A STRESS-DIATHESIS MODEL OF SCHOOL SHOOTINGS: A SYSTEMATIC
REVIEW

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Introduction

On February 14th, 2018, the third deadliest school shooting in American history occurred in Parkland, Florida (CNN, 2018). This shooting happened in Marjory Stoneman Douglas High School and resulted in the deaths of 17 adults and children. The perpetrator of this shooting was a former student of this high school who reportedly posted on a blog that he was going to be a professional school shooter (NBC News, 2018). It was reported that he lost his mother a few months prior. Following this shooting, there were mixed reactions and explanations. The President of the United States, Donald Trump, stated that there were many signs the shooter was mentally disturbed. Many other officials and victims called for gun reform. Student news outlet Kent Wired reported a continuous update of the school shootings happening in the United States in the year 2018 (Kent Wired, 2018). There were 41 shootings in a school setting through the year of 2018, and four of those shootings met criteria to be a "mass killing" (three or more deaths, not including the shooter) (FBI, 2018).

Rampage Shootings in Schools

School shootings are often referred to as rampage shootings to differentiate these events from other forms of gun violence that occur in schools. Rocque (2012) defined a rampage shooting as having multiple victims, therefore the definition of rampage shooting includes mass killings, but does not need to have three or more victims. School rampage shootings can be described using the following criteria: the area of the event (often taking place in rural/suburban areas), the target of the shooting (rampage shooting

lacking in specified targets), and the number of deaths (rampage shootings resulting in a high number of deaths) (Rocque, 2012). The FBI released a report in 2018 describing active shooter incidents in 2016 and 2017. They define an active shooter as an individual actively engaged in killing or attempting to kill people in a confined and populated area. This report stated that 20 of the 50 active shooter incidents in 2016 and 2017 met the mass killing definition. The authors also found that the most prevalent place for a mass shooting in the united states was high schools (Paradice, 2017). The increasing prevalence of rampage shootings in schools has prompted calls for action. Whatever action is taken can be informed by determining the causes of the problem. Many people argue that new gun policies or increased security (such as an increase in school resource officers) is necessary, but those solutions do not address the causes of rampage shootings in schools. That is, every rampage shooting involves one or more shooters, and understanding the causes of their behavior can inform the solutions chosen.

There are currently no widely accepted theories of, or explanatory models for, rampage shootings in schools. Although there have been numerous theoretical explanations, attempts to profile school shooters, and opinion pieces written about school shootings, certain features of rampage shootings make the development of explanatory models difficult. For example, rampage shootings are rare. Thus, a very small number of cases are available for analysis. Also, low base-rate events are very difficult to predict. Hypotheses derived from new theories and explanatory models may be difficult to test. Given these constraints, I decided to use an explanatory model from a similar problem that is much more common: suicide.

Connection to Suicide

The World Health Organization estimates that about 800,000 people die from suicide every year, making it the second leading cause of death in ages 15-29 (WHO, 2018). Rampage shootings have several points of similarity with suicides, as well as differences. With respect to similarities, they are both low base-rate events that result in a catastrophic event. Also, the nature of a school shooting suggests that the attacker is willing to end their life as well. In about 55% of school shooting mass murder events, the attacker committed suicide (Paradice, 2017). In all other cases, the shooter is either killed by a police officer (10%), or they are taken into custody (20%). Thus, contemporary models of suicide may provide a fruitful basis for developing an explanatory model of school rampage shootings.

However, there are limits to using models of suicidal behavior to study school shootings. For example, there are likely differences between these two events in how the underlying distress is expressed. Suicide could be considered an internalizing behavior, whereas a rampage shooting would be considered an externalizing behavior. An internalizing behavior results from negativity directed inward (Eisenberg et al., 2001). Thus, committing suicide is an act an individual carries out with the intent to kill only themselves. An externalizing behavior is expressing the negativity in an outward response. Individuals who commit school shootings express in an externalizing manner by harming others. Of course, there is some overlap between internalizing and externalizing behaviors. Some suicidal behavior (e.g., parasuicidal behavior) may reflect externalizing behavior in an attempt to manipulate others or get help. And as previously

noted, rampage shootings often end in suicide, adding internalizing behavior to what would otherwise be an externalizing behavior. Thus, although suicide and rampage shootings occupy different points on the internalizing-externalizing continuum, they may be similar enough to allow for similar theoretical models.

The planning of the event may also differ between suicide and rampage shootings. Conventional wisdom has been that most suicide attempts are impulsive in nature (Williams et al., 1980). This characteristic makes intervening in suicidal attempts challenging since many of the interventions require the individual to ask for help or for others to report the individuals at risk (Simon et al., 2001). However, many people who commit suicide have had sustained suicidal ideation and may have planned carefully for their suicidal behavior. Most school shootings are also premeditated and planned well ahead of time. Recently it was reported that 60% of school shootings were premeditated (Paradice, 2017). Thus, the planning of the event may differ somewhat between suicide and rampage shootings, but not entirely. After identifying these similarities, we must identify a theory that explains rampage shootings in the same context as suicide.

The stress-diathesis model of suicide

Psychologist Paul Meehl pioneered the development of interactive models that include both risk factors and precipitating stressors (Meehl, 1962). Coining the term "stress-diathesis," his model combining risk factors with stress in the area of schizophrenia found broad empirical support and led to the development of stress-diathesis models for other problems.

For suicide, the first stress-diathesis model argued that the "stress" aspect of the model describes a current event that triggers suicide to happen (Mann, 1998). The model explains that an individual who is at high risk due to diatheses, when presented with an additional stressor or trigger, will likely commit suicide. The largest stressor is acute psychological illness; 90% of cases of suicide have a significant psychological illness (Mann, 1998). Stressors also include acute substance abuse and acute family/social stress (Mann, 1998). One feature of this model that is confusing concerns assigning mental illness to the stressor category instead of the diathesis category. That is, a mental illness might be better conceptualized as a feature of the person that confers risk when they are faced with stressors.

Life events and psychological illness are important for suicide to occur, but the diatheses help explain why suicide happens to only a few individuals with mental illness (Van Heeringen and Mann, 2014). The "diathesis" refers to a trait-like susceptibility to suicidal behaviors, that is, a risk factor or vulnerability. Most people with psychiatric disorders do not commit suicide, indicating the need for a diathesis or predisposition to explain why some individuals are vulnerable (Mann, 1998). Mann (1998) proposed that risk factors contributing to suicide are genetics, early life experiences, chronic illness, chronic substance abuse, and diet. Thus, *chronic* mental illness is a diathesis, and perhaps *acute* mental illness is a stressor. The model is not entirely clear on this point.

Nevertheless, a stress-diathesis model would be a good fit for a theory describing the causes of rampage shootings in schools. However, there is a more prominent theory of suicidal behavior, the interpersonal-psychological theory of suicidal behavior (Joiner,

2005), that may also prove useful. Although not called a stress-diathesis model, it incorporates elements of the concepts of risk factors and precipitating factors. Unlike the stress-diathesis model of suicide proposed by Mann (1998), it is clearer with respect to differentiating between risk factors and stress (precipitating) factors.

The interpersonal theory of suicidal behavior proposed by Joiner (2005) argued that there are three different components that lead to suicide. There must be two psychological states that lead to the desire of death: perceived burdensomeness and thwarted belongingness. Perceived burdensomeness is the idea that the individual's life is a burden to their family, peers, and society. Along with perceived burdensomeness, thwarted belongingness is another psychological state that contributes to the desire for death. Thwarted belongingness is the experience that one is alienated from their family, peers and other social groups.

