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Learning to blast a way into crime, or just good clean fun? Examining aggressive play with toy weapons and its relation with crime

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ABSTRACT

Background *Researchers, such as Bandura, have proposed that children's mere exposure to the use of play weapons encourages deviant displays of aggression, but there is very little research to support this hypothesis of 20 years.*

Aim *To examine the relationship between amount of weapon play and concurrent aggression as well as later violent juvenile crime, while controlling for other variables possibly influencing criminal pathways.*

Method *Using longitudinal survey data collected from mothers and children (n = 2019) from age 5, with follow-up at age 15, correlations between children's play with toy weapons and juvenile criminality were examined. Multivariate regression analyses were employed to determine to what extent early childhood aggression, symptoms of attention deficit hyperactivity disorder, and symptoms of depression were antecedents of juvenile crime.*

Results *For bivariate analysis between toy weapon play and juvenile criminality, the effect size was small and not significant. The relationship remained not significant once control variables were introduced into the model.*

Conclusions and implications *The act of pretending to be aggressive in childhood thus plays little role in predicting later criminality after other factors, such as gender, attention deficit hyperactivity disorder or depression, have been taken into account. Involvement in imaginative play with toy gun use in early childhood is unlikely to be useful as a risk marker for later criminal behaviour. Play fighting and war toy games may even be considered necessary components within the frame of normal development.*
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INTRODUCTION

Many children are drawn to using toy weapons in creative play. Toy guns alone, led by Hasbro's Nerf line, make over 500 million units worldwide for toy companies (Fisher, 2014). Some researchers have proposed that children's mere exposure to the use of these play weapons encourages deviant displays of aggression (Bandura & Jeffery, 1973). Concern that weapon and war play is problematic is an issue of live debate internationally (Holland, 2000). Some scholars and advocates suggest that playing with these pretend weapons encourages concurrent aggression and violent delinquency in later life (Holland, 2000). The argument continues that such play can be detrimental as it encourages violent imitation rather than creativity (Goldstein, 1995). As a result, the UK developed a zero-tolerance approach to weapon and toy gun play, discouraging all forms of it within classrooms and other public settings early in life (Holland, 2000). Stemming from these concerns, education policy and lawmakers have used this as a peripheral argument to reinforce an agenda set on supporting The Violent Crime Reduction Act in England in 2006, implemented in England and Wales in 2010, banning realistic toy guns that might be used to imitate real guns in juvenile crimes (Wheal & Tilley, 2009), although concerns about accidental shootings by police are also at issue. Others have argued that toy weapon play can alleviate preexisting aggressive tendencies brought about by other life challenges, including such disorders as attention deficit hyperactivity disorder (ADHD) or depression (Watson & Peng, 1992). There are few empirical studies of toy weapon play.

The main concern among many scholars and policy makers is that early violent toy play will encourage later aggression detrimental to public well-being. Ever since Bandura's famous bobo doll study, researchers have studied potential associations between aggressive play and criminally delinquent acts in children. Bandura suggests that socialised war play, and rewarding such play, leads to displays of deviant aggression (Bandura & Jeffery, 1973). This idea has been expanded to social cognitive theories to imply that rehearsing aggressive acts, even through play, may encourage more serious violence (Berkowitz, 1984). They suggest that the neural pathways involved in aggressive play ultimately encourage aggressive behaviour and even violent delinquency in real life (Smokowski et al., 2017). When children define aggression as a common solution, it cues and facilitates a cycle that reinforces a process resulting in future real, deviant aggression (O'Leary-Kelly et al., 1996).

Social learning theory suggests some support for the cuing effect of aggressive priming (Hirst & Echterhoff, 2012). Among play behaviours, most attention has been focused on activities such as engagement with violent video games. Here, despite several decades of research, no consensus on effects was ever reached (Quandt et al., 2015; Ferguson & Colwell, 2017). Use of toy weapons often occurs early in development, giving such toys the potential for more influence than video games. Research into such weapon play provides some support for

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progression from this to later aggressive delinquency (Turner & Goldsmith, 1976; Watson & Peng, 1992), although the few studies reported often rely on small samples. Most of this research is limited to cross-sectional or short-term experimental studies that look at minor, not necessarily problematic acts of aggression. In other words, much of the literature is limited by considerations of 'normal aggression' rather than of seriously harmful acts, possible reflecting pathology (Watson & Peng, 1992). Few studies consider the effects of this type of faux weapon play on more serious outcomes such as juvenile crime. With the development of video games and children's time spent playing them, research involving toy weapons largely ceased in the 1990s (Watson & Peng, 1992). After this, it seems that most attention has focused on violence in video games, with comparatively little attention to other issues, such as war-themed toys. This also appears to fit with political and moral agendas in the USA and other countries (Copenhaver, 2015.) There is a clear need for a further look at the issue.

