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Abstract

Through the process of priming, incidental stimuli in our environments can influence our thoughts, feelings and behavior. This may be true of incidental stimuli in online environments, such as adverts on websites. Two experiments ($N=325$, $N=331$) showed that the mere presence of advertisements with violent content on a simulated Facebook page induced higher levels of aggression-related cognition in comparison to non-violent adverts ($d=0.56$, $d=0.71$). In a subsequent word recognition task, participants primed with the violent stimuli 'remembered' more actually-unseen violence-related words than did the control participants. That is, they reported recognizing violent words they had not actually seen. However, priming with violent adverts had no effect on mood or person perception. A third correlational study ($N=131$) examined whether variance in the extent of priming could be attributed to individual differences in aggressiveness. Participants' aggressiveness was unrelated to their scores on the aggressive cognition measure. These studies established that website adverts with violent content could prime aggressive cognitions. Individuals differed in the extent to which they experienced the priming effect, and this was not attributable to their levels of trait aggressiveness. No effects of priming were found on either mood state or person perception.

Keywords: priming; aggressive; advertisements; Facebook; automaticity; banner blindness

Highlights:

- Unattended stimuli in our environments can prime thoughts, feelings and behavior.
- Violence-related website adverts primed aggressive cognition.
- Mood and person perception were not affected by exposure to violent adverts.
- Individuals differed in the extent to which they were primed.
- There is scope for genuine internet adverts to prime aggressive cognition.

1. Introduction

Internet adverts can be annoying. But could they actually influence your thoughts, and make you more aggressive?

When we use online services, we are typically exposed to numerous stimuli that simultaneously compete for our attention. Some are things we consciously focus on - the material we are attending to. Others are unattended, incidental stimuli. For instance, when one looks at a page of Google search results, or a Facebook page, one is also exposed to targeted adverts at the side of the screen. Both the attended and the incidental stimuli may have effects on our psychological processes.

1.1 Automaticity and Priming

Environmental cues may influence our behaviour, without our volition or awareness, in a phenomenon known as automaticity (e.g. Bargh & Williams, 2006; Huang & Bargh, 2014). There is considerable evidence (e.g. Bargh & Chartrand, 1999) that many social processes, thoughts and behaviors can proceed in a seemingly automatic manner when triggered by incidental environmental cues. This process of triggering is known as ‘priming’, where the accessibility of a mental construct is temporarily increased by exposure to stimuli semantically associated with that construct. This increased accessibility means the construct (e.g. a stereotype, goal, behavioral script or other type of schema) is more likely to be used in guiding our evaluations, cognitions and even actions. For example, seeing the word ‘food’ may prime one to start thinking about dinner plans.

There is currently debate about the strength of some claims made for the automaticity of behavior, the degree to which these processes are truly unconscious, and the replicability of certain studies (Newell & Shanks, 2014; Pashler, Coburn &

Harris, 2012; Stafford, 2014). However, even critics concede that some priming effects are robust (e.g. Pashler et al. 2012; Stafford, 2014). There is a large body of evidence that priming effects do occur, and can influence our thoughts, feelings, perceptions and actions.

1.2 Priming Effects of Attended Stimuli

If priming effects can arise from stimuli in our physical environments, is the same true of cues we encounter in computer-mediated environments and online interaction spaces? Indeed, there is some evidence that attended stimuli (the things we are actually looking at) in online environments can have psychological effects on users. For example, a study by Kramer, Guillory and Hancock (2014) that sparked significant media debate and ethical concerns (Verma, 2014), involved manipulating information presented to Facebook users. Facebook users see a range of content delivered via the News Feed feature. This comprises a selection, determined by Facebook's proprietary algorithms, of materials posted by other users they are linked to as 'friends'. Facebook users often express emotions in materials they post on the network. Therefore, any typical user will be exposed to a selection of content via the News Feed that includes information about friends' emotional states.

To assess whether emotional material posted by friends impacted on users' own emotional states, Kramer et al. manipulated the content users saw in their News Feed. Suppressing the number of posts with positive words displayed in the News Feed resulted in users' own posts containing fewer positive and more negative words. Conversely, screening out posts with negative words resulted in users' posts containing fewer negative and more positive words.

Kramer et al. explained their findings in terms of emotional contagion, postulating that the actual emotional experience was transferred from one individual

to another via text. However, their findings can be also be explained in terms of priming effects. If exposure to negative words increases accessibility of related words, then reducing the exposure should reduce the accessibility compared to some baseline level. Therefore, fewer negative words should be used in subsequent postings – which is what Kramer et al. reported.

1.3 Priming Effects of Unattended Stimuli

Kramer et al's study dealt with material that Facebook users actively attended to – the content of the News Feed. Such stimuli that we actively attend to are likely to influence us in various ways. However, what about incidental stimuli such the adverts that clutter our screens but to which users typically devote little attention? Might they affect us in similar ways? The companies that place the adverts clearly believe that they do influence brand perception and purchasing behavior, despite observations that click-through rates for various types of advert are typically low (Lewis & Reiley, 2014).

