Testimony of Brad J. Bushman, Ph.D.

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Chairman Wolf, Ranking Member Fattah, and distinguished Members of the Subcommittee, my name is Brad J. Bushman. I am a professor of communication, a professor of psychology, and the endowed chair of mass communication at The Ohio State University. In the summer, I am a professor of communication science at the Vrije Universiteit (Free University), Amsterdam, the Netherlands. I have been doing research on the causes of aggressive and violent behavior for almost 30 years. I have published over 130 articles in peer-reviewed journals, including in the top scientific journals such as *Science* and *Nature*. I have conducted over 50 studies on violent media effects.

In the wake of the Newtown shooting, Chairman Wolf asked the National Science Foundation (NSF) to find out what researchers know and don't know about the connection between exposure to media violence and youth violence, and other factors that contribute to these devastating events. NSF approached Katherine Newman, Dean of the Arts and Sciences at Johns Hopkins and an expert in rampage shootings, and I to assemble a committee[*] with relevant expertise (e.g., communication, law, sociology, computer science, adolescent development, natural language analysis, gun policy, data analysis) to address this urgent and important topic. The committee gathered at NSF headquarters on February 1st and 2nd to write a report titled *Youth violence: What we need to know*. My purpose today is to summarize the results from that report.

When rampage shootings occur, people want to identify "the" cause of such tragedies. However, there is no single cause. Legislators and the mass media have focused on three risk factors—guns, violent media, and mental illness. Of course there would be no school shootings without guns. The same day as the Newtown shootings, a man attacked several primary school children with a knife in China, wounding 22 of them.[1] Fortunately, none of these children died, perhaps because they were stabbed with a knife rather than shot with a gun. Guns, especially automatic or semi-automatic guns with magazines that hold a large number of bullets, allow the perpetrator to kill a greater number of victims in a shorter amount of time. Guns also provide psychological distance between the perpetrator and victim, which makes killing easier. But focusing on guns

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alone will not solve the problem of youth violence. Even a three-pronged approach, with a focus on guns, mental health, and violent media, is insufficient. Violent behavior is very complex and is determined by numerous factors, often acting together.

Before discussing risk and protective factors for youth violence, it is important to note that rampage shootings in schools differ in dramatic ways from "street violence" in urban areas. School rampages typically occur in stable, close knit, low-crime, small towns. The shooter often is a white adolescent male, with no recorded history of disciplinary problems, and no documented history of medical treatment for mental disorders. The shooter is often at the high end of the intelligence and academic achievement spectrum, but lacking in attributes highly valued by peers (e.g., athletic ability, social skills, physical attractiveness, popularity). In contrast, street violence often occurs in densely populated areas plagued by high levels of crime, low levels of social trust, and illicit drug and gun markets. Although rampage shootings like the tragedy in Newtown are rare, they are devastating because they often includes random victims. Urban bloodshed, which often unfolds between known antagonists, is far more ubiquitous and hence exacts a terrible toll on families and communities destabilized by persistent violence.

We already know a great deal about youth violence. For decades social scientists have conducted research on this youth violence, including research supported by the National Science Foundation, the National Institutes of Health, the National Research Council, the Centers for Disease Control, and other federal agencies. Numerous excellent and well-validated theories have been proposed to explain the causes of youth violence. In my opinion, such research is an excellent use of tax payer money.

EXPOSURE TO MEDIA VIOLENCE

Public debate on the link between violent media and aggressive and violent behavior can be contentious, especially following a shooting rampage. Anders Breivik, who killed 77 people in Norway, said he used the violent video game *Modern Warfare 2* as a military simulator to sharpen his shooting skills.[2] Eric Harris and Dylan Klebold, who killed 13 fellow students in Colorado, said they used the violent video game "Doom" to practice their shooting rampage.[3] Violent video games have also been implicated in other school shootings (e.g., Bethel, Alaska; Paducah, Kentucky; Jonesboro, Arkansas, Newtown, Connecticut). However, it is not possible to know whether playing violent games *caused* Breivik, Harris, Klebold (or any other killer) to shoot their victims.

