Distinguishing Hypotheses From Hyperbole in Studies of Media Violence: A Comment on Markey et al. (2015)

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In alleging that Bushman et al. (2013) made sensational and unsubstantiated claims, Markey et al. (2015) mistake hypotheses for hyperbole. Moreover, in their effort to show that gun violence in PG-13 movies (for ages 13 and older) is unrelated to trends in population violence, they make unjustified demands on our data, with outcomes that are unconnected to hypothesized effects. Using outcomes in line with our hypotheses, we draw the contrary conclusion that recent trends in gun violence in youth are actually consistent with gun violence trends in PG-13 movies. Nevertheless, because we do not believe those patterns are sufficient to draw causal conclusions, we suggest more adequate tests of the hypothesis that exposure to movie gun violence affects the beliefs and attitudes of youth toward guns.

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“The speaking in perpetual hyperbole is comely in nothing but love.”

— Francis Bacon, Viscount St Albans: 1625 Essays, no.10, “Of Love.”

“Hyperbole is something I’d better avoid.”

— Terry Gilliam, member of the Monty Python comedy troupe

Markey, French, and Markey (2015) take issue with our 2013 article showing that gun violence in top-grossing films rated as acceptable for children aged 13 and older (i.e., rated PG-13) has steadily increased since the introduction of that rating (Bushman,
Jamieson, Weitz, & Romer, 2013). They do not challenge the finding but rather question whether movie violence affects rates of aggregate homicide and assaults in the United States. In so doing, they take issue with claims we did not make. Although Markey et al. note that Bushman et al. (2013) did not “examine any potential negative outcomes related to the trends they found in violent films,” the purpose of our study was not to relate the increasing depiction of gun violence in films to societal outcomes. Instead, the purpose was to identify trends in gun use as a specific form of violence in films, and to determine whether children might be increasingly exposed to such depictions because of the lax application of the movie rating system that increasingly assigns the PG-13 rating rather than the more restrictive R rating (for ages 17 and older) to violence, a phenomenon known as ratings creep.

We noted one potential outcome of exposure to gun-violence depictions, namely the association of guns with violence. In particular, films showing the use of guns to resolve conflicts could teach youth scripts that legitimize the use of weapons rather than more peaceful ways of handling problems. The most dramatic influence of those scripts occurs when perpetrators of mass shootings dress and act remarkably like violent characters in movies. However, gun violence depictions may also create other outcomes. Considerable research shows that the mere presence of a gun can elicit aggressive thoughts and behavior—a phenomenon called the “weaponseffect” (Bushman, 2013). One way that might happen, especially for children who are still learning about weapons, is through violent films depicting gun use.

In this response, we discuss four deficiencies in Markey et al.’s analysis of our research. First, we highlight an important distinction between plausible statements of hypotheses about the potential effects of media violence and statements of hyperbole about those effects, which are clearly inappropriate in scientific discourse. We note that Markey et al. conflate these two forms of discourse in ours as well as other articles, and in the process mistake hypotheses for hyperbole. Second, we note that their use of our gun violence trends in PG-13 movies goes well beyond what those data can support with outcomes that are largely irrelevant to the hypotheses we proposed. Third, we show that an examination of gun violence trends in youth provides evidence consistent with potential effects of gun violence trends in PG-13. Fourth, we note that Markey et al. fail to consider the important role of exposure to gun violence in media in their analysis, and we suggest some ways that more sensitive tests of the effects of gun violence in media can be conducted.

Hypotheses Versus Hyperbole

Contrary to the implication that we are trafficking in sensationalism (i.e., hyperbole) as the title of their article suggests, we asserted that (italics added): “the presence of weapons in films might amplify the effects of violent films on aggression” (p. 1014); “The mere presence of guns in these films may increase the aggressive behavior of youth” (p. 1017). Films might “provide scripts for gun use. Gun violence in films might also encourage an association between guns and violence” (p. 1015). Note the
subjunctive verbs—*may* and *might*—used in these statements. We also raised several possibilities that future research should examine, such as “whether (media) violence with guns is more likely to increase aggression in youth than (media) violence without guns” (p. 1017), and “whether films containing gun violence provide viewers with scripts on how to use guns” (p. 1017). We also predicted that “youth will be more interested in acquiring and using guns after exposure to gun violence in films” (p. 1017). All of these statements are plausible hypotheses based on prior research and theory regarding the effects of media violence on youth.

Nowhere in the article do we link or assert a link between exposure to violent films and trends in violent behavior or “in severe acts of violence” (p. 4). We do not do so because as we argue below, the kinds of evidence we used to make a case about ratings creep did not permit such inferences.