Empirically, there is some evidence that online adverts can influence the thoughts of those who view them. Courbet, Fourquet-Courbet, Kazan, and Intartaglia (2014) showed that exposure to pop-up adverts for a novel fictional brand on a website influenced participants' ratings of that brand up to three months later, with people who had seen the pop-ups rating the brand and their own purchase intentions more positively. These findings suggest that online adverts may well have effects consistent with the desires of the advertisers who place them. However, there is also scope for them to have other less desirable effects. For example, what effects might adverts with antisocial or violent content have?

1.4 Violent Content Online

There have been concerns over the visibility of violent materials in social media. Livingstone, Kirwil, Ponte, and Staksrud (2014) found that unwanted exposure to violent content was one of the main risks of the internet that European children reported being concerned about. Such concerns apply mainly to content that users have posted, but have also been expressed about adverts. For example, in 2010 the UK Advertising Standards Authority banned Facebook from displaying an advert for the game 'Mafia Wars' featuring a man wielding a knife, arguing that it implied carrying weapons could lead to success and respect (Sweney, 2010). Internet companies have made efforts to curtail violent content online, but it is a problematic area where issues of public protection collide with those of free speech. At the time of writing, violent content—of at least a mild variety, for example in adverts for games or films—still features prominently in online advertising. There are clear parallels between these concerns, and the more general debate on media violence that still persists after a number of decades. There has also been long-standing concern about antisocial, aggressive behaviors such as ‘trolling’ or misogynistic attacks online, which have received recent media scrutiny. As well as being examples of aggression themselves, these have the additional characteristic of adding more aggression-related content to what is already publicly viewable online.

1.5 Aggressive Priming

There is considerable experimental evidence that mere exposure to unattended, incidental, aggression-related stimuli can lead to activation of aggressive thoughts, feelings and behavior. The best-known example of this is the Weapons Effect. Berkowitz and LePage (1967) demonstrated that subjects behaved more aggressively (giving more electric shocks to a confederate of the experimenter) when a rifle was incidentally present in the laboratory than they did when a badminton racket was

present. There is also considerable evidence that exposure to violent cues in the media (e.g. film, television, music and computer games) can lead to priming of aggressive thoughts (e.g. Anderson, Carnagey & Eubanks, 2003; Bushman, 1998; Todorov & Bargh, 2002). However, even more subtle cues can lead to increases in aggression-related thoughts, feelings and behaviors. For example, Srull and Wyer (1980) showed that exposure to aggression-related words as part of a sentence construction task led participants to rate an ambiguous target person as more aggressive. There is still disagreement over the extent to which these findings map on to real-world aggressive behavior (e.g. Ferguson, 2009a), but the evidence for effects in laboratory settings is substantive.

1.6 Aggressive Priming Online

In summary, there may be scope for incidental stimuli such as adverts on social media to influence our psychological processes through the mechanism of priming. Concerns are regularly expressed about the effects that violence-related online stimuli may have on observers. The question that needs to be answered is whether such stimuli can prime aggression-related responses in the same way as they have been shown to in the offline world.

1.7 Aim and Hypotheses

The overall aim of this project was to examine whether non-attended incidental stimuli, in the form of online adverts, could have priming effects. The focus was on adverts with violent content, given their potential to prime violent thoughts, feelings and behaviour.

Study 1 was intended to ascertain whether incidental priming using aggressive stimuli can influence cognition (misrecognition of aggressive information, implying that priming could lead to faulty impressions of material), emotion, and evaluation of

others. It was predicted that participants exposed to aggressive primes would experience more aggressive cognition (Hypothesis 1), more hostile mood (Hypothesis 2) and evaluate a target person as more aggressive (Hypothesis 3) than would participants exposed to less aggressive primes.

2. Studies 1a and 1b

Recent literature (e.g. Pashler, Coburn & Harris, 2012) and media discussion has challenged the replicability of some social priming effects. Therefore, two identical studies were carried out, with the second study (1b) directly replicating the first (1a). The material that follows applies to both studies, except where specifically indicated.

2.1 Method

2.1.1 Materials. All materials were presented online as interactive web pages. They were hosted on the commercial survey portal www.hostedsurvey.com.

2.1.1.1 Stimuli. To create the simulated Facebook page, a new account profile was set up with the name 'Stephen Green' and populated with some information (biography, likes and so on) to provide some content on the page. The screen contents were then saved as an image for use in the experiment.

For the experimental and control conditions, either aggressive or non-aggressive adverts were embedded in the right hand margin of the page. There was space on the page for four such adverts.

The adverts used were selected from a range of those actually being displayed on Facebook at the time the study was conducted. Fourteen images were initially selected. To identify those most and least associated with aggression, images were pre-tested in an online pilot study. Seventeen respondents drawn from the same

population as the main study rated them for the extent to which they thought "...each of these advertisements is associated with aggression (broadly defined to include anger, hostility and violence)". Two sets of four adverts were selected for use on the basis of their aggressiveness ratings, which differed significantly ($t_{(16)}=26.20$, $p=.0000$), and non-overlapping content.

Of the aggressive adverts chosen, the first, titled "Are You the Best?" was an image of a sniper rifle aimed at a person, with the text "Prove your skill in the most addictive shooter game. Always free, download the mywebsearch toolbar. Daily Prizes, Play Now" beneath it. The second, titled "The Mafiator" was an image of a burly man with a flamethrower over the caption "Mafia Wars" and the text "Mafia Wars lets you bring out the big guns. Start your own criminal organisation - play now." The third, titled "Camelot Needs You" was an image of a knight wielding a mace, with the text "New features, enhanced gameplay and still one of the most advanced games on Facebook. Come and see what the buzz is about - Play Now!". The fourth, titled "Build an Army", was an image of tanks in a street with the text "Build a civilization and attack your friends' empires in this 5 star game on facebook[sic]. Play City of Wonder Now!".