Along with these two psychological states, the final component of the interpersonal theory is the ability to commit suicide. The ability to commit suicide is largely related to repeated exposure to painful and fear-inducing behaviors. Joiner (2005) asserted that this habituation to painful and fear-inducing behaviors will make someone more tolerant to pain in the future and consequently less likely to fear death.

Figure 1 depicts an adaptation of the interpersonal model and the stress-diathesis model of suicidal behavior. The three components of this theory can be categorized as risk factors (diatheses) or stressors. For example, a risk factor in this theory is the ability to commit suicide. Having repeated exposure to adverse experiences will habituate the individual to death. Since this happens prior to the suicidal behavior or the completion of

suicide, it is identified as a risk factor, or diathesis. The stressors in this theory would be the psychological states that contribute to the desire for death. The combination of thwarted belongingness and perceived burdensomeness can trigger suicidal behavior in those individuals who already have the ability to commit suicide. Investigations have generally supported the interpersonal-psychological theory of suicidal behavior (Joiner et al., 2009).

One feature of the interpersonal-psychological theory of suicidal behavior potentially limiting its applicability to school rampage shootings is that it does not describe the immediate precipitants of suicide attempts. That is, it could be elaborated by explaining how acute stress interacts with risk to result in a suicide attempt. Therefore, the model I developed incorporates some of the interpersonal-psychological model of suicide into a stress-diathesis model, broadly defined.

A stress-diathesis model of rampage shootings

Considering the similarities between suicide and school shooting events, I will attempt to explain school shootings in the context of a stress-diathesis model derived from these models in the context of suicide as well as some elements of the interpersonal-psychological model of suicide. I will hypothesize that school shootings can be explained using a stress-diathesis model as shown in Figure 2.

Beginning with the diathesis, I found that all of the diatheses can be categorized as individual factors or societal factors. The individual factors include the following risk factors: mental illness, developmental factors, premeditation, and capability for homicide. Mental illness includes diagnosed severe mental illnesses, primarily focusing on paranoid

behavior and psychosis. Developmental factors include how an individual's childhood affects their risk of committing a school shooting. Premeditation is a risk factor that describes how an individual who may commit a school shooting has thought about it often and plans it in advance. The final individual risk factor is the capability for homicide. This is adapted from the interpersonal theory of suicidal behavior. In the context of school shootings, this describes the fact that people who commit school shootings may be ideating about guns or have access to guns.

The other category of diatheses in the model is societal factors. The societal factors include the following risk factors: media sensationalization, school size, and hypermasculinity. Media sensationalization describes how the news media reports extensively on school shootings and how that can increase the incentive for an individual committing a school shooting due to the press they might get. School size is a risk factor, as it has been suggested that attending a larger school may put individuals at a higher risk to commit a school shooting. Gender roles is another risk factor for school shootings. Specifically, the risk factor is hypermasculinity, a construct described as an exaggeration of masculine stereotypes (e.g., aggression, strength, and sexuality).

The model I developed hypothesizes that if an individual is at high risk from the diatheses stated above, there must be a stressor for the school shooting to happen. I hypothesized that the stress would be social factors. Within social factors, the following stressors were identified: bullying, thwarted belongingness (alienation from peers and family), and perceived burdensomeness (feeling like an individual's life is a burden to others). The stressor of bullying describes when the shooter's peers target them and make

them feel ostracized. Along with bullying, another stressor was identified as thwarted belongingness. Thwarted belongingness was adapted from Joiner's interpersonal theory of suicidal behavior. This describes the feeling of being alienated by peers, and family (Joiner, 2005). The other stressor is perceived burdensomeness. Joiner (2005) describes this as the misconception that an individual's existence is a burden to peers, family, and/or society. With the determined diathesis and a stressor, this results in a school rampage shooting to occur.

Whereas a School Rampage shooting was previously defined as a non-targeted attack, the US Secret Service and Department of Education in the safe school initiative found that the shooter had a grievance with one of the targets and victims in 73% of the school rampage shooting incidents in 2000 (Vossekuil et.al., 2002). However, in all events, non-targeted individuals were attacked as well. Thus, social factors such as bullying would help explain why the majority of school shooters target specific individuals.

The stressors identified suggest that conflict and, in many cases, bullying play a role in school shootings. Similar to the explanation that most individuals with psychological disorders do not commit suicide proposed by Mann (1998), most individuals who have been bullied do not commit a school shooting. This suggests that a predisposition or "diathesis" must be present in the individuals that carry out these acts.

The present study

The purpose of this study was to review the literature on rampage shootings in schools and evaluating whether or not the literature supports the stress-diathesis model I

have developed to explain the occurrence of these events. I hypothesized that the
literature would identify the risk factors for school shootings described by the model:
mental illness, developmental factors, the capability for homicide, premeditation, media
sensationalization, school size, and gender roles. I further hypothesized that the literature
would identify the following stressors in the model: bullying, thwarted belongingness,
and perceived burdensomeness.

Methods

Literature Search Strategy

I conducted a comprehensive systematic literature search to find articles focused on the shooter and the factors that directly affect the shooter's actions (see inclusion and exclusion criteria). The literature search followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline (Moher, Liberati, Tetzlaff, and Altman, 2009). The purpose of the PRISMA guideline is to provide a focused and standardized system to report systematic reviews and meta-analyses to ensure accuracy and reliability. Databases searched included Pubmed, PsychInfo, MEDLINE, and SocIndex for the years 2000 to 2018. Search terms used were "School shooting" OR "Mass Shooting." To identify additional citations not located using the database search strategy, a subject matter expert was consulted to obtain recommendations of prominent sources that may not be indexed. That is, the "grey literature" was explored by asking an expert. The articles were then screened based on the article name and abstract. The PRISMA Flowchart (Fig. 3) was completed to depict the strategy used to choose each article that is included in the qualitative review.

Inclusion and Exclusion Criteria

Studies included in the current systematic review were selected based on the following criteria; (1) describe the shooter (typology) or present a factor that affects the shooter's decision (2) shootings occur in a school setting (3) shootings are mass killings (three or more deaths, not including the shooter) (4) written in English (6) shootings took

place in the US. Studies were excluded from the review if they met the following criteria;
(1) presented an explanation independent of the shooter (2) mass shootings that were not
in a school setting (3) reported on school violence instead of rampage shootings (4) not
written in English (5) shooting occurred outside of the US (6) the article was a
commentary about another article (7) focus on intervention for victims.

Data Analytic Plan

After the literature search was completed, all the articles were categorized by the
factors affecting the shooter as described in Figure 2. The "societal factors" category
included environmental factors that would affect the shooter. This included media, school
size, hypermasculinity, etc. Another category was "individual factors," this was meant to
take into account individual differences in the shooter that may put him or her at risk.
This included mental illness (paranoia and psychosis), developmental factors,
premeditation and capability for homicide. The last category was "social factors" meant
to describe relationships specifically in the school context. This included bullying,
thwarted belongingness (alienation) and perceived burdensomeness (feeling like the
individual's life is a burden).

Each study was reviewed to determine whether or not it was an empirical study, a
review, or an opinion piece. Empirical studies were described regarding what data was
collected and what conclusions were drawn. Reviews were evaluated for whether or not
they support the model. Specifically, reviews and empirical studies are analyzed based on
if their conclusions could provide evidence for the elements of stress or diatheses as

identified in Figure 2. This information was combined using a qualitative synthesis to answer the primary question of the review.