Contrary to the assertion in their paper, we did not assert anywhere in our article that “the apparent rise in school and other public shootings coincides with the increase in violent films …” (p. 3). The citation to the news story Markey et al. (in press) cite explicitly states that “we do not draw a direct causal link to the recent rise in school and other public shootings …” (France-Presse, 2013). Moreover, the assertion that Romer has argued that “violent films might cause ‘a lot of kids’ who lack parental guidance to act in a manner similar to Aurora, Colorado shooter, James Holmes” (p. 3) is based on a radio interview in which he was merely stating the hypothesis that violent films depicting mass shootings might be harmful, especially for children whose parents are not interested in exercising the parental guidance that the film ratings system requires. In sum, we did say that violent films *might* provide youth with scripts for using guns. We did not say that the rise in mass shootings is causally linked with the rise in gun violence in films.

We said that the magnitude of the positive correlation between media violence and aggression is at least as large as the magnitude of correlations reported in several other meta-analyses of public health topics (e.g., the positive correlation between secondhand smoke and lung cancer; the positive correlation between calcium intake and bone mass; the positive correlation between exposure to asbestos and cancer; the negative correlation between condom use and HIV infection, the negative correlation between exposure to lead and IQ scores in children; see Bushman & Anderson, 2001). We did not say behaving aggressively after exposure to violent media is comparable to getting lung cancer from second hand smoke, or osteoporosis, contracting HIV, or getting cancer from asbestos, or getting brain damage from lead-based paint.

We said that even if violent media adversely affect a small proportion of the population, it only takes one or two affected individuals to wreak havoc on society (Bushman & Anderson, 2001). We did not say that everyone adversely affected by violent media becomes a mass shooter or commits a violent criminal act.

We said that aggression is any behavior intended to harm another person who does not want to be harmed (Baron & Richardson, 1994). We did neither say that laboratory measures of aggression are “proxy measures of violence” (p. 6). Nor did
we say that laboratory measures of aggression “generalize to severe forms of violent behaviors, such as homicides and aggravated assault,” (p. 7).

Their article also contains some other errors that deserve mention. For example, Markey et al. cite a correlation of .07 for longitudinal studies included in a meta-analysis we cite (Anderson et al., 2010). The bivariate correlation based on all studies was actually .20. The smaller correlation of .075 was obtained after controlling for initial level of aggressiveness.

Markey et al. also cite articles that discuss the potential effects of media violence on real world violence. For example, they report that 28% of the studies in Anderson et al.’s (2010) violent video game meta-analysis “discussed severe forms of violence” (p. 5). However, that is a far cry from saying that 28% of studies stated that violent video games cause severe forms of violence, or that the researchers mentioned severe forms of violence to “substantiate the rationale of their research” (Markey et al., 2015, p. 157).

Making Unjustifiable Demands on Our Movie Data

According to the inference invited by the Markey et al.’s (2015) title, if trends in violent movies are not related to aggregate measures of real-world violence, we are engaging in sensationalism rather than science. To support their argument, they conduct an analysis that purports to test the relation between gun use in films and actual rates of gun violence in the United States. Although we applaud Markey et al.’s attempt to examine the link between gun violence in top-selling films and violent criminal behavior (i.e., aggravated assaults and homicides), we find their analysis unpersuasive for at least three reasons. First, our film violence data do not permit the inferences they attempt to derive from them. Second, even if our data could be used for the purposes that Markey et al. intended, their outcome measures do not capture the effects we predicted in our article. Third, without a measure of exposure to violence in films, it is difficult to draw conclusions about their effects in aggregate data. With these concerns in mind, we turn to the Markey et al. analysis.

Because our data were readily available on our Website, youthmediarisk.org, as noted in our article, we were surprised to learn that Markey et al. used a computer program to estimate them. Assuming that they were able to recover those scores within reasonable limits of error, there is still no reason to expect exposure to 5–10 movies per year, which are only seen for a few hours, to have a dramatic effect on annual deviations in aggregate rates of violence in the U.S. population. Indeed, we would not even expect them to register in annual changes in violence among the subpopulation that we are interested in understanding, namely adolescents and young adults. Our hypotheses about the effects of gun violence are directed at youth, not the entire adult population. Thus, on the input side, the data are not adequate to assess the effects of movie violence on an annual basis, and on the output side, the data are not focused on the population of interest that could provide a test of the relation between movies and real world behavior.
The Coding of Health and Media Project has correlated annual changes in television violence on aggregate outcomes using time series methods (Jamieson & Romer, 2014a). But those analyses involved many more hours of potential audience exposure (people watch much more TV per day than movies). It is important to consider exposure to media content before using it to predict effects on audiences. In that study, we found that annual changes in TV violence were positively related to annual changes in the adult population’s fears of crime as assessed in national polls. Before doing so, we verified that the programs we selected were seen by a sufficient proportion of adults in U.S. households at a high enough rate to expect annual deviations from TV violence trends to predict deviations from trends in audience behavior. We have also examined the relation between annual changes in smoking depictions on TV and annual changes in cigarette consumption in the aggregate adult population (Jamieson & Romer, 2014b). But in neither case would we expect those relations to be detectable on an annual basis with the sparse annual movie data we have collected.