We haven't "proven" that violent video games directly cause violence because it can't be proven. There is no way to ethically run experiments that see if playing a violent game like *Call of Duty* can push a person into violence. But that doesn't mean we are left without evidence. We know that video game violence is correlated with violence[4, 5] – just like smoking is correlated with lung cancer. However, this does not mean that the research does not indicate causal effects; in fact it does. The most comprehensive review of violent video game effects to date included 381 effects from 136 research reports involving over 130,000 participants from around the world.[6] These studies show that violent video games increase aggressive thoughts, angry feelings, physiological arousal (e.g., heart rate, blood pressure), and aggressive behavior. Violent games also decrease helping behavior and feelings of empathy for others. The effects were observed for males and females of all ages, regardless of what country they lived in.

Similar effects have been found for other forms of violent media (e.g. TV programs, films, music).[7]

People who consume a lot violent media come to view the world as a hostile place,[8] where violence is "normal" behavior.[9] When people expect others to behave aggressively, they are more likely to behave aggressively themselves.[10]

Aggressive youth often consume violent media because it allows them to justify their own behavior as being normal.[11] A child's own aggressive behaviors usually elicit guilt, but this guilt is relieved if the child who has behaved aggressively consumes violent media. The reduction in guilt that consuming violence provides makes continued aggressive and violent behavior by that child even more likely.

There is also a downward spiral[12] between aggression, rejection, and violent media consumption. Aggressive youth tend to be rejected by prosocial peers,[13] and therefore spend more time consuming media and associating with other rejected, aggressive youth, which, in turn makes them even more aggressive.

It is useful to consider a child's life as filled with a succession of social challenges that must be met. Indeed, many young rampage shooters are depressed and suicidal. To meet these challenges, the child draws on a set of programs (called *scripts*). In theater, scripts tell actors what to do and say. In memory, scripts define situations and guide behavior: The person first selects a script for the situation, assumes a role in the script, and behaves according to the script. Children learn scripts by observing others, including mass media characters. In many shooting sprees, the perpetrator puts on a uniform (e.g., hockey mask, trench coat, movie costume, military uniform), as if following a script from a movie or video game. This allows the perpetrator to identify more closely with other killers. The perpetrator then collects a bunch of guns, and ammunition, most often from relatives, goes to a place where there are a lot of people gathered, kills as many people as possible, and then often kills himself. For most people, carrying out such a script would be impossible. But it is possible for some who perceive the act as a means of realizing a more satisfying identity as an anti-hero or a notorious and hyper-masculine figure, lionized in popular culture and admired by peers. In this way, those who feel marginal and socially inadequate in real life achieve a sense of accomplishment through these tragic acts: they leave a mark on the world.

Parents are key in reducing children's exposure to media violence, but they need help. Media literacy programs, such as *Media Power Youth*[14], may help children become more intelligent media consumers. A universal rating system on all media (TV, films, video games), with universal symbols that are easy for parents to understand, may also help parents. The PEGI (Pan European Game Information) system, for example, has 5 age-based ratings (3+, 7+, 12+, 16+, 18+) and 6 well-recognized symbols for potentially objectionable material (violence, sex, drugs, discrimination, fear, gambling). The current rating system in the United State is like alphabet soup (e.g., R for movies; TV-MA for television, AO for video games), which is confusing to parents.[15] Violence is especially likely to be condoned in media, with films rated as acceptable for children under age 13 (i.e., PG-13) having as much violence as those rated R.[16] A warning label on violent video games might also help parents.[17] In 1972 the U.S. Surgeon General issued a

warning regarding violent TV programs: “It is clear to me that the causal relationship between televised violence and antisocial behavior is sufficient to warrant appropriate and immediate remedial action…There comes a time when the data are sufficient to justify action. That time has come.”[18] Unfortunately, one unintended side effect of warning labels is that they make violent media “forbidden fruits” for children.[19] Educating parents about the research on violent video games is also important. This is an uphill battle, because the news media, entertainment industries, and other mass media purveyors may be reluctant to report that that they are marketing products that can be harmful to children.[20].[21]

Although researchers have learned a great deal about violent media effects, additional research is still needed to address new and important questions, particularly given the rapid evolution of the technology. Little is known, for example, about the impact of social media on youth violence. Technology also is flooding young consumers with ever more realistic depictions of violent behavior on screen. Future research is needed to investigate:

• What types of youth are most susceptible to violent media effects (e.g., those with certain mental illnesses).
• What kinds of relationships do youth form with onscreen characters?
• When does fantasy behavior transfer to enacted violent criminal behavior among youth?
• What is the impact of immersive technology (e.g., 3D, large screens) on aggression?
• How does competition and collaboration between game players influence aggression?
• How do consumption patterns of violent media vary by geography (rural/suburban/urban), socioeconomic status (SES), gender, ethnicity, or household composition?
• Do video games tap into biological reward systems, and are they addictive in ways comparable to drugs, alcohol, or gambling?
• What role does self-control play in the use of video games?
• How do violent media impact brain development and function?

