27*, 5–22.