CONFOUNDING VARIABLES THAT MAY EXPLAIN LINKS BETWEEN TOY WEAPONS AND JUVENILE CRIME

Scholars generally acknowledge that it is important to control for theoretically relevant explanatory variables when considering the meaningfulness of correlations between two variables (Ferguson et al., 2009; Savage & Yancey, 2008). Developmental trajectories that include toy weapon use, for example, may also include later criminality, without toy weapon use and criminality being causally connected. One such variable is sex; males offend at much higher rates than females for all violent juvenile crimes (Steffensmeier & Allan, 1996) and tend also to play with more toy weapons – this may simply illustrate a common link between these behaviours and being male, not necessarily an association between the behaviours. Mental health variables may similarly act as confounders. Other possible variables that may encourage delinquency include environmental stress, inadequate parental controls, family violence and opportunity variables (Akers, 2013).

Our aim, in the study reported here, was to include as many variables as possible that have previously been highlighted and which are available in the AVON data set (for details see succeeding texts). Our hypothesis was that toy weapon use will be associated with juvenile criminal behaviour, even after controlling for other relevant factors.

METHOD

Ethical approval for the longitudinal cohort study was obtained from the Avon Longitudinal Study of Parents and Children (ALSPAC) Ethics and Law

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Committee and Local Research Ethics Committees. Our use of data for this study was approved by the study's ethics committee and our local Stetson University ethics committee.

Participants

The ALSPAC recruited 14,541 pregnant women resident in Avon County, UK, who had expected dates of delivery between 1 April 1991 and 31 December 1992. Fourteen thousand five hundred forty-one pregnant mothers enrolled and had either returned at least one questionnaire or attended a 'Children In Focus' clinic by 19/07/99. There were 13,988 children from these pregnancies who were alive at 1 year of age. An attempt was made to enlarge the sample when the oldest children were 7 years of age, by two more phases of participant recruitment. The phases of enrolment and cohort are described with detail by Boyd et al. (2013). The total number of participants was increased to 15,445 children.

All these children were then interviewed at several different intervals during their life, through to adulthood. Independent variables were collected from the mother when the child was almost 5 years old (57 months) and then again at 7 years old. Outcome variables relating to juvenile crime were collected from the child when the child was 15.5 years old. Complete data on juvenile crime and prior toy weapon uses were available for 2,019 participants. As such, this subset constitutes the sample of the present study. Further details of the study aims and design as well as data dictionary are available (www.ich.bris.ac.uk/alspacext/). The sample was about equally male (50.6%) and female and overwhelmingly White (99.8%).

Not all respondents responded to each of the surveys at each of the time points used in the current analysis; juvenile crime scale data were particularly likely to be missing. Details of our subsample are set out in the Results section.

Measures

Table 1 includes basic information on all scales included in the current analysis. All measures comprised continuous scales unless otherwise indicated.

The Toy Weapon Scale was a 2-item scale asking the mother about the frequency with which the child played with (i) swords and (ii) guns (Chronbach's $\alpha = 0.746$) up to age 57 months. Scale responses were of Likert type response, with higher numbers indicating greater use.

The Early Childhood Aggression Scale is made up of 20 items requiring yes/no answers from the mother to questions whether the child kicks, hits, fights, swears at, uses angry words with children who are family, adults who are family, children who are not family and adults who are not family ($\alpha = 0.84$). This scale was developed by the AVON team as part of their longitudinal assessment of behavioural disorders and was also assessed at 57 months. It has been demonstrated

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Table 1: Sample description by independent and *dependent* variables

Variable	Min	Max	Mean	sd
Toy weapons use	2	10	3.31	1.84
Time-1 (57 months) aggression	20	60	25.45	4.10
ADHD DAWBA bands	0	5	0.6726	1.02
Depression DAWBA bands	0	5	0.4436	0.686
Juvenile crime	12	48	13.96	3.64

Note. ADHD = attention deficit hyperactivity disorder; DAWBA = Development and Well-Being Assessment; sd = standard deviation.

good construct and predictive validity (e.g. Kretschmer et al., 2014; Kung et al., 2017). We included it here as a means of assessing early developmental aggression and to be able to control for it in longitudinal analyses.