The first neutral advert was titled 'Play blues like Clapton rawblues.net' and featured a photo of a man holding a guitar, accompanied by the text "What you must be able to do with your guitar to create real music that wows your audience. Watch this video to find out more". The second, titled "V+ HD for £5 allyours.virginmedia.com" was an image of a cable TV box with the text "Pause and rewind live TV and record two channels while you watch a third. Sound good? Get V+ HD for just £5 a month". The third, titled "Family Command Centre fambit.com", was an image of a web calendar with the text "Fambit is your fridge door online:

family blog, calendar, tasks, photos, reminders. Trusted space just for your family. Register free!". The fourth, titled "Benidorm £89 was £189 travelzoo.com" was an image of a holiday resort with the text "Save £100 on this 3-night mini break to Benidorm. Includes flights & 4-star accommodation. Get this deal by email before it sells out."

2.1.1.2 Mood measure. Angry mood was measured using the Anger-Hostility scale of the Profile of Mood States (POMS, McNair, Lorr, & Droppleman, 1981). The POMS is a self-report inventory that give measures of six different affective states including Anger-Hostility (sample items "Angry", "Bad tempered"), and Vigor-Activity (sample items "Lively", "Full of pep"). It has been widely used in a number of contexts, and there is evidence that it can be validly administered online (Wiegand, Luedtke, Friscia, Nair, Aleles, & McCloskey, 2010). To reduce the load on participants, only the Anger-Hostility and Vigor-Activity scales were used in the current study: Anger-Hostility because it was the construct of interest, and Vigor-Activity to provide filler items and provide some balance with positively valenced items for face validity.

Participants were requested to indicate the extent to which each item described their current mood using a 4-point scale (implemented as radio buttons) anchored at '*Much unlike this*' and '*Much like this*'. In the current sample, internal reliabilities were acceptable and are shown in Table 1.

2.1.1.3 Aggressive cognition measure. Aggression-related cognition was measured using a word recognition task. The logic underlying tasks such as this is that when a construct (such as aggression) is primed, cognitive neoassociation theory predicts that activation spreads to other related information in memory (Anderson & Bushman, 2002; Berkowitz, 1993; Bushman, 1998). Thus for people primed with the

construct of aggression, aggression-related words should come to mind more easily. The task used here is essentially a variant of the Deese-Roediger-McDermott paradigm, which shows that people will ‘remember’ seeing a previously unseen word if they have been exposed to a number of associated words (Roediger & McDermott, 1995).

Participants were presented with a list of 30 words, with the instructions “Now, please think about the Facebook page you saw earlier on. Shown below is a list of words, some of which appeared on that page. Please select ALL of the words you remember seeing on the page. Please don’t go back to check –we’re interested in how many you can remember without prompting”. The word list included 10 words that had been in the text of the Facebook page (e.g. onion, experience), 10 non-aggressive words that had not been in the text of the Facebook page or any of the adverts (e.g. hospital, cabaret) and 10 ‘aggressive’ words that had not been in the text of the Facebook page or any of the adverts.

The aggressive words were drawn from two sources. Six (armed, force, hit, kill, sword, soldier) had been used in previous research by the author. They had been drawn from a larger pool of words created by participants doing a word generation task. These had been categorised by a jury (6 psychology postgraduates and final year students) as having connotations of aggression (that is, they reflected “thoughts concerning aggression, anger or violence”). The remaining four aggressive words (complaining, angry, annoyed, irritated) were drawn from another source, comprising items from the Hostility scale of the Comprehensive Personality and Affect Scales (COPAS; Lubin & Van Whitlock, 2002). This was done to boost the face validity of the measure, as they were words that might be more likely to be found on a real Facebook profile. The ‘non-aggressive’ words were also drawn from the same

previous research, and comprised items that had not been categorised as having aggressive connotations.

All 30 words were presented in randomised order on a single web page. Participants were requested to indicate, by ticking checkboxes, which words they thought they had seen on 'Stephen Green's' Facebook profile. The dependent measure of interest is the number of aggressive words they ticked as having seen (in fact they had seen none of them).

2.1.1.4 Person evaluations. The person evaluation task required participants to indicate the impression they had formed of 'Stephen Green's' personality after reading his Facebook profile. They were presented with brief definitions of a number of personality constructs (Extraverted, Agreeable, Aggressive, Anxious, Sensation Seeking, Self-monitoring) and asked to indicate on 7-point scales (anchored at '*very low*' and '*very high*') how they thought 'Stephen' would score on each dimension. The dependent variable of interest here is the rating they gave Stephen on the Aggressiveness scale; the others were included as fillers for purposes of face validity.