Results

Search Results

The literature search yielded a total of 1,426 total citations. After the abstracts and names were analyzed for inclusion based on the criteria defined above, 1361 were excluded. The full text of the remaining 65 articles were obtained and reviewed to determine whether or not they could be included. A total of 27 articles were excluded. Of these, 11 articles were excluded because they identified explanations that are independent of the shooter (gun availability, school security, etc.). Five articles were excluded because they were commentary article offering an opinion on another primary article. Three articles reported on shootings outside of the US, three were not reported on mass killings, two articles were not written in English, one article reported on shootings that were not in the school setting, and two articles reported on intervention strategies for the victims. After excluding those 27 articles, there were 38 articles included in the qualitative synthesis. See Figure 2.

Description of Eligible Studies

The 38 articles that were included in the systematic review are listed in Table 1. Of the included studies, 12 articles focused on societal factors. Within this category, the following subcategories were identified: media sensationalization, school size, gender roles, and fame-seeking behavior. Along with societal factors, 10 articles focused on individual factors. Within this category, the following subcategories were identified: mental illness, development, and typology/profiles. Eight of the articles focused on social

factors. These articles were grouped into the single subcategory of bullying/marginalization. An additional category was created for articles that described an explanation for a school shooting based on a theory and identified possible intervention. Eight articles were identified for this category. Three articles were theoretical explanations and five articles were intervention and threat assessment articles. Of all the articles analyzed, 22 articles were supported by empirical data that was collected and analyzed. 15 of the articles were reviews of the current literature. Of the articles that analyzed data, 12 articles studied more than 15 school shooting incidents, and 10 of those articles studied 15 or less shooting incidents. The smallest sample of incidents were case studies of three or less incidents/perpetrators; three total studies fit these criteria.

General Findings

Many of the empirical articles collected data on specific shootings that occurred within a specific time period and which were classified as a mass killing (three or more deaths, not including the shooter) using media reports, court records, police records and data drawn from government research or previous epidemiological research.

Societal Factors

One of the diatheses is societal factors (see Fig. 2). Societal factors include all the environmental risks affecting a school shooter. These risks include the sensationalizing of these events in the media, large school size and the notoriety some shooters get from media reports which may encourage other shooters to seek attention.

Media sensationalization

Three articles were categorized as pertaining to the role of the media in normalizing school shootings, which was viewed as a societal risk factor for rampage violence. Markward et al. (2001) proposed that the internet serves as a way for men who are feeling socially isolated, to have "in-group support." They proposed that school shooters fit into this group and that this could contribute to the problem. They studied the literature of group socialization, the background of specific school shooters coming from newspaper accounts, and the accounts from early friendships that caused victimization of the shooter. They concluded that some internet socialization groups attract men with problems of isolation and that parents have very little knowledge of these support groups or that their child is using the internet in this way. However, none of these conclusions were based on data supporting a connection between school shooters and internet social groups.

De Venanzi (2012) wanted to apply the thought that violent media creates a context for violence to the domain of school shootings. He created a model to determine the effects of popular culture on school shootings by defining popular culture implications as "manufactured risks." He argued that how much popular culture affects an individual depends on their placement within the social landscape (some social roles having a more risk). He found that peer marginalization happens from the combination of these specific factors: society's narcissistic culture, the location of the school (specifically the suburbs), status hierarchies within the school structure, and the tendency for popular culture to trivialize the negative.

Towers et al. (2015) applied the "contagion effect" to mass and school shootings. Contagion theory posits that when an event is highly sensationalized in the press, there is a surge of these events occurring more frequently. They hypothesized that after a mass shooting event there is an immediate increase in the frequency of mass shootings, but as time passes, the frequency will decrease. They examined these results by fitting a contagion model to data of US mass shootings. By examining data from the FBI supplemental homicide reports, media reports, and police documents for mass killings with firearms, mass killings without firearms, Brady Campaign school shootings, and Brady Campaign mass killings, they attempted to fit a mathematical equation based on the self-excitation contagion model. They found a significant contagion effect in all groups except the Brady Campaign group that had less than 3 deaths. They reasoned that these events are not sensationalized in the press like the other events are. They concluded that a reasonable explanation for the high frequency of mass shootings and school shootings is that the sensationalism can cause a contagion effect.

Out of these articles, one article addressed internet support groups but did not have enough data to support the authors' argument. The other two articles in this subcategory addressed how media coverage can increase the occurrence of shootings. While one of the articles was an opinion piece referring to violent media, the other article was an empirical article about the contagion effect that offered some evidence.

School Size

Only two articles described large school size as a possible risk factor for school shootings. Kaiser (2005) was interested in the effects of large class sizes on the school

shooters and the neurobiological implications of large class sizes. He hypothesized that large class sizes damage social information processing. Deficits in social information processing are correlated with violent and antisocial behavior. Therefore, large school sizes could contribute to school shootings. He analyzed data on school shootings from 1996-2005, using the National Center for Educational Status, National School Safety and Security Services and media reports. The only significant correlation he found was a positive correlation between grade size and the injuries per assailant. He interpreted this to be because the larger the grade size, the greater the anonymity of the shooter will be, and the larger the response against social structure can be.

Baird et al. (2017) investigated the link between school shootings and school size. They hypothesized that a larger school has less support, which will, therefore, increase the risk of a school shooting occurring. They also hypothesized that students transitioning from a small school to a larger school are at higher risk. They selected a sample of 22 shooters and obtained data from media reports and preexisting school shooting data. They found a significant increase in the number of shootings when students transferred from a small school to a larger school. They argued that this happens because of the difference between support in smaller schools and the student-teacher ratios are much higher in larger schools not allowing for that support.

Although both articles argued that larger schools have more shootings, it appears that there is not enough research to support a conclusion that school size has an effect on school shootings.

Gender Roles

The gender role subcategory had five articles. In this category, there was one article that was an opinion piece about the role of gender in school shootings. The other three articles are empirical. In the opinion piece, Mai and Alpert (2000) used feminist psychodynamic theory to assess the influence of gender role in school shootings. She questioned what about being boys contributes to them committing violence. Mai and Alpert argued that boys experience separation at infancy and socialization in childhood and adolescence may encourage aggression in males. How this relates to the perpetration of school shootings was unclear.

Kimmel and Mahler (2003) argued that part of the explanation for school shootings should include gender differences and specifically the bullying that centers around homophobia. They analyzed data from media outlets, including USA Today, New York Times, and the Los Angeles Times. They reported that most of the reports contained evidence that the perpetrators were bullied for being gay even if they were not gay. They explained that this is because the perpetrators were not typically masculine, and they were marginalized because of it. However, this article did not contain any statistical analyses that supported their claims. It is also possible that bullying attributable to homophobia may be a marker that a person is marginalized, and that stereotypically masculinity is not the key element.

Danner and Carmody (2001) asked the question, "to what extent is gender involved in explanations of school shootings and the media coverage around it?" They then examined cases of school shootings to determine how frequent this explanation is used in media coverage. They included 489 newspaper reports of 7 school shootings

between the years of 1997-1999. They found that a gender explanation in media coverage occurred as frequently as individual psychopathology and gun use (about 15% of total articles). Most of these explanations came from personal reports by family and friends of the shooter. The implications, in their view, is that gendered violence (dominance over women and high-status male dominance over low-status males) plays a role in school shootings.

Kalish and Kimmel (2010) took a theoretical approach to the effect of hegemonic masculinity on school shooters who commit suicide. They hypothesized that committing mass murder before committing suicide might frame the act in a violent and aggressive manner and make it a more potent act. They specifically analyzed three shootings: Columbine, Virginia Tech and Northern Illinois. They argued that the men who committed these shootings were acting under "aggrieved entitlement," meaning that they felt they were expected or entitled to take revenge on those who have hurt them in the past. Although plausible, drawing firm conclusions from such a small sample size may be premature.