The Development and Well-Being Assessment (*DAWBA*), *ADHD and Depression Scale* is rated from a semi-structured interview when the child participants were aged 7 years and 7 months. Interviews were conducted with the parent or caregiver. DAWBA 'bands' are created, with each band corresponding to ordered categorical measures of likelihood of ADHD and/or depression over six levels – from 'very unlikely' to 'probable'. The bands are the result of computer algorithms and have been found to be valid in other UK-based research (Etchells et al., 2016). As with most survey scales, the DAWBA does not, in and of itself, lead to a diagnosis. It provides a likelihood that a diagnosis may exist based upon symptoms of the disorder endorsed by adult reporters. Unlike most survey scales, the DAWBA provides ordinal categories of probability rather than interval scales. These composite scores have been used in the literature for predictive and correlative analyses (Joinson et al., 2006, Etchells et al., 2016). Mean scores tend to be low, given that they represent psychopathology in a general sample of young people.

For each ADHD item, parents marked boxes to say whether their child showed the behaviour; these were coded 0 for 'no', 1 for 'a little more than others' and 2 for 'a lot more than others'. A total ADHD trait score was calculated by summing these responses to give figure between 0 and 36. The likelihood 'bands' (of having a clinical diagnosis) are calculated according to symptom levels relative to other children. We used these bands as control variables.

As with ADHD, 7-year-old depression symptoms were assessed using the DAWBA system. Depression bands were also used as control variables.

Juvenile crime traits were assessed in ALSPAC when the participants were 15 years and 6 months of age. The young people were asked to complete a questionnaire themselves about the frequency with which they had performed certain aggressive/delinquent activities in the last year. The 12 questions asked about how often the young person *hit*, *spat or threw stones at someone they knew*; *hit/*

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kicked/punched someone else on purpose with the intention of really hurting them; *or deliberately damaged or destroyed property that did not belong to them*. A total juvenile crime trait score was calculated by summing these responses ($\alpha = 0.813$). For the current analysis, we were interested in criminal acts occurring during the teen years. The AVON data set does continue to assess outcomes into early adulthood, but these were beyond the scope of our research questions.

Analyses

To determine if playing with toy weapons correlated with greater or lower levels of aggression, a bivariate analysis was first run between toy weapon use at age 5 years and juvenile crime scale scores at age 15 years. To control for other potential variables, multiple regression was then used with juvenile crime at age 15 as the dependent variable. The dependent variable was not normally distributed (Kurtosis = 3.078), so the full model, with Ordinary Least Squares regression was not usable. Instead, multivariate analyses were conducted using Poisson regressions, with the robust estimator correlation matrix. Examination of the independent, possibly predictor variables did not indicate the presence of multicollinearity (variance inflation factor values were below 2.0). The log odds of the bivariate relationship were compared with the log odds of the relationship, after controlling for all variables within the final model.

A note on trivial effects

It has been observed that large samples may sometimes return 'statistically significant' results which, nonetheless, are trivial in practical value or which may be because of 'noise' rather than true effects. As such, we employed an interpretation system borrowed from video game research (e.g. Ferguson et al., 2009) in which results above the equivalent of $r = 0.20$ or $OR = 2.0$ will be considered to be of practical value. Lower figures have very little predictive value and should not be considered of clinical significance or to have impact in the real world.

RESULTS

Sample description

Distributions of the basic characteristics of our sample were similar to those of the parent AVON database. The sample was also similar in DAWBA scale scores/bands.

Table 1 sets out the mean scale scores and standard deviations for the main variables used in analysis.

Results from the bivariate correlation showed a significant positive relationship between toy weapon use and both concurrent aggression and later juvenile

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criminality (Table 2). For aggression, this value was just below our level of practical significance, for juvenile criminality it was substantially below.

Results from the Poisson regression for male participants are presented in Table 3. The overall model was significant [χ^2 (4) = 19.312, $p < 0.001$]. Only DAWBA bands for ADHD were significant predictors of future juvenile crime. After controlling for additional variables, the effect of toy weapon use was non-significant. This reduced the effect size for toy weapon use to about the equivalent of $r = 0.014$, well below the threshold for non-practical effects.

Results from the Poisson regression for female participants are presented in Table 4. The overall model was not significant [χ^2 (4) = 8.157, $p = 0.08$]. As with male participants, only the ADHD DAWBA ratings were predictive of juvenile crime, although these results are more difficult to interpret in light of the non-significant omnibus test. The effect size for toy weapon use to about the equivalent of $r = 0.038$, well below the threshold for non-practical effects.