2.1.2 Participants. For Study 1a, participants were recruited between 27th October 2010 and 15th September 2011. A total of 388 responses were submitted. The survey platform used (www.hostedsurvey.com) prevented submission of multiple responses from the same internet address. Four respondents who indicated their ages were below 16 years were excluded due to ethical concerns about their ability to give valid consent. Following removal of responses from people who did not complete the study or give consent at the end for their data to be used, 325 remained. The file was then scrutinised for instances of 'extreme data entry' or unrealistic combinations of demographic data (e.g. people claiming to be very young, with postgraduate qualifications). None were found.

The final sample for Study 1a comprised 62 men and 262 women (one person did not give their sex). Ages ranged from 16 to 72, with a mean of 33.60 years ($SD=13.80$). Participants indicated that they lived in 29 different countries, but the great majority were from the USA (68.5% of those answering the question) or the UK (11.7%). Most were either students (40.2% of those answering) or employed for wages (35.0%). They were typically well educated, with 77.5% having at least some college / university education.

During recruitment for Study 1b, 480 respondents accessed the study web pages between 6th February and 2nd July 2014. Respondents who began but did not complete the study, or did not indicate consent on the last page, were excluded. Sixteen cases where respondents indicated their age was under 16 (or did not give that information) were also excluded due to ethical concerns about their capacity to give valid consent. Following this process, 331 remained. The file was then scrutinised for instances of 'extreme data entry'. None were found.

The final sample for Study 1b comprised 78 men and 253 women. Ages ranged from 16 to 82, with a mean of 31.90 years ($SD=13.19$). Participants indicated that they lived in 38 different countries, but the majority were from the United States (41.4% of those answering the question) or the U.K. (30.5%). Most were either students (39.9% of those answering) or employed for wages (38.7%). They were typically well educated, with 70.04% having at least some college / university education.

2.1.3 Procedure. Ethical approval for the study came from the host Department's ethics committee. Participants were recruited through the established personality testing website www.personalitytest.org.uk. This does not actively solicit participants; people come to it through a variety of routes (e.g. web searches for

personality tests; or prompted by a college instructor). The site permits people to complete an online Five Factor personality inventory that then gives them feedback on their scores. These data were not recorded for use in the current study: the website was simply used as a recruitment gateway. After delivery of the feedback, a message was shown inviting people to participate in the current study. Those who clicked on the link provided were then forwarded to the participant information / informed consent page.

The information / informed consent page provided information about the study, which was described as being “intended to look at how the presentation of information on a web page (such as a Facebook page) influences our reaction to it”, and what they would be asked to do. Those who gave their consent for participation indicated this by clicking on a button that then took them to the first page of the experiment. There was a second opportunity to give (or withdraw) consent on the final page of the study, where people were asked whether there was any reason their data should not be used.

Participants first saw the simulated Facebook page, depicting a profile belonging to ‘Stephen Green’. In the experimental (aggressive) condition the adverts with aggression-related content were embedded in the right hand margin of the page; in the control (neutral) condition the four non-aggressive adverts were used. Participants were asked to study the profile and warned they would be asked questions about it later. Once they felt they had looked at it for long enough (there was no time limit), they clicked a ‘continue’ button to proceed.

They were then asked to complete the mood rating questionnaire (POMS subscales), the aggressive cognition measure, and the personal evaluation ratings all

on separate pages. This was followed by a page requesting demographic information, and a final consent question that asked whether their data could be used.

Finally, they were fully debriefed as to the nature and hypotheses of the experiment, and thanked. They were also given the opportunity to sign up anonymously to a mailing list that would be used to disseminate a summary of findings once the study was complete. Very few did so.

2.2 Results

All analyses were performed using SPSS 20.0. Participants' responses on the measures of interest are summarised in Tables 1 and 2. There were small amounts of missing data on several variables, and on the POMS scale scores in particular – it appeared that some respondents had simply left items unanswered when they thought they did not apply to them, rather than selecting the appropriate response. Participants were excluded casewise from analyses involving variables where data were missing, but retained in the analyses for which their data were available.

2.2.1 Results of Study 1a. Hypothesis 1 predicted that participants in the aggressive condition would report having seen more of the aggressive words, and an independent t -test indicated that this was in fact the case ($t_{(247.52)}=5.13, p=.000$). An adjusted t -test was used because a Levene's F test indicated heterogeneity of variance across conditions ($F=62.66, p=.000$) with more variance in the aggressive condition. However, participants in the two conditions did not differ in terms of their POMS Anger-Hostility scores ($t_{(295)}=.34, p=.74$) or ratings of 'Stephen Green' as aggressive ($t_{(322)}=1.71, p=.09$).

Because the score distributions for aggressive cognitions were heavily skewed, violating assumptions of normality, non-parametric Mann-Whitney U -tests comparing the conditions were also conducted as a cautionary measure. These gave an identical

pattern of results to the *t*-tests, with a statistical difference between conditions in terms of aggressive cognition ($U=9495.5, p=.000$) but not Anger-Hostility ($U=10064.5, p=.17$) or aggressiveness ratings ($U=11595.0, p=.06$).