Tonso (2009) wanted to describe school shootings from a sociocultural perspective and describe how the social context of masculinity and violence apply to this problem. She attempted to answer this question by reviewing two school shooting events: Columbine and École Polytechnique Université de Montréal. She analyzed media reports of these two shootings and described them in length. She found that there is a social explanation of hypermasculinity in both examples; the Montreal Massacre was characterized by violence against women, and Columbine was characterized by the social

hierarchy of men. She suggested that implications for these findings are that social hypermasculinity should be addressed as well as individual risks.

Together these articles examined a few specific cases in detail so this theory may not generalize to other school shootings. Therefore, there is not enough evidence to conclude that gender roles are a definite risk factor in all school shootings, but they offer important theory to apply to the context of school shootings.

Fame-Seeking

Only two articles explained school shootings by describing the shooters as fame-seeking. Lankford (2016) was interested in the fame-seeking shooter and wanted to identify characteristics that differentiate a fame-seeking shooter from a non-fame-seeking shooter. He defined a fame-seeking shooter as an individual that commits mass shootings to become infamous in the press. To analyze this group, he sampled data from suicide notes, manifestos, and videos created by 24 shooters that he labeled as "fame-seeking." After identifying the group, he found that fame-seeking shooters were younger than others and they killed more than the non-fame-seeking. He explained that this is because fame-seeking individuals will crave the most media coverage which results from the more victims.

Azam and Ferrero (2016) proposed that the school shooter's motivations could be described by the "Herostratos Syndrome." Herostratos was a 4th-century arsonist who sought fame by burning down a Greek temple. This syndrome describes killers (e.g., arsonists) who carry out their acts for the sake of self-glorification.

These articles about fame-seeking describe how some shooters are motivated by the infamy of completing a school shooting. There is not enough evidence to conclude that school size and gender roles affect all school shootings. Fame-seeking could be used as an explanation for some shootings, but may not be generalizable.

Individual Factors

The other diathesis is individual factors. The individual factors are the individual differences that could put an individual at risk for a school shooting.

Mental Illness

Of the individual factors, four of the articles describe the mental illness in the shooter. For example, Langman (2009a) was interested in identifying school shooters based on three different categories: traumatized, psychotic and psychopathic. The traumatized group was defined by physical abuse, sexual abuse or parental substance abuse. The psychotic group was defined by paranoid delusions, hallucinations or grandiose illusions. The psychopathic group exhibited narcissism, lack of empathy and sadism. He collected data on 10 rampage shooters using general research and psychological reports given after arrest. He found that two out of 10 were psychopathic, five out of 10 were psychotic and three out of 10 were traumatized. He explained that due to the variability of the cases, a clear typology cannot be formed from these studies.

Dutton et al. (2013) wanted to find the prevalence in paranoia in school shooters. They accomplished this by taking a case study approach. They looked at diaries and psychiatric reports from four specific cases. They took specific quotes from each of the diaries and labeled the paranoid thinking and behavior present. Found evidence of

paranoia in all four of the cases, but there were only four cases who all kept detailed diaries. Their findings suggest that paranoia contributes to those specific shootings, but it is too little of a sample to generalize.

Oksanen et al. (2015) aimed to compare homicidal threats in school using police reports and psychiatric reports. One data set consisted of homicidal school threat police reports, and the other consisted of psychiatric reports of individuals threatened to. They found after analyzing these data sets that 40% of the police reports found some sort of mental illness most commonly related to depression or impulse control. They also found there to be psychological factors present as well as social problems with a peer group from both the homicidal reports and the psychiatric reports.

Steinkoler (2017) performed a case study on the Sandy Hook shooter. She did not identify where she obtained the information about the Adam Lanza case. She found there to be psychotic symptoms to be present, and they also found social marginalization along with the feeling of loneliness. She found that he exhibited a feeling of inadequacy or being not masculine enough. While many of these findings were consistent with other reports of school shootings, this was a case study so it could only inform this case.

All of the mental illness studies were empirical and offered evidence that mental illness is a prevalent risk in school shootings. In particular, these articles offered evidence that paranoia and depression are common in school shooters.

Development

There were two articles that described the upbringing and childhood of an individual being a possible risk factor for school shootings. Thompson and Kyle (2005)

identified the environment in which a school shooter is raised. They theorized that this environment begins with marginalization at a young age by peers and their caregivers. They argued that this causes damage to the development of morals. They then theorized that the school competitive environment will further marginalize them, which will cause the individual to have a subdued sense of self-expression and a sense of significance. Their overall conclusion was that marginalization is constant throughout life, and that causes morals (the understanding of right from wrong) to be damaged, and then in school, it damages their personhood.

Weisbroot (2008) completed a review specifically on literature surrounding assessments of children and adolescents. She used her experience of assessing children from her nine years in the profession. She first defined the evaluation process as assessing suicidality, homicidality, thought process reality testing (to assess an individual's perception of reality), mood, and behavior. She then explained the psychodynamic process of evaluations. She used the example of aggression and explained that as a child presents with aggression, the clinician would try to find where and when that aggression became integrated into the personality. She concluded with how early clinical assessment could be useful for potential school shooters

Even though childhood trauma and upbringing are theorized as being a common diathesis in school shooters, only two articles were found that focused on this problem. Both of these articles were reviews and did not offer enough evidence to suggest this is a risk factor for school shootings.

Typology and Profiles

There were three articles that grouped school shooters into a common typology or profile to attempt to identify potential shooters. Meloy et al. (2001) wanted to collect data surrounding school shootings to identify a general typology. They determined cases by going through psychiatric reports, criminal databases, and medical reports. They evaluated 27 cases including 34 perpetrators. They found the shooters to be mainly a white male from the age of 11-19. Their other significant findings were the perpetrator was described as a "loner" in 19 out of 34 cases and there is a precipitating event in 20 out of 34 cases. They also use the variables "talks about murder", which suggests a premeditation of the shooting. This only occurred in 15 out of the 34 cases. Another variable they identified was weapons preoccupation. This occurred in 12 out of the 34 cases. However, they were unable to identify this in nine of the 34 cases. Even though these are the most salient findings, they do not show a high percentage.

Dumitriu (2013) analyzed school shooters and put them into three groups: "downward spiral," "perfect student," and "social injustice collector." The downward spiral group was defined as the loner, shy student who often gets bullied, has anger problems, long premeditation and ideation of the act. The perfect student has plenty of friends, is not bullied, has a lot of pressure from a parent, suddenly snaps from a significant negative event (sudden move, family member death, etc.). The social injustice collector is defined as the revenge-seeking perpetrator who had something happen specifically at the school that he is seeking revenge for. She collected data from government records, police reports, court records, school records, and newspapers and found 160 school shooting events, carried out by 163 perpetrators. She identified several

common factors within the young age group of shooters. These common factors included family issues, mental illness, easy access to guns, and cultural influences (which she describes as general exposure to violence). She found 71% of profiles were the downward spiral and 14% fit the perfect student profile and specific findings were not reported for the social injustice warrior. They interpreted these results as defining the downward spiral group as the highest risk group.

Gerard et al. (2016) attempted to review school shooting incidents and identify characteristics that are common in each. They specifically wanted to look at general differences from offenders above 18 or younger than 18. They used case law, books containing case studies, published reports and the media to analyze the shootings. The major typology characteristics include male, Caucasian, and suffered from depression. They found that most incidents were premeditated. The major finding across age groups was that younger offenders are more to express depressed or suicidal thoughts, but older offenders (over 18) are more likely to commit suicide after the act. They described that this could be because younger offenders were more often restrained by the police.

Out of these articles, they found that there are common threads to school shootings, but not all school shootings have one factor that occurs in every case. All the articles identified marginalization and premeditation and ideation as common factors among most school shootings.