PEER REJECTION AND HIERARCHIES

Most youth who engage in lethal violence have a history of social rejection, but are highly concerned about acceptance. An analysis of 15 school shooters found that social rejection (e.g., from a romantic partner, peers) was present in 13 of 15 cases.[22] Two factors make adolescents particularly sensitive to rejection and likely to overreact in aggressive ways. First, adolescence is a time when identities are being formed and consolidated. Thus, adolescents are particularly vulnerable to identity threat and may be particularly attuned to the reactions of peers. Second, adolescence is a time of considerable biological change. Functional imaging research has found that some adolescents show both heightened reactivity in the amygdala (implicated in threat response) and lower activity in the prefrontal cortex (implicated in self-regulation) relative to either adults or younger children.[23] One feature of individuals who are highly sensitive to rejection is that when in a state of physiological threat, they perceive the danger posed by the threat source as exaggerated.[24] When guns are on hand they may be used because they may be perceived as eliminating a potentially lethal sense of psychological threat to the self.

Youth also care a great deal about peer hierarchies. In schools, self-perceived low positions in popularity hierarchies are linked to heightened stress in male adolescents.[25] High-achieving students can be stigmatized by peers as "nerds" or "geeks."[26] How peers deal with such stress varies a great deal across interpersonal and school contexts.

Research shows that school climates and cultures of social trust can act as protective factors against violence and conflict. Some schools are better at establishing and sustaining these healthy environments than others. The same school may take a turn for the better on this score, or become significantly less supportive of healthy social relations among adolescents and between kids and adults.[27] The "natural history" of adult/youth relations needs to be better understood in these key contexts because they are central to conflict resolution and better peer relations, and to building the trust needed for young people to come forward when they hear threats about violent intentions from their peers. Future research should investigate:

• How does heightened sensitivity to rejection develop among youth? How does violence serve the goals of those youth who use or plan to use it in response to rejection? Does violence provide a sense of escape from feelings of powerlessness?

• How does self-regulation capacity moderate reactions to rejection and promote more adaptive responses to social threat?

• How do security and exclusionary disciplinary regimes affect social trust and adult-youth interaction, particularly with respect to peer hierarchies and youth conflict?

•How do off-campus, third-parties (e.g., alumni, community members) facilitate or inhibit the production of social trust in schools?

•How do youth seek out help and support from adults when dealing with troubling situations, either in face-to-face or online situations?

• Among marginalized youth, what kinds of relationships might reduce risk of extreme reactions to rejection, promote help seeking and, interrupt plans for revenge that might involve lethal violence? How do youth learn to seek help?

• How do youth handle peer conflict across different contexts? What social and institutional conditions (strong and weak relational ties) facilitate non-violent as compared to violent responses?

• A number of rampage shooters have been college students or dropouts. Understanding what contributes to risk of lethal violence among college age students is important because they have aged out of adolescent peer groups and may be even more difficult to identify as a result.

COMPARATIVE CRIMINOLOGY

There is a characteristic distribution of violent behavior over the life-course, such that incidents of violence increase in frequency with age up to late adolescence or early adulthood and then rapidly and continuously decline throughout life. Violent crime, like most problem behaviors, occurs disproportionately during adolescent and young adult years. Individual differences in self-control or self-regulation are among the strongest and most consistently shown individual correlates of crime, delinquency, violence and other problem behaviors.[28]

Many rampage shooters commit suicide following their acts, placing their behavior into

the highly unusual category of murder-suicide[29]. Although murder-suicides are rare[30], they are disproportionately likely to involve multiple homicide victims[31]. It is likely that suicidal youth who consider killing others as well as themselves have hostile attitudes toward others, perhaps blaming them for their condition.