A final analysis was performed to control for any possible confounding role of gender. While the sexes were distributed evenly across conditions (19% male in each condition), there is a large literature on relationships between sex and aspects of aggressiveness. Therefore a two-way ANOVA crossing the factors of Condition (aggressive or neutral) and Sex (male or female) was performed for each of the three dependent variables of interest. For aggressive cognition, there was a significant main effect of Condition ($F_{(1,320)}=16.0, p=.000$) but not Sex ($F_{(1,320)}=1.09, p=.30$). There was no significant interaction ($F_{(1,320)}=.000, p=.98$). For POMS Anger-Hostility there was no significant effect of Condition ($F_{(1,292)}=.02, p=.90$) or Sex ($F_{(1,292)}=.23, p=.63$), nor was there a significant interaction ($F_{(1,292)}=.43, p=.51$). The same was true of aggressiveness ratings, with no significant effect of Condition ($F_{(1,319)}=2.37, p=.13$) or Sex ($F_{(1,319)}=.89, p=.35$) and no interaction ($F_{(1,319)}=.15, p=.70$).

2.2.2 Results of Study 1b. In the replication study, participants in the aggressive condition again reported seeing more aggressive words ($t_{(232,19)}=6.50, p=.000$). An adjusted *t*-test was used because a Levene's *F* test indicated heterogeneity of variance across conditions ($F=77.44, p=.000$) with more variance in the aggressive condition. However, participants in the two conditions did not differ in terms of their POMS Anger-Hostility scores ($t_{(293,46)}=1.38, p=.17$; again using an adjusted test due to higher variance in the aggressive condition – $F=7.86, p=.005$) or ratings of 'Stephen Green' as aggressive ($t_{(325)}=-.13, p=.90$).

Because the score distributions for aggressive cognitions and Anger-Hostility were heavily skewed, violating assumptions of normality, non-parametric Mann-

Whitney *U*-tests comparing the conditions were also conducted as a cautionary measure. These gave an identical pattern of results, with a statistical difference between conditions in terms of aggressive cognition ($U=9208.5, p=.000$) but not Anger-Hostility ($U=11703.5, p=.77$) or aggressiveness ratings ($U=13077.5, p=.73$).

As in Study 1a, a two-way ANOVA crossing the factors of Condition (aggressive or nonaggressive) and Sex (male or female) was performed for each of the three dependent variables of interest. For aggressive cognition, there was a significant main effect of Condition ($F_{(1,327)}=25.88, p=.000$) but not Sex ($F_{(1,327)}=2.16, p=.14$). There was no significant interaction ($F_{(1,327)}=0.21, p=.65$). For POMS Anger-Hostility there was no significant effect of Condition ($F_{(1,305)}=.06, p=.81$) or Sex ($F_{(1,305)}=3.84, p=.051$), but there was a significant interaction ($F_{(1,305)}=4.10, p=.04$). This is shown in Figure 1, and demonstrates that for the neutral condition only, men had higher levels of Aggression-Hostility than did women. For aggressiveness ratings, there was no significant effect of Condition ($F_{(1,323)}=0.18, p=.67$). There was a significant effect of Sex ($F_{(1,323)}=4.22, p=.04$), with men rating 'Stephen Green' as more aggressive ($M=2.74, SD=1.33$) than did women ($M=2.36, SE=1.37$). There was no interaction ($F_{(1,323)}=0.74, p=.39$).

2.3 Discussion

In both Studies 1a and 1b there was evidence that for participants in the aggressive condition, aggressive cognitions were more accessible, as shown by the number of aggression-related words they mistakenly reported having seen. There was no evidence of effects on angry mood (Anger-Hostility) or on evaluations of the simulated profile owner's aggressiveness.

In Study 1b only, the secondary analyses provided some hints of gender effects. Men rated the fictional profile as more aggressive than did women, and in the neutral

condition only reported higher levels of angry mood. Neither of these findings is particularly surprising in the light of extant literature on gender differences in aggressiveness. However, they do not appear to have a bearing on the differences between conditions in priming of aggressive cognition. They are also based on relatively small numbers of men compared to women, and were not replicated across the two studies.

In contrast, the effect of the priming manipulation on aggressive cognition was replicated across the two studies. These findings suggest that exposure to incidental stimuli associated with aggression led to priming of aggressive thoughts. People who had seen the version of the Facebook profile with the violent adverts 'recognised' more words with aggressive connotations. This is consistent with theoretical propositions that activation of a concept such as aggression makes related information more accessible.

The presence of violent vs. nonviolent priming stimuli did not affect participants' reports of Anger-Hostility: the predicted difference in angry mood was not observed. One possible reason for this is that the stimuli were relatively bland in nature. Other work that has demonstrated effects on mood has used stimuli that are more arousing or more likely to evoke an emotional response (for example, violent films, music or games). Furthermore, the presence of aggressive adverts on the profile page did not lead to a change in how the profile owner was perceived in terms of his rated aggressiveness.

It was notable that in the violent condition, there was significantly more variance in the number of aggressive words people 'recognised' than there was in the non-violent condition. One explanation for this arises from individual differences among participants. Bushman (1995) argued that individual differences in trait

aggressiveness arise from differences in the richness and density of associative networks of aggression-related material in memory. People with richer and more frequently activated aggressive networks are likely to be primed more easily. Thus, one might argue that the increased variance in the violent condition was due to individual differences in aggressiveness. The same range of responses would not be seen in the neutral condition, because no priming was taking place.