Criticism of Profiles

Ferguson et al. (2011) reviewed the literature to dispute wrong directions in psychological profiling in school shootings. They explain the general problem with

creating a psychological profile of school shooters is that research is limited, due to the low amount and the amount that die in the act. They argued that this led to uninformed claims. They specifically looked at the case of video games affecting school shootings. They found there is not enough evidence that video games cause school shootings. They also offered a review of the psychology of school shooters. They used the U.S. Secret Service and the Department of Education to define what is known about the psychological profile (Vossekuil et.al., 2002). They found overall that antisocial youth were more prone to youth violence but particularly when they are depressed.

These articles all found some commonalities within school shooters from the past. The typology they identified was an adolescent Caucasian male. The common type they found was a loner and history of marginalization. While they find similar types and factors, there was not a singular factor that is in every case. This means there is high variability in school shootings. The article criticizing profiles explains that profiling could lead to false conclusions about school shootings.

From all the individual factors articles, I found that severe mental illness (paranoia and psychosis specifically) is a relevant diathesis, and childhood trauma do not have enough evidence to define it as a diathesis. It was also found that profiling can inform commonalities, but it also found that there is high variability in factors that can cause a school shooting.

Social Factors

The stressor for school shootings is social factors. These factors include relationships that an individual has with others and how that can trigger them to commit a

school shooting. When grouping the literature into social factors, the only subcategory found was bullying and marginalization. This subcategory explains how peers ostracizing an individual and targeting an individual can trigger that individual to commit a school shooting.

Bullying and Marginalization

Leary et al. (2003) asked how much of a role social rejection plays into school shootings. They attempted to answer this question by studying data from media sources about school shootings. They chose nationally covered school shootings from 1995 to 2001. They included 15 shootings in their study. They found that 12 out of the 15 studies showed teasing and bullying. At least six of the 15 perpetrators also experienced romantic rejection. They also found that 10 out of the 15 cases showed psychological problems. They concluded that this review shows that social rejection plays a large role in school shootings.

Klein (2006a) tried to determine if the high school male hierarchy increases the risk of school shootings. She identified 12 school shootings through media reports from 1996 to 2002 and analyzed them to see if those with low cultural capital (at the bottom of the hierarchy) commit school shootings. She found that these cases all included bullying specifically by males. She concluded that the cases report that the bullying centered around masculinity, but she does not cite examples to back up her conclusion. The masculinity she describes that bullying centers around could be considered hypermasculinity.

Klein (2006b) wanted to define how prevalent sexuality centered bullying occurs in school shooting incidents. She analyzed data from media reports of media reports on school shootings ranging from years 1996 to 2000. She found that gay-related bullying was present in many of the reports, but they were not analyzed in the media coverage. She argued that the presence of this explanation calls for intervention in the construct of violent masculinity (or hypermasculinity) when implementing bullying interventions.

Reuter-Rice (2008) wanted to review the literature of school shootings as it pertains to bullying to identify individuals at risk to commit a shooting and to intervene. She reviewed the literature about school shootings that specifically focused on bullying. She found bullying to happen in the following domains: gender, family, school, and community. She then identified several red flags that occur from bullying, including absences from school, avoidance of activities, psychosomatic illness, unexplained injuries, etc. She concluded that these signs could be used to identify possible victims and possibly avoid a school shooting.

Klein (2009) attempted to look at school shootings from the perspective of violence in result from rejection from women. She examined media coverage reports of 13 incidents from 1996 to 2002. She found that in five of these 13 shooting that the shooter killed a girl that rejected the individual in the past. In three other cases, the men committing the shootings commented that they were protecting their girlfriends by killing people who threatened their relationship and in three other cases men identified a general difficulty with women. She did not define whether these shooters fell under the category of school mass killings (killed three or more individuals, not including the shooter).

Lankford (2012) was interested in the difference between rampage, workplace and school shootings. He wanted to know how these different environments of shootings compare and how they are different. He did a quantitative and qualitative analysis of 81 total rampage, workplace and school shootings together. He collected data using government reports and media reports. He found that workplace shooters were the outlier finding that this was at the highest risk of targeted violence. All other environments for these shootings were non-targeted. He also found all groups except workplace shooters were highly likely to be socially marginalized.

Sommer et al. (2014) wanted to find the role of social dynamics in school shootings. Social dynamics refers to the relationships formed between individuals and how they interact. They did not hypothesize a specific result based on the previous literature. They performed a systematic review of 35 articles primary research articles that described school shootings and information on the personal development of the perpetrator from 1990 to 2013. They found 85.1% of articles included social marginalization and 88.1% of articles included social conflict including bullying, romantic conflict or teacher conflict. In general, most cases in school shootings include the idea of social marginalization, but not all cases. They concluded that social dynamics is an important factor contributing to school shootings, but there is no singular characteristic that is present in all cases.

Bushman et al. (2016) compiled an advisory report on what we know and what we need to know about school violence, including school shootings. They identified all media reports from all school shootings from 1974 to 2002 and found 25 incidents

involving 27 attackers. They found that 78% of the school shooters were marginalized and 61% of the school shooters exhibit severe depression. They explained these results by finding their suicide ideation may be related to their hostile ideation from long-standing resentment toward others.

Theory and Intervention

The theory and intervention category included articles that offer a theoretical interpretation of school shootings. The intervention subcategory included articles that inform possible interventions to prevent school shootings, such as threat assessments.

Theory

There were three articles included in the theory subcategory. Sandler and Alpert (2000) used psychoanalytic concepts such as projective identification, basic assumptions group and the social defense system to show that the group's unconscious processes led to the role definitions of the shooters of Columbine. They theorized that from projective identification that the shooters of Columbine responded to the projections in an explosively hostile and abusive manner. The basic assumptions were defined as unconscious assumptions that emerge from a group including, dependency, fight or flight, and pairing. They related Columbine to these basic assumptions because there is a definite hierarchy of power, adolescents seek to conform and reject those who do not, and there is a push to secure identity against regressive behavior. They also found a link between school shootings and the social defense system. They defined the social defense system and argued that the Columbine shooters used this social defense system of "help to avoid anxiety, guilt and uncertainty" by committing the shootings. This theory article

did not contribute to the current model and offers a differing explanation to school shootings.

Katz (2016) described a theoretical examination of school shooting events. He theorizes that school shootings can be conceptualized as an "intimate massacre." An intimate massacre simply means that the perpetrator knows the place that he commits the shooting in (intimate) and the killings are random instead of targeted (massacre). Part of his theory he claimed that for a school rampage shooting to occur, there must be a precipitating event. He also theorized that it is a requirement to be a loner or an outcast. While his theory is consistent with some of the elements in the current model, more research is needed to confirm.

Madifs (2016) reviewed the current literature to find if these acts are random violence or not. Random violence is defined as pointless, patternless, and unqualified deterioration. He argued that school shootings are not random violence. His main argument against the "pointless" part of the definition is that the literature found that most school shootings are premeditated. He argued that it is planned out in detail, they have a motive. He argued against the "patternless" definition because school shooters do have a definitive typology (gender, race, age) even though there is not a definite profile. He explained that school shootings do not represent unqualified deterioration because, even though the rate of them are increasing, they are still exceedingly rare. His final argument was that the media portrays school shootings as random violence, but reality does not reflect that. I would agree with his theory that random violence is not supported by the literature and that it is also not patternless.

All the articles offered differing theoretical frameworks that empirical evidence could be applied. Katz (2016) fits into the current model because it identified a precipitating factor to be present for a shooting to occur. Madifs (2016) also fits into the current model because it identified that school shootings are not random and they could possibly be predicted.