What our data can reliably assess is long-term trends in popular movie content, and it is those trends that we reported in our Pediatrics study. We did not test differences between violent content in PG-13 versus R-rated movies at any single time point. We tested differences in trends, and noted that the trend for guns depicted in violent scenes in PG-13 films exceeded the trend in R-rated films in 2012, indicating that the increasing trend of gun violence in PG-13 movies was now significantly greater than in popular R-rated movies. As Markey et al. correctly note, correlating trends over time is subject to too many alternative explanations to allow any causal conclusions. Using deviations from trends is a useful next step, but only when those deviations are sensitive enough to predict changes in the outcome variable.

Despite their awareness of the pitfalls in using trends in time series to draw causal conclusions, Markey et al. do not appear to recognize that one should not “prewhiten” variables before testing contemporaneous relations between time series unless one wants to remove lagged effects. Such lagged effects are critical for demonstrating the temporal precedence of one series as a predictor of the other, a relation known as Granger causality. Indeed, one can use regression across lags to test those relations, a procedure known as vector autoregression (Diebold, 2007). Their emphasis on prewhitening each series before correlating them misses the opportunity to observe lagged relations between the potentially causal and dependent series. A good example is a study that examined both contemporaneous and lagged media predictors of cigarette consumption in the adult population (Jamieson & Romer, 2014b). Only examining contemporaneous relations between series, as Markey et al. did, ignores the potential impact of such lagged predictors, which are actually even stronger evidence of Granger causality than contemporaneous relations (for a discussion of how to detect Granger causality between time series using vector autoregression, see Romer, 2006).

We note similar concerns regarding a related article by the Markey team (in press) in which they lead with a title that suggests an interest in “rhetoric versus data.” However, they again conduct repeated analyses using time series methods with
aggregate violence outcomes but without ever adequately testing Granger causality and without ever considering the possibility that those outcomes might be too insensitive to detect effects on the audience most at risk of acting on media depictions. Similar concerns can be raised regarding an analysis of violent video games by Ferguson (in press) that uses only aggregate relations between time trends and does not examine gun violence injuries in young people, which we argue are more reflective of exposure to violent media that emphasize the use of guns as a means to attack others.1

How Might Gun Violence Depictions in Media Affect Gun Violence in the Real World?

Although we find the time series analysis conducted by Markey et al. (2015) deficient, there are other reasons to find their analysis unpersuasive. As already noted, we did not claim that the increase in depictions of gun violence in PG-13 movies would lead to aggregate increases in gun violence in the adult population. The most direct outcome would be the learning of gun-use scripts in children heavily exposed to films with gun violence. Those scripts could encourage greater use of guns among youth vulnerable to engaging in serious violence, such as urban youth living in conditions of frequent street violence or nonurban youth with access to guns and the kinds of resentments that can lead to mass shootings (Bushman & Members of the NSF panel on youth violence, 2013). Thus, we would not expect film violence to have a short-term effect on aggregate violence rates or gun use rates across the entire population. It was no coincidence that our study was published in Pediatrics, a journal that is read by pediatricians and policy makers concerned about the health of youth.

If the trend toward greater violence in movies directed to youth has affected gun use, we might expect the use of guns by youth to have increased in recent years. Indeed, as seen in Figure 1, rates of gun assault injuries among children and adolescents (ages 0–19 years) as well as young adults (ages 20–29 years) have not declined since 2001 but have increased over several years during that time span. Although not shown, these trends are evident across Black, Hispanic, and White youth. They also parallel the trend we reported for PG-13 violence in this study. Critics of research about gun violence in media entertainment sometimes point to the decline in violent deaths among youth since the mid-1990s (e.g., Males, 2013), when all forms of youth and adult violence began to decline in the US. This decline followed a period of rapid increase starting in the mid-1980s that was associated with urban drug use and conflicts, primarily in Black and Hispanic neighborhoods (Webster & Vernick, 2013). Despite the drop in youth violence in recent decades, the rate of fatalities attributable to gun use in Black youth has continued to increase since 1963 (Children’s Defense Fund, 2013). In White youth, there has been a decline in gun fatality rates since the mid-1990s that is contrary to the violence trend in movies. Despite this decline, the rate of gun deaths in White youth is still just as high as it was in the early 1960s when violence rates began to increase. This is surprising because we are better able to save the lives of gun-shot victims today than at that time (Centers
Figure 1 Standardized rates for U.S. PG-13 (for ages 13+) movie gun violence and total nonfatal gun assaults ages 0–19 and 20–29 (per 100,000) years, from 2001 to 2012. PG-13 movie gun violence rates are from Bushman et al. (2013). Nonfatal gun assaults data are taken from the Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Available at: www.cdc.gov/ncipc/wisqars. Note: Mean for gun assault rates ages 0–19 years is 13.8, and for ages 20–29 years is 53.4.