The news media cover rampage shootings heavily, but very little is known about the effects of such coverage. Does such coverage increase thoughts of imitation, as it does in suicide? Is it more likely to influence thoughts of imitation among youth who already have thoughts of suicide and homicide? Do some youth use such events as ways to achieve notoriety, as has been suggested in sensational coverage of suicides?

More research is required to discover the similarities and differences between rampage shootings and more common forms of violent crimes and delinquencies (e.g., the extent of planning, the relationship between levels of self-control or self-regulation and violence, the solitary or group nature of the offending, and the time, place, and method of occurrence). Future research should investigate:
• The relationship between suicide and homicide, and the intersection between the two, especially in regard to ideation for committing both acts.
• Whether there are differential effects of self-control or self-regulation for the development of suicidal and homicidal ideation.
• How school and other social institutions can create enhanced social efficacy and bonding effects for students, and how differences in school climate can reduce levels of crime and violence particularly during adolescence.

FAMILY INFLUENCES ON VIOLENT BEHAVIOR

There is a large body of research suggesting that many family-based qualities and processes are important risk or protective factors for antisocial behavior, including youth violence.[32, 33, 34, 35] Risk factors based in the family include low social status, poverty, harsh and rejecting parents, chaotic family life, inter-parental conflict, domestic violence, child abuse and neglect, family stress (prenatal and post-natal exposure), poor monitoring by parents, criminal behavior or incarceration of parents, and mental illness in parents. Protective factors based in the family include close attachment bonds with consistent caregivers, effective parenting, good cognitive skills or education in parents, and families that are organized, safe, and well-regulated.

Yet there are many gaps in knowledge about the roles of families in violent behavior that could inform policy and interventions to reduce risks for youth violence and promote resilience among high-risk youth. Important data could be gathered from large child longitudinal development data sets and planned studies, such as the National Children's Study. Future research should investigate these questions:
• How do early experiences, toxins, and stress in the family, both prenatal and post-natal, alter child development to increase vulnerabilities or risks for later violence?
• What are the most cost-effective protective interventions for families in different phases of child development to reduce risks for later violence?
• Do family-focused interventions that improve self-control skills in children reduce youth violence? What interventions and timing are the most beneficial and cost-effective?

• What are the most effective interventions and timing for educating parents about effective and age-appropriate ways to monitor child behavior, including their media use, peer interactions, and school involvement?
• Given that high-risk families (e.g., unstable, impoverished or poorly educated, with incarcerated parents, substance abuse, or violence in the home) contribute disproportionately to violence in inner-city neighborhoods, what are the most effective and timely interventions to prevent intergenerational transmission of these problems in families? • Do some systems intended to help children, such as foster care, juvenile justice, or special education systems, unintentionally increase their vulnerability for exposure to violence and risks for developing violent behavior?
• What kind of mental health and community resources are needed for families concerned about a child who demonstrates signs of preoccupation with violence, violent media, or violent behavior?
• Do large-scale interventions underway that aim to increase academic achievement (e.g., Race to the Top or Promise Neighborhoods) also mitigate youth violence?

DATA MINING FOR PREDICTION AND INTERDICTION OF SHOOTINGS

Online data sources may have multiple potential uses for understanding, predicting, and preventing violence, such as: (a) tracking population-level demographic and geographic trends in risk behaviors, (b) geographic "hot spot" prediction for urban violence, (c) "risk stratification" to identify—with appropriate safeguards—those who are signaling violent intentions and who would benefit from early intervention, (d) facilitating the reporting of planned or potential attacks by others (e.g. friends and classmates) with knowledge of impending events, and (e) understanding "bullying" behavior and its role in influencing violence. Each of these potential applications should be explored further to analyze its potential impacts (benefits and risks) and feasibility of implementation. Many of the methodological tools needed for these analyses (such as anomalous pattern detection, predictive modeling, sentiment analysis, and social network analysis) have already been developed in the fields of machine learning, data mining, computational linguistics and statistics. Research in any of these domains must address the potential biases and limitations of these online data sources, as well as mitigate serious risks to privacy.