Intervention/ Threat Assessment

There were five articles included in the intervention subcategory. Verlinden et al. (2000) aimed to find risk factors that are prevalent in all school shootings that can inform future possible shootings. They examined nine mass school shootings through court records, local and national media, and was clarified with local investigators, school officials, and other researchers. From the nine cases, they found commonalities within individual factors (uncontrolled anger, threatened violence, depression and a detailed plan for the attack), family factors (lack of supervision and troubled family relationships), social and peer factors (most were isolated and rejected by peers), societal/environmental factors (all had access to guns (meaning there was a firearm located in the home), and all were clumped close together in time, which the authors interpreted as being from media sensationalization) and situational/attack-related behaviors (most noticed a loss of function and a recent stressful event, and all had an interest in weapons and targeted violence). They wanted this information to be used for threat assessments in the psychological field. The risk factors used and their groupings of factors are consistent with the model.

Twemlow et al. (2002) reviewed the literature to offer an informed threat assessment of potential school shooters. They identified several warning signals for a school shooting that include: previous warning communications and ambiguous messages. They decided to look at other factors that could affect a threat assessment other than verbal threats. The other factors that could affect a threat assessment included the availability of guns, victimization of social groups, the concern expressed by adults or peers, mimicry of media figures, change in emotions and interest, and families in low emotional closeness or understanding of adolescent's life. They argued these factors should be integrated into a threat assessment that will be more effective in preventing shootings. The risk factors that they identified are consistent with the model.

Haan and Mays (2013) reviewed the current literature around school shootings and aimed to find an explanation and a possible intervention. They found literature that supports bullying as a possible explanation for the school shooter's actions. They recognized that school shooters often do not target those who are bullies and they identified the typology to be different from the normal delinquent: Caucasian male, middle to high socioeconomic status, and living in small conservative communities. They also defined media sensationalism as a cited explanation for the prevalence of shootings. To solve the problem, they offered four different solutions: (1) strict bullying policy (2) media to stop sensationalizing the shootings (3) schools to change their suspension policy and (4) updated crisis management from law enforcement and schools.

Duplechain and Morris (2014) synthesized a review of the literature to define different factors that contribute to school shootings. They split their search into the

following categories: Bullying, the individual family and society, relationships and past

trauma, and brain development. In each of these categories, they cited popular research

that explains those fields and provided possible solutions at the end of their article. These

solutions included increased security in schools (such as controlling and limiting points

of entry, a panic alarm system and improved relationship with local law enforcement),

school-management based programs that change the environment of the school system

(by making schools feel safer with cameras and metal detectors, as well as decreasing

school size) and student profiling to identify kids at risk. They identified similar risk

factors and categories as the current model.

Mears et al. (2017) wanted to determine that school shootings are not directly

caused by bullying and that a wider approach with several factors should be taken. They

reviewed literature that pertained to school shootings and specifically bullying. They

identified that literature creating a profile of a shooter or a typology could lead to

confirmation bias, that researchers are assuming these characteristics are what causes the

problem. They concluded that targeting a specific "cause" to a shooting will likely not

stop the problem. Therefore, they asked to fund large scale researching efforts that have

enough scientific evidence to draw a conclusion.

All of these intervention and threat assessment articles attempt to find risk factors

and a typology to identify possible offenders in the future. Most of these articles

identified similar risk factors and categories that the model identifies with an emphasis on

bullying and social relationships.

Discussion

The purpose of the present systematic review is to describe and evaluate a stress-diathesis model of school shootings. I hypothesized that the following risk factors would be identified as diatheses: media sensationalization, school size, gender roles, mental illness, development, premeditation, and capability for homicide. Of the hypothesized diatheses, the following were identified in the literature: media sensationalization, gender roles, school size, mental illness, and development. Whereas many studies found mental illness to be common in school shooters, it is important to note that only severe mental illness poses as a plausible risk for committing homicide. Mental illness ranges across many types of disorders and varying severity. Since those with a mental disorder are rarely violent, it is unfair to demonize this group and exacerbate the stigma surrounding this issue. Furthermore, severe mental illness is associated with other variables such as the use of psychotropic medication, drug use (e.g., marijuana), social stigma (e.g., thwarted belongingness), and occupational challenges (e.g., unstable employment). It is possible that a correlated variable drives the association of severe mental illness with violent behavior.

These do include most of the risk factors identified by the model but do not include premeditation or capability for homicide. While premeditation was not identified as the main topic of any study, several archival profiling studies identify this as a common characteristic of school shootings (Dumitriu, 2013; Gerard, 2016; Meloy et.al., 2001; Paradice, 2017; Twemlow, 2002). Capability for homicide was also not specifically

identified by any of the studies. However, Joiner (2005) defines the related factor, capability for suicide, as repeated exposure to adverse events habituates the individual to death. In this case, the capability of homicide could also be developed through repeated exposure to violence. This idea of repeating exposure to violence is present in many of the factors identified above. Media sensationalization describes how media normalizes school shootings by reporting on them consistently and in a sensational manner, this could, in turn, increase the exposure to violence. Gender roles explain the construct of hypermasculinity that encourages males to be violent to prove his masculinity and role in society. These two societal factors explain the normalization and encouragement of violence, but the third element of easy access to guns and fixation on guns explains how the shooter is able to commit violence. The access to guns and fixation on them is present in some of the typology studies identified as a common characteristic of the shooter (Dumitriu, 2013; Meloy et.al., 2001; Twemlow, 2002; Verlinden et.al., 2000). All the societal factors need more empirical research to identify them as diatheses, but media and gender roles may contribute to the overarching factor of the capability for homicide. Out of the individual factors, mental illness can be identified as a diathesis along with premeditation and capability of homicide, but development was not confirmed to be a diathesis.

I also hypothesized that all school shootings would have a precipitating event, identified as a stressor. The stressors I hypothesized are present in school shootings are all social factors, and they include the following: bullying, thwarted belongingness, and perceived burdensomeness. I found the only stressors present in the literature were

bullying and marginalization. While this does support that bullying is a stressor as the model suggests, they do not specifically identify thwarted belongingness and perceived burdensomeness. Thwarted belongingness was defined by Joiner (2005) as feeling alienated by peer groups, family and other social groups. This definition is very similar to marginalization, and the literature that describes marginalization could be interpreted as supporting the factor of thwarted belongingness. Perceived burdensomeness was defined by Joiner (2005) as an individual feeling that their life is a burden to their family, peers, and society. This stressor was not found in the literature for school shootings. The reason for this could be that there is a difference between the model for suicide and the model for school shootings.

Implications

This study is novel because there are no other studies that use the stress-diathesis model to describe school shootings. This study also provides a mechanistic link between suicide and school shootings. This study is important because there is very little research that focuses on the shooter and their actions. From the literature search, 1,361 articles were excluded before full-text review because they focused on the following topics: victim interventions, gun control, school security, and policy implications. The lack of research in this area could be explained by the lack of data on the shooter and the difficulty to obtain data about the shooter and their motivations. Along with this lack of research, most research that was identified focused on how a singular factor affects school shootings. However, it is extremely unlikely that a univariate model can explain the differences between school shooting events.

Limitations

A limitation of this study is the small number of studies examined (38) and the even smaller amount of empirical studies (22). Many of the studies collected data from archival sources, mostly from media reports, criminal records, FBI reports, etc. While archival data is limiting, many of the other studies are reviews which is even more limiting because there is not any data that contribute to the theory being proposed. There were also some elements absent from the model that should be examined in further research, including perceived burdensomeness and development.