for Disease Control and Prevention & National Center for Injury Prevention and Control, 2010). The data in Figure 1 are a better measure of trends in gun violence than gun fatalities because nonfatal injuries would not be expected to decline simply due to better trauma care. Thus, based on the trends in Figure 1, one cannot rule out the possibility that violence in popular media has contributed to an increase in gun injuries among youth.

Those concerned about the influence of gun violence in the media are also sensitive to the rise of mass shootings in schools and other venues, especially since the events at Columbine (Newman, 2007; Rocque, 2012). A recent report indicates that at least 44 school shootings have occurred between the event in Newtown, CT and early 2014 (Mayors Against Illegal Guns, 2014). As some of us have noted in a report submitted to Congress on behalf of the National Science Foundation (Bushman & NSF panel, 2013), such events are often marked by apparent inspiration from movie plots, especially those that focus on the antihero taking revenge on society for perceived past wrongs. Young people who engage in mass shootings...
are mostly non-Hispanic White suburban or rural youth who often harbor suicidal and homicidal tendencies that might make them susceptible to imitation of media characters who use violence to seek revenge (Newman, 2007; Rocque, 2012). It is for this reason that Romer (2013) tendered the hypothesis that films with gun violence might influence some vulnerable youth to act in ways consistent with those depictions.

**Better Ways of Testing the Effects of Movie Violence**

Despite these anecdotal and aggregate patterns of gun violence, we cannot conclude that exposure to gun violence in the media has contributed to these trends. Such a study would require much greater evidence of individual exposure to media gun violence. To reach any conclusions would at the minimum require studies that are similar to those that have been conducted to study the influence of movie tobacco (Dal Cin, Stoolmiller, & Sargent, 2012) and alcohol use (Dal Cin, Worth, Dalton, & Sargent, 2008). Those studies follow cohorts of adolescents over time and observe changes in attitudes and behavior that are predicted by reports of prior exposure to relevant content in the media. No one has conducted a study of the influence of exposure to gun violence in popular media on adolescents, but as both the Institute of Medicine and National Research Council have suggested, such a study is long overdue (Institute of Medicine and National Research Council, 2013). Thus, we see no reason to be complacent about the rise in gun violence in movies, especially those rated as acceptable for children older than age 12. Indeed, a child of any age can gain entry to a PG-13 movie, whether accompanied by an adult or not. This trend is a serious concern among those who study media effects and those who regard our high rates of gun violence as a national problem.

In summary, Markey et al.’s (2015) challenge to this study does not address the potential effects that movies have on youth, misunderstands the purpose of this study, and presents a data analysis that is unconnected to the concerns we raised in the study.

**The Charge of Sensationalism**

Perhaps Markey et al. (2015) did not intend to level that charge against us? As they said in the conclusion to their article: “The sensationalistic language used by some (italics added) in generalizing the findings of research conducted primarily in laboratories, with questionnaires, or by examining minor forms of aggression in relation to violent crime appears to be unfounded.” If “by some” they mean to include Bushman et al. (2013), they should support that statement with clear examples from our study. As we note above, many of the claims leveled against us and other researchers are inconsistent with the actual content of those articles. In singling out radio interviews and news reports about Bushman et al., Markey et al. fail to note the many times we stated in interviews that further research is required to understand the effects of gun violence on youth. These statements reflect our belief that such research will show that gun
violence in films has adverse effects on youth, particularly those with access to guns and reasons to use them. But these are hypotheses. As we suggest, the charge that we are engaging in sensationalism reflects the failure to appreciate the difference between hypotheses and hyperbole. We hope that our clarification of what Markey et al. said and did makes this clear.

**Note**

1 Despite this caveat, a recent study by Ferguson (2014) shows that the relation between movie violence and national homicide rates is positively correlated over the period from 1920 to 2005, \( r = .33 \). However, all of the concerns about using relations between time trends, especially using measures with unknown reliability, remain.

**References**


Bushman, B. J., & The Subcommittee on Youth Violence of the Advisory Committee to the Social, Behavioral and Economic Sciences Directorate of the National Science Foundation (2013). *Youth violence: What we need to know*. Arlington, VA: National Science Foundation.