3. Study 2

In Studies 1a and 1b, individuals differed in the extent to which their aggressive cognitions were affected by the priming manipulation, and it was speculated that this might arise from individual differences in aggressiveness. Accordingly, a followup correlational study was performed to test the hypothesis that among individuals exposed to aggressive primes, those with higher levels of trait aggressiveness would display higher levels of aggressive cognition (Hypothesis 1).

3.1 Method

3.1.1 Materials. The methods for Study 2 were mostly identical to the ‘aggressive’ condition of Study 1: all participants saw the version of the profile with the aggressive adverts in the right hand margin, then completed the mood measure, aggressive cognition measure, and person evaluation measures. However, they were also asked to complete a measure of trait aggressiveness – the AQ12 (Bryant & Smith, 2001), a short version of the widely used Buss-Perry Aggression Questionnaire (Buss & Perry, 1992). In four three-item scales, this provides indices of Hostility (conceived as reflecting cognitive components of aggressiveness), Anger (tendency to experience angry emotions), Physical Aggression (behaving in a physically violent manner) and Verbal Aggression (making verbal threats, arguing) as well as an overall

aggressiveness score. Respondents rated the extent to which each item was characteristic of them using a six point scale anchored at '*Extremely uncharacteristic of me*' and '*Extremely Characteristic of me*'. Reliabilities of each scale fell within the acceptable range in the current sample, and are shown in Table 3.

3.1.2 Participants. Of the 131 participants, 97 were women (74.0%) and 34 were men (26.0%). Reported ages ranged from 16 to 75 years ($M=32.36$, $SD=13.57$). Participants reported living in 21 different countries, with the majority (58.8%) being in the United States followed by the U.K. (15.3%). The largest proportion (41.2%) were students, closely followed by those employed for wages (35.9%). Consistent with this, the modal level of education was 'some college / University' (41.2%) with 74.8% being educated to this level or beyond.

3.1.3 Procedure. The procedure for Study 2 followed the same pattern as Study 1: participants recruited through the personality testing website indicated informed consent, then saw the 'aggressive' version of the simulated Facebook page belonging to 'Stephen Green', featuring the adverts previously rated as reflecting aggression. They were then asked to complete the mood rating questionnaire (POMS subscales), the aggressive cognition measure, and the personal evaluation ratings all on separate pages. This was followed by the AQ12 measure of trait aggressiveness, a page requesting demographic information, and a final consent question that asked whether their data could be used. Finally, they were fully debriefed as to the nature and hypotheses of the study, and thanked.

3.2 Results and Discussion

Analyses were performed using SPSS 20.0. Participants' responses on the key study variables are summarised in Table 3. There were small amounts of missing data on several variables where participants had omitted items. Participants were excluded

casewise from analyses involving variables where data were missing, but retained in the analyses for which their data were available. As in Studies 1a and 1b, the number of aggressive words 'recalled' and POMS Anger-Hostility scores were strongly skewed, with a spread of responses but most participants at the lower end of the distribution.

It was hypothesised (H1) that the number of aggressive words these participants (who had been exposed to aggressive primes) listed as having seen would be associated with their trait aggressiveness. Correlations between the AQ12 scales and the number of aggressive words ticked are shown in Table 4, along with POMS Anger-Hostility scores and evaluation of 'Stephen Green' as aggressive. Given that some of the score distributions were skewed, non-parametric correlations (Spearman's *rho*) are also included.

Table 4 clearly shows that neither the AQ12 overall trait aggressiveness score, nor any of its components, was associated with level of aggressive cognition. These findings are inconsistent with Hypothesis 1. However the trait aggressiveness measures did correlate positively with state Anger-Hostility as measured by the POMS – more characteristically aggressive people reported feeling angrier at that moment in time. This is unsurprising, but boosts confidence that the measures are working as intended. Trait aggressiveness was not associated with evaluations of 'Stephen Green's' own aggressiveness.

4. General Discussion

Studies 1a and 1b showed that exposure to adverts with violent content on a simulated Facebook page increased the number of aggression-related words people erroneously reported they had previously seen, in comparison to participants seeing non-violent adverts. This is consistent with the view that exposure to violent

incidental stimuli can prime aggressive cognition. Effect sizes for these comparisons, with Cohen's d of 0.56 and 0.71 respectively, exceed the threshold suggested by Ferguson (2009b) for "practically" significant effect sizes in social science data ($d=0.41$). These findings suggest that seeing adverts with aggressive content on Facebook really may lead to increases in aggressive thoughts among users. The use of genuine adverts enhances the external validity of the comparison.

With these findings, website adverts join the ranks of assorted violent stimuli that have been shown to prime aggressive cognition. Exposure to television programs, movies, video games and even music (Anderson et al., 2003) with violent content can lead to increases in aggression-related variables in laboratory settings. The same appears to be true of online adverts with violent content. However, a limitation of the current findings is that they can tell us little about whether such adverts affect viewers' behaviour. Critics (e.g. Ferguson, 2009a) dispute the extent to which violent media and games influence violence in society, and the present data can tell us nothing about how violent adverts may lead to actual aggression.

A future direction for research could therefore be to examine 'real world' effects of these stimuli. There is currently considerable concern about online aggression: antisocial trolling, cyberbullying, antagonistic comments and harassment that can sometimes lead to real-world aggression or other harmful outcomes. Given that these behaviors often occur in observable media, it would be possible to investigate whether they could be induced by violent adverts. For example while Kramer et al. (2014) manipulated the content of Facebook users' News Feeds, it would be entirely possible (though perhaps ethically problematic) to manipulate the nature of adverts Facebook users saw and to assess whether exposure to violent adverts led to higher levels of written aggression in the comments they posted online.