Future Directions

Future research should begin researching school shootings by identifying school shooter's diatheses or risk factors and then identifying the precipitating event or stressor for that specific shooter. Research should also attempt to identify more stressors that could contribute to a school shooting that were not identified by the model or the literature. Since not all cases of school shootings involve bullying or thwarted belongingness (marginalization), there may be more precipitating factors that research has not identified, such as romantic rejection. Romantic rejection was briefly discussed in the gender roles section and briefly as a precipitating factor in Sommer et al. (2014). However, it should be investigated further as a stressor. Another possible stressor is bereavement. The Parkland shooter discussed earlier experienced a loss of his mother a few months before the shooting occurred. Further research can also investigate the interaction between medicine for the severely mentally ill and their ability to commit these actions. For example, some antidepressants include risk of suicide in the FDA-

mandated packaging as a potential side effect. Antidepressants may also provide the energy that severely depressed individuals lack to take action on their impulse for self-harm or homicide. Further, antidepressants could improve the individual's functioning and makes them feel like they can stop taking the medication. This could cause a rapid deterioration in symptoms, which could trigger a psychotic break. The interaction of psychiatric medication and school shootings have been discussed in previous literature, but should be investigated further (Langman, 2009b).

Conclusion

Since there are similarities between suicide and school shootings, including the fact that 55% of school shootings end in the perpetrator committing suicide, theoretical models developed to explain suicide can be applied to school shootings. The following diatheses were hypothesized and confirmed as risk factors for school shootings: mental illness, premeditation and capability for homicide. Capability for homicide includes the repeated exposure to violence (media sensationalization), hypermasculinity encouraging aggression and violence and the ideation of guns and possibly the access to them. The following stressors were hypothesized and confirmed as precipitating events: bullying and thwarted belongingness. Thwarted belongingness is synonymous with marginalization. While these were the identified stressors, research suggests there are more stressors that are not identified. This model could be used to conduct empirical research on the past school shooters and further identify their motivations and explain their actions.

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Tables

Table 1

Description of Studies

Article	Category	Subcategory	Design	Number of Shootings
Markward 2001	Societal Factors	Media Sensationalization	Reviewed literature	N/A
De Venanzi 2012	Societal Factors	Media Sensationalization	Reviewed literature	N/A
Towers et.al 2015	Societal Factors	Media Sensationalization	FBI reports, police reports, and media reports	420 total events
Kaiser 2005	Societal Factors	School Size	National Center for Educational Status, National School Safety and Security Services and media reports	17 school shootings
Baird et.al 2017	Societal Factors	School Size	Media reports and preexisting school shooting data.	22 school shooters
Mai and Alpert 2000	Societal Factors	Gender Roles	Reviewed literature	N/A
Kimmel and Mahler (2003)	Societal Factors	Gender Roles	Media outlets, including USA Today, New York Times,	28 Shootings

Article	Category	Subcategory	Design	Number of Shootings
Danner and Carmody (2001)	Societal Factors	Gender Roles	and Los Angeles Times 489 newspaper reports	7 Shootings
Tonso (2009)	Societal Factors	Gender Role	Media Reports	2 Shootings
Kalish and Kimmel (2010)	Societal Factors	Gender Role	Media Reports	3 Shootings
Lankford (2016)	Societal Factors	Fame-Seeking	Suicide notes, manifestos, and videos	22 Shooters
Azam and Ferro (2016)	Societal Factors	Fame-Seeking	Review of Literature	N/A
Langman (2009a)	Individual Factors	Mental Illness	General research and psychological reports given after arrest	10 Shooters
Dutton et.al (2013)	Individual Factors	Mental Illness	Diaries and psychiatric reports	4 Shooters
Oksanen et.al (2015)	Individual Factors	Mental Illness	Police reports and psychiatric reports	97 total shootings
Steinkoler (2017)	Individual Factors	Mental Illness	N/A	1 shooter

Article	Category	Subcategory	Design	Number of Shootings
Thompson and Kyle (2005)	Individual Factors	Development	Review of literature	N/A
Weisbroot (2008)	Individual Factors	Development	Review of literature	N/A
Meloy et.al (2001)	Individual Factors	Profile/Typology	Psychiatric reports, criminal databases and medical reports	27 shootings, 34 shooters
Dumitriu (2013)	Individual Factors	Profile/Typology	Government records, police reports, court records, school records and newspapers	160 shootings, 163 shooters
Gerard et.al (2016)	Individual Factors	Profile/Typology	Case law, books containing case studies, published reports and the media	28 shootings
Ferguson et.al (2011)	Individual Factors	Criticism of Profiles	Review of literature	N/A
Leary et.al (2003)	Social Factors	Bullying and Marginalization	Media reports	15 shootings
Klein (2006a)	Social Factors	Bullying and Marginalization	Media reports	12 shootings
Klein (2006b)	Social Factors	Bullying and Marginalization	Media reports	10 shootings

Article	Category	Subcategory	Design	Number of Shootings
Reuter-Rice (2008)	Social Factors	Bullying and Marginalization	Review of literature	N/A
Klein (2009)	Social Factors	Bullying and Marginalization	Media reports	13 shootings
Lankford (2012)	Social Factors	Bullying and Marginalization	Government reports and media reports	81 total shootings
Sommer et.al (2014)	Social Factors	Bullying and Marginalization	Review of literature	N/A
Bushman et.al (2016)	Social Factors	Bullying and Marginalization	Media reports	25 shootings and 27 shooters
Sandler and Alpert (2000)	Theory	Theory	Review of literature	N/A
Katz (2016)	Theory	Theory	Review of literature	N/A
Madifs (2016)	Theory	Theory	Review of literature	N/A
Verlinden et.al (2000)	Theory	Intervention/ Threat Assessment	Court records, local and national media reports	9 shootings
Twemlow et.al (2002)	Theory	Intervention/ Threat Assessment	Review of literature	N/A
Haan and Mays (2013)	Theory	Intervention/ Threat Assessment	Review of literature	N/A

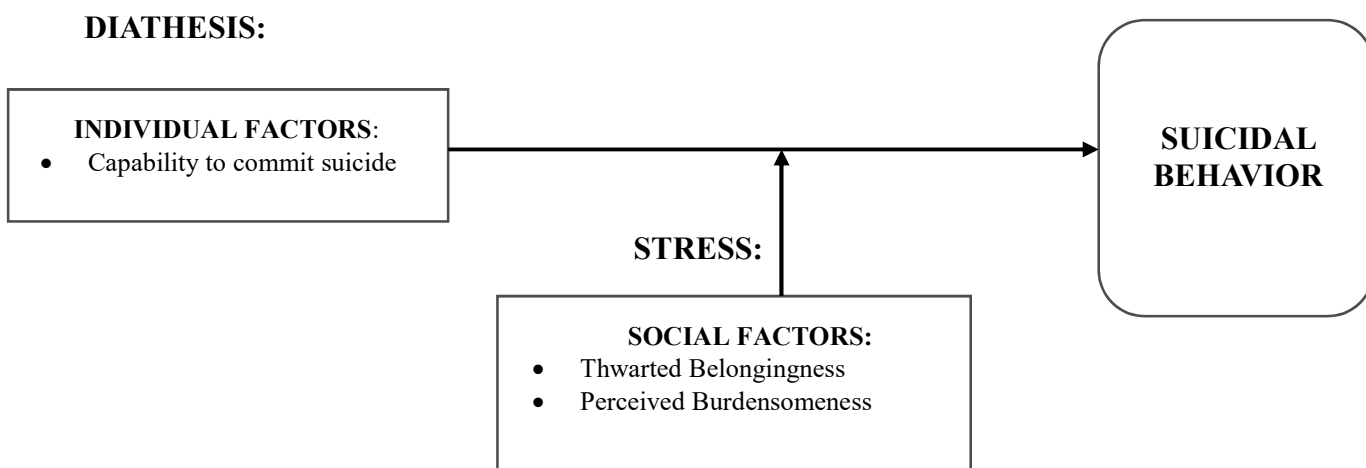| Article	Category	Subcategory	Design	Number of Shootings
Duplechain and Morris (2014)	Theory	Intervention/ Threat Assessment	Review of literature	N/A
Mears et.al (2017)	Theory	Intervention/ Threat Assessment	Review of literature	N/A