DISCUSSION

We found that the relationship between toy weapons use and juvenile criminality was minimal, particularly once other variables were controlled. This finding differs from earlier work, showing potential cuing effects of toy weapons, mainly because other variables are more influential. In our study too, bivariate analyses offered some support for the playing with toy weapons-later aggression link, but effect sizes were very small and reduced to non-significance once even a few other

Table 2: Bivariate correlations between toy weapon and (i) concurrent aggression and (ii) juvenile crime at age 15 years

Outcome Variable	*r*	Rho	*p* value
Aggression	0.165	0.180	<0.001
15-year criminal delinquency	.064	0.067	<0.001

Table 3: The effect of toy weapon play on criminality, Poisson regression among males

Predictor variable	B	SE	Wald	Sig.	Exp(B)
Toy weapons use	−0.002	0.0051	0.144	0.705	0.998
Time-1 (57 months) aggression	0.005	0.0026	3.070	0.080	1.005
ADHD DAWBA bands	0.030	0.0099	9.530	0.002	1.011
Depression DAWBA bands	0.008	0.0170	0.241	0.623	1.008

Note. ADHD = attention deficit hyperactivity disorder; DAWBA = Development and Well-Being Assessment.

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Table 4: The effect of toy weapon play on criminality, Poisson regression among females

Predictor variable	B	SE	Wald	Sig.	Exp(B)
Toy weapons use	0.006	0.0053	1.353	0.245	1.006
Time-1 (57 months) aggression	0.004	0.0020	3.514	0.061	1.004
ADHD DAWBA bands	0.024	0.0112	4.497	0.034	1.002
Depression DAWBA bands	0.003	0.0097	0.071	0.790	0.984

Note. ADHD = attention deficit hyperactivity disorder; DAWBA = Development and Well-Being Assessment.

relevant variables were taken into account. We iterate that it is likely that the allowing for other relevant variables unavailable to us in this data set could diminish these effects even more.

Further, although other variables, such as a history of ADHD, were more significant predictors of juvenile criminality, in general, social predictors of juvenile criminality had relatively small effect sizes. This suggests that predicting criminality from social variables, particularly over long spans of time, remains difficult.

Our conclusions about cuing are in line with some of the explanations from research. Such cuing may apply to only short-term influences rather than having long-term developmental impact. Parents and educators often misinterpret or are uncomfortable with play fighting, due to its resemblance to serious aggression, and have difficulty recognising subtle differences between the two. The act of pretending to be aggressive is not equivalent to being aggressive, nor is it a strong indicator of future aggression.

To the extent that parents, educators and policymakers may be worried about the developmental pathways to serious aggression in youth, restricting access to toy weapons does not appear to be a fruitful avenue for positive change. Techniques such as role reversal and cooperation (to encourage empathy), voluntary engagement in civic activities and addressing issues such as poverty and educational disparities may be more productive outcomes toward positive outcomes. Within this framework of understanding, play fighting and war toys can be considered necessary components of balanced understanding that encourage coping mechanisms – an exploring of aggressive instincts within a safe context (Trotter et al., 2003). Parents of young children need opportunities to enhance their understanding of the benefits of pretend play, including play fighting and war, in order to support the balanced lifestyle inherent in normal behaviour more effectively. In light of our results, outright bans on toy weapons in the classroom (excepting those that may resemble real weapons of course), in family or general communal play with peers may be more debilitating than beneficial.

We also suggest that policymakers, scholars and child advocates exert great caution in asserting conclusive links between war theme toys and behavioural problems, as evidence does not support such contentions. The apparent absence

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of association between playing with war toys and later real aggression is in line with recent data questioning the long-term harmfulness of similarly themed television (Schwartz & Beaver, 2016), movies (Markey et al., 2015) or video games (Przybylski & Mishkin, 2016). Attraction to some aggressive themes in play and media may be developmentally normal (Olson, 2010), and restricting such play may have more detrimental impact than positive.

As with all studies, ours has limitations. First, our data is correlational, so causality cannot be asserted. Second, we considered only a small number of potential control variables. Inclusion of more could have further weakened links between toy weapons play and later criminality. Third, all data are either parent or self-report and, as such, subject to reporting biases – however, they probably yield a more complete picture than criminal records data.

In conclusion, evidence from our study did not provide evidence to support the contention that toy weapons play in childhood is associated with later criminality in any way that warrants significant public health concern. We hope that these findings will inform continuing debate on this issue.

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