However, the priming manipulation did not appear to have an effect on levels of aggressive mood, or on ratings of the target person as being aggressive. Studies 1a and 1b each had 96% power to detect Ferguson's practically significant effect size with $\alpha=.05$. It may therefore be reasonable to suggest that in the real world, it is only thoughts that are likely to be directly primed by aggressive adverts, and not moods or person perception.

The current findings may also have implications for interpreting the Kramer et al. (2014) Facebook study discussed earlier. The present studies found that cognition, rather than mood, was affected by the priming manipulation. This raises the question of whether the same is true of the Kramer et al. findings. Priming negativity should have led to increased accessibility of similarly valenced information—potentially affecting an individual's posting behavior—whether or not it was accompanied by experience of a negative emotional state. It may well be that Kramer et al. actually demonstrated priming of emotion-relevant cognitions, rather than emotional contagion. Of course, the classic neoassociationist perspective adopted in this project does not rule out emotional effects—in fact mood effects are entirely consistent with it. However in this view emotional contagion is not necessarily the cause of the behaviour observed.

In both Studies 1a and 1b, there was notable variance in the extent to which people exposed to the priming manipulation appeared to experience aggressive cognition. Study 2 indicated that this could not be attributed to participants' levels of trait aggressiveness.

What caused variation in priming, if not individual differences in aggressiveness? A potential alternative explanation is the phenomenon of 'banner blindness', whereby it is believed that people avoid looking at online adverts (Hervet,

Guérard, Tremblay, & Chtourou, 2011; Nielsen, 2007). Indeed, feedback from multiple respondents in the studies described here included comments that they didn't pay attention to the adverts (and in real life tried to avoid looking at them). One possibility worth exploring is that there are individual differences in the extent to which people attend to the adverts and process information derived from them. Individual differences in banner blindness could account for the variance in the extent to which aggressive cognitions were primed by the adverts in the aggressive conditions of the studies reported here. This could be a fruitful area for future research, and could be of value in terms of potential implications for the online advertising industry.

5. Conclusions

In conclusion, online adverts with violent content can prime aggressive cognitions among at least some people. Some individuals appeared to be more affected by this than others. The extent to which such priming influences other psychological processes and ultimately behaviour is unclear. However, in a context where there is concern both about online violent content, and antisocially-aggressive online behaviour, the phenomenon documented here may well have real world significance.

Acknowledgements

Data collection in Study 1a was partially supported by contract no. DSTLX1000043811 from the Centre for Defence Enterprise. The sponsor had no other involvement in this paper.

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Table 1
Psychometric Properties of Dependent Variables in Studies 1a and 1b

| Variable | <i>n</i> | <i>M</i> | <i>SD</i> | <i>α</i> | Range | | Skew |
|---|----------|----------|-----------|----------|-----------|--------|------|
| | | | | | Potential | Actual | |
| Study 1a | | | | | | | |
| Aggressive words 'remembered' | 325 | 0.66 | 1.31 | | 0-10 | 0-7 | 2.54 |
| POMS Anger-Hostility | 297 | 2.77 | 4.48 | 0.87 | 0-36 | 0-24 | 1.97 |
| Rating of 'Stephen Green' as aggressive | 324 | 2.35 | 1.30 | | 1-7 | 1-7 | 0.91 |
| Study 1b | | | | | | | |
| Aggressive words 'remembered' | 331 | 0.68 | 1.22 | | 0-10 | 0-6 | 2.06 |
| POMS Anger-Hostility | 309 | 4.02 | 6.18 | 0.92 | 0-36 | 0-31 | 2.03 |
| Rating of 'Stephen Green' as aggressive | 327 | 2.44 | 1.37 | | 1-7 | 1-7 | 1.24 |

Table 2
Comparison of Conditions in Studies 1a and 1b

| Variable | Aggressive Condition | | Neutral Condition | | <i>t</i> | <i>DF</i> | <i>p</i> | 95% CI | Cohen's <i>d</i> |
|---|----------------------|-----------|-------------------|-----------|----------|-----------|----------|---------------|------------------|
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | | | | | |
| Study 1a | | | | | | | | | |
| Aggressive words 'remembered' | 1.02 | 1.57 | 0.31 | 0.85 | 5.13 | 247.52 | .00 | [0.44, 0.99] | 0.56 |
| POMS Anger-Hostility | 2.85 | 4.36 | 2.68 | 4.61 | 0.34 | 295 | .74 | [-0.85, 1.20] | 0.04 |
| Rating of 'Stephen Green' as aggressive | 2.47 | 1.32 | 2.22 | 1.28 | 1.71 | 322 | .09 | [-0.04, 0.54] | 0.19 |
| Study 1b | | | | | | | | | |
| Aggressive words 'remembered' | 1.08 | 1.48 | 0.27 | 0.66 | 6.50 | 232.19 | .00 | [0.57, 1.06] | 0.71 |
| POMS Anger-Hostility | 4.48 | 6.96 | 3.52 | 5.20 | 1.38 | 293.46 | .17 | [-0.41, 2.33] | 0.16 |
| Rating of 'Stephen Green' as aggressive | 2.44 | 1.40 | 2.45 | 1.34 | -0.13 | 325 | .90 | [-0.32, 0.28] | -0.01 |