The focus should be on developing tools that can be broadly used, and framing methodological questions (e.g., early event detection and prediction) that generalize across multiple domains. The solutions to such problems would then advance the science (e.g., of language understanding, massive data analysis, and pattern discovery), as well as potentially preventing or reducing youth violence. Future research should investigate:
• Can Twitter and other online data sources (e.g., gaming forums) be used to track the demographic and geographic trends in consumption of violent media and correlate these with other indicators (e.g., use of violent language), accounting for demographic and other biases in these data sources?
• Can new data sources (e.g., Twitter, or specialized systems to monitor, identify, and track graffiti) be integrated with currently used law enforcement and 911 call data to enhance the timeliness and accuracy of prediction ("where" and "when" street shootings are likely to occur, as well as predicting "who" may be the perpetrators and victims).

• Can we identify “risk factors” for individual mass shooters that are both predictive, and can be reliably extracted from online data, such as latent user attributes (location, age, gender), socioeconomics (poverty), family (divorce, single parents), access to guns, expressions of violent sentiments, intentions, and plans, signs of certain mental illnesses, attitudes toward violence, social relationships (marginality, social rejection, encouragement by peer groups), etc.? Can administrative data be integrated with online data for more accurate risk predictions?
• Can we accurately model both the probability that these risk factors are present given noisy, unstructured online data, and estimate overall risk of violence given these factors?
• Is there a role for monitoring of online data in early warning and rapid response to mass shootings, similar to its role in disaster response more generally, to inform law enforcement and potential victims?
• Can we understand and develop a framework to inform and encourage best practices of online interventions at various stages leading up to a potential mass shooting (teachers providing online, positive influences; availability of mental health counseling; mitigating negative impacts of social rejection; facilitating reporting of potential threats and at-risk individuals in need of help)?
• Can online data from occurrences of “cyber-bullying” be captured and analyzed to understand the causes, processes, and impacts of bullying behavior more generally? What are the similarities and differences between online and offline bullying behavior (e.g., online anonymity and greater spread of embarrassing information), and how do these change the impacts on victims of bullying?
• What are the risks of mining online data to individual privacy, and how can these risks be mitigated or eliminated? For example, when are aggregated counts and de-identified data sufficient to study violent behavior? On the other hand, under what conditions is it acceptable to use online data to intervene at the individual level (which may not be possible without identifying at-risk individuals)?

GUN POLICY AND YOUTH

All mass killing and more than 80% of homicides involving youth are committed with guns. It is critical to reduce access to guns in youth, especially those with a history of delinquency, crime involvement, and certain mental illnesses. Future research topics:
• What is the relationship between minimum age or youth-focused firearm restrictions (e.g., safe storage) and youth-perpetrated violence? Is the effectiveness of these laws dependent upon other gun regulations designed to deter the diversion of guns to prohibited persons (e.g., universal background checks, licensing provisions)?
• How do penalties and illegal gun suppression tactics by police affect illegal gun carrying and use by youth?
• How do factors such as price, trust in gun sellers, gun characteristics (new/used), and perceived risks of prosecution affect youth illegal acquisition of firearms? How easily do youth adapt to interdiction strategies (e.g., access sources outside of state if state gun laws reduce gun diversions)?
• Do youth steal guns opportunistically or target homes, stores, or individuals for gun theft? How important are stolen guns to the underground gun market where youth acquire guns? How commonly do youth discard guns, lose them to theft, sell them, have them confiscated by parents, police, or school authorities?
• How do youth access ammunition?

• How much do community members know about how youth are illegally acquiring guns, stashing, and carrying guns, and are they willing to share this information (anonymously) with police?
• When do youth share guns?
• Can mediators (e.g., street outreach workers, peers) keep guns away from youth planning rampage shootings?
• What is the potential for new technologies (personalized guns) to reduce youth violence? How will consumers react to the introduction of these new technologies?

CONCLUSION

It is estimated that the social cost of gun violence is roughly $174 billion a year.[36] The costs include medical and mental health care costs, criminal justice costs, wage losses, and the value of pain, suffering and lost quality of life. Beyond this enormous financial toll, is the devastating emotional impact of lost lives, neighborhood destabilization, and fear of attack. For children in particular, exposure to violence erodes confidence in social institutions and the society they live in. These costs alone justify the dedication of our federal research agencies and the scientific community to understanding the problem of youth violence.

Thank you all for allowing me to appear before you today. The National Science Foundation advisory group that I am here to represent hopes that you will find their research and their suggestions for future research that could help the country understand and prevent gun violence, useful and practically valuable. I am happy to answer any questions you might have.

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http://www.childrenssafetynetwork.org/cost-gun-violence