Note:

DIATHESIS:

INDIVIDUAL FACTORS:
• Capability to commit suicide

SUICIDAL BEHAVIOR

STRESS:

SOCIAL FACTORS:
• Thwarted Belongingness
• Perceived Burdensomeness

Figure 1. Stress-Diathesis Model of Suicidal Behavior

DIATHESIS:

INDIVIDUAL FACTORS:
- Mental Illness
- Development
- Premeditation
- Capability for Homicide

SOCIETAL FACTORS:
- Media Sensationalization
- School Size
- Gender Roles

STRESS:

RAMPAGE SHOOTING

SOCIAL FACTORS:
- Bullying
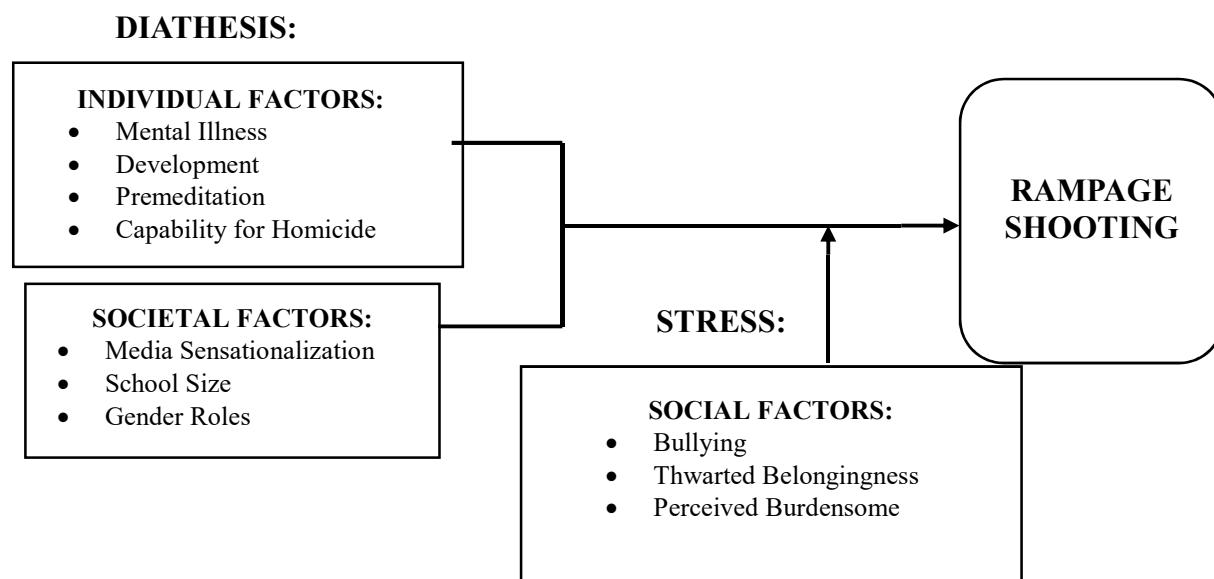- Thwarted Belongingness
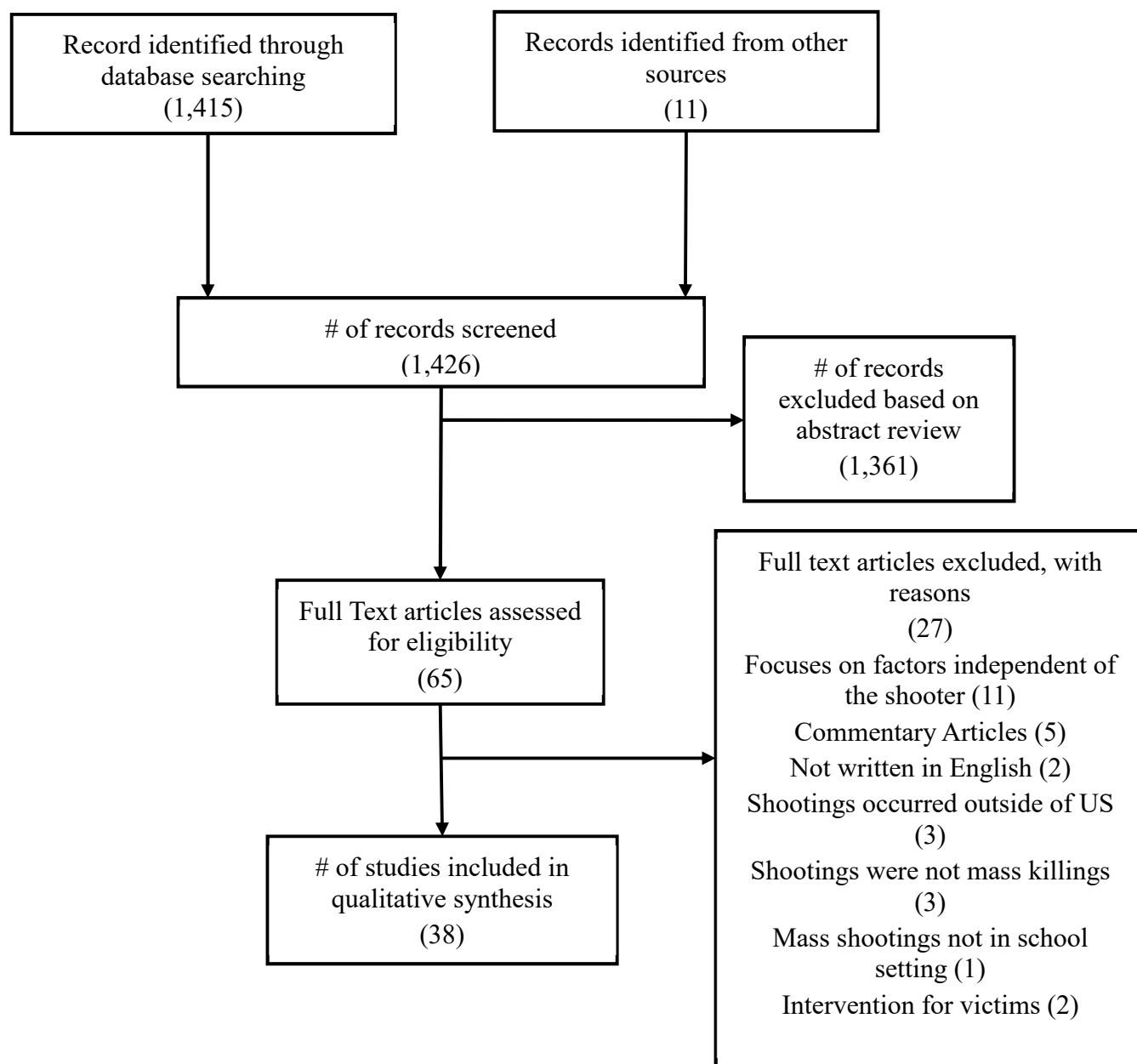- Perceived Burdensome

Figure 2. Stress-Diathesis Model of School Shootings

PRISMA Flow Diagram

Figure 3. PRISMA Flow Diagram