Table 3
Psychometric Properties of Key Variables in Study 2

| Variable | <i>n</i> | <i>M</i> | <i>SD</i> | <i>α</i> | Range | | Skew |
|---|----------|----------|-----------|----------|-----------|--------|------|
| | | | | | Potential | Actual | |
| Aggressive words 'remembered' | 131 | 0.81 | 1.37 | | 0-10 | 0-8 | 2.24 |
| POMS Anger-Hostility | 128 | 4.05 | 5.79 | 0.91 | 0-36 | 0-36 | 2.30 |
| Rating of 'Stephen Green' as aggressive | 129 | 2.39 | 1.33 | | 1-7 | 1-6 | 1.07 |
| AQ12 Overall | 128 | 29.38 | 11.17 | 0.84 | 12-72 | 12-57 | 0.55 |
| AQ12 Hostility | 129 | 7.64 | 4.12 | 0.78 | 3-18 | 3-18 | 0.54 |
| AQ12 Anger | 130 | 7.15 | 3.75 | 0.77 | 3-18 | 3-18 | 0.86 |
| AQ12 Verbal Aggression | 129 | 7.84 | 3.96 | 0.84 | 3-18 | 3-18 | 0.84 |
| AQ12 Physical Aggression | 130 | 6.00 | 3.54 | 0.71 | 3-18 | 3-17 | 1.13 |

Table 4
Intercorrelations Among Key Variables in Study 2

| Measure | Aggressive words | | | POMS Anger-Hostility | | | Rating of 'Stephen Green' as aggressive | | |
|---|------------------|----------------------|----------|----------------------|----------------------|----------|---|----------------------|----------|
| | <i>r</i> | <i>r_s</i> | <i>N</i> | <i>r</i> | <i>r_s</i> | <i>N</i> | <i>r</i> | <i>r_s</i> | <i>N</i> |
| Aggressive words 'remembered' | - | - | 131 | .05 | .15 | 128 | .10 | .12 | 129 |
| POMS Anger-Hostility | .05 | .15 | 128 | - | - | 128 | .06 | .17 | 127 |
| Rating of 'Stephen Green' as aggressive | .10 | .12 | 129 | .06 | .17 | 127 | - | - | 129 |
| AQ12 Overall | -.03 | .05 | 128 | .37** | .35** | 125 | -.06 | -.02 | 126 |
| AQ12 Hostility | .00 | .03 | 129 | .41** | .35** | 126 | -.16 | -.12 | 127 |
| AQ12 Anger | -.02 | .01 | 130 | .33** | .25** | 127 | -.04 | .04 | 128 |
| AQ12 Verbal Aggression | -.08 | -.01 | 129 | .25** | .19* | 126 | .10 | .16 | 127 |
| AQ12 Physical Aggression | -.02 | .02 | 130 | .14 | .27** | 127 | .01 | .05 | 128 |

* $p < .05$. ** $p < .01$.

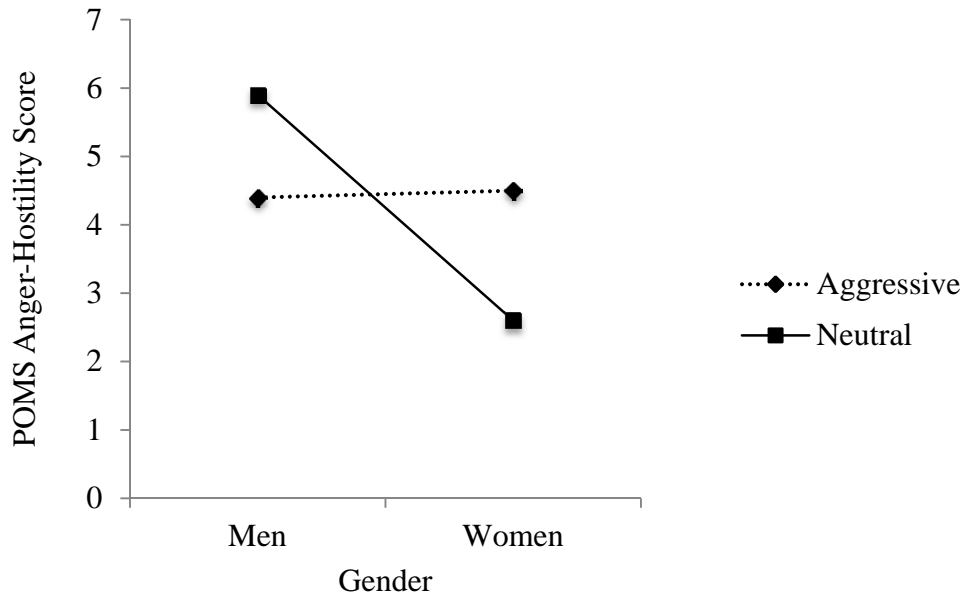


Figure 1. Anger-Hostility scores for men and women across aggressive and neutral priming conditions in Study 1b. In the neutral condition only, men had higher Anger-Hostility scores than women.