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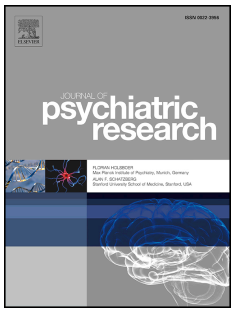

Media use and insomnia after terror attacks in France

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Title Page

Media use and insomnia after terror attacks in France

Short title: Media use and insomnia

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Media use and insomnia after terror attacks in France

Abstract

Direct exposure to traumatic events often precipitates sleep disorders. Sleep disturbance has also been observed amongst those indirectly exposed to trauma, via mass media. However, previous work has however focused on traditional media use, rather than contemporary social media. We tested associations between both traditional and social media consumption and insomnia symptoms following 2015 terror attacks in Paris France, controlling for location and post-traumatic symptomology. 1878 respondents, selected to represent the national French population, completed an internet survey a month after the Bataclan attacks (response rate 72%). Respondents indicated different media use, post-traumatic stress and insomnia. Controlling for demographics, location and PTSD, insomnia was associated with both traditional (β .10 P=.001) and social media use (β .12 P=.001). Associations between social media and insomnia were independent of traditional media use. Interventions targeted at social media may be particularly important following mass trauma.

Key words: Anxiety, Stress Disorders, Post-Traumatic, Terrorism, sleep

Media use and insomnia after terror attacks in France

Introduction

A large body of evidence suggest that stress, and in particular, stress from direct exposure to trauma, is a precipitating factor for sleep disturbance (Bui et al, 2012; Harvey et al, 2003; Sinha, 2016). Studies with war veterans (Lewis et al, 2009) and individuals who experienced missile (Lavie, 2001), terror attacks (Galea et al, 2002, North et al, 199) and natural disasters (Bui et al, 2012, McMillen et al, 2000) found increased difficulty in initiating sleep, returning to sleep after awakening, nightmares, and a general hyperarousal following traumatic events (Germain, 2013; Lavie, 2002; Sinha, 2016). A smaller literature has considered the impact of trauma on sleep amongst those indirectly exposed, primarily through the media. This includes associations between watching TV and dreams (following the Challenger disaster (Terr et al, 1999) , and after 9/11 (Propper et al, 2007)), terror-related TV consumption and general sleep difficulties following missile file in Israel (Soffer-Dudek & Shahar, 2010), and reading internet news and disruptive nocturnal behaviour after the 2011 Great Japan earthquake (Bui et al, 2012). Most of this work has focused on engagement with traditional media; however, research following natural disaster suggests the immediacy and personalization offered by social media may have a greater psychological toll (Goodwin et al, 2013; 2017). As yet, the impact of these social media on sleep disturbance following trauma has been underexplored.

In November 2015 gunmen claiming allegiance to the Islamic State group attacked the Bataclan concert hall and restaurants in St. Denis, Paris, killing 130. Using data from a national survey (Goodwin et al, 2017), we consider the associations between traditional and social

media use following the attack and subsequent insomnia. Because location (physical proximity to attack) has been positively associated with distress (Goodwin et al, 2017) we control for location within vs. outside of Paris. While the relationship between mass trauma and PTSD is complex, insomnia has been associated with acute psychological distress (Sinha, 2016; Germain, 2013, Krakow et al, 2015; Schoenfeld et al, 2012) primarily via the hyperarousal component of PTSD. We therefore report both associations between media use and insomnia, and media use and insomnia, controlling for the impact of post-traumatic symptomology on insomnia. This allowed us to assess the unique association of media use on insomnia, beyond the impact of distress.

Method

A major survey organization (https://www.surveygoo.com/) operates with a network of international panel surveys. We drew participants from their large French panel (approx. 500 000 individuals). Potential participants were sent a web link four weeks after the attacks (week of December 13, 2015) using validated addresses. Participants were selected using random stratified sampling, using weights for key demographic elements (age, gender), to create a nationally approximate representative sample (Supplement 1). 2612 participants were sent the web link; a validation question removed 1.3% respondents, leaving 1878 who fully participated (response rate 72%; Mean age 41.1 [SD 10.8], Median age 43, age range 18-60, 54% female). This compares to a national median age of 41.2 for France in 2015, with 52% female (Statista, n.d.). Surveys took approximately 30 minutes to complete, with participants given account credit for participation which could be redeemed as cash payment. The first survey item required

informed consent to continue. Approval was from the Institutional Review Boards at Ariel University and Warwick University.

Measures

Insomnia was assessed using the Bergen insomnia scale (Pallesen et al. 2008), a six-item, seven-point scale assessing how many days per week, over the previous month, participants had problems with sleep onset, maintenance, early morning waking, non-restorative sleep, daytime impairment and dissatisfaction with current sleep (α = .89). *PTSD* was measured using the recently proposed ICD-11 scale (Cloitre et al, 2013). This scale comprises six items on a five-point scale (α =.91). Questions asked participants how often they had felt nervous, hopeless, restless, depressed, worthless or that everything was an effort since the attacks (*none of the time* to *all the time*). Scales were translated to French by a French specialist in public health. To assess *media use,* respondents indicated number of hours they used each of six media sources in the weekend after the Paris attacks (Friday evening, Saturday and Sunday, 50 hours in total). Nine participants (0.5%), reporting > 50 hours, were excluded. Media use was subsequently coded into 'traditional' media (TV, Radio, Newspaper) and 'social' media use (Twitter, Facebook, Youtube).

Analyses

Preliminary statistical analyses report frequencies of media types used and associations of demographic background variables with different types of media use, PTSD symptoms, and insomnia symptoms including Pearson's Correlations and t-test. A priori multi-collinearity tests

checked multi-collinearity amongst independent variables (Supplementary Table 2). Linear regressions tested associations between media use and insomnia, controlling for age, gender, location (Paris or elsewhere) and PTSD symptoms. All analyses were conducted with SPSS Statistics v. 22.

Results

In the weekend after the attacks TV was the most widely used media, followed by radio and Facebook (Table 1 and Table S2). There were small positive correlations between distress and all forms of media use (Supplementary Table 2). Female respondents reported higher levels of insomnia (Ms 19.08 vs. 14.46, t (1872) = 8.38, P=.001), but there was no significant correlation between age and insomnia (r (1877) = -.04, P=.054).

Media use and insomnia

Figure 1 maps association of each individual media with insomnia, controlling for demographics and PTSD. Associations between media use and insomnia were strongest for the use of TV, Facebook, Youtube and Twitter.

We formed media into two larger groupings: Traditional (TV, Radio, Newspapers) and Social (Facebook, Twitter, YouTube). Table 2 presents associations between demographics, media group use and insomnia, first without then with control for PTSD symptoms. Use of both traditional media and social media were significantly associated with insomnia, even when controlling for age and sex, location and PTSD symptomatology.

Additive contribution of social media in associations with insomnia.

Use of social and traditional media were moderately correlated (r (1578) = .16 p=.001). Table 3 shows the additive effect for social media usage on insomnia, beyond the inclusion of traditional media. Social media had an additional association with insomnia, beyond traditional media use.

Discussion

Research on insomnia following traumatic events has focused on direct exposure to such events (Sinha, 2016). Media consumption, however, may prove significant for the national dispersal of stress beyond those directly impacted. In our data, media use in the immediate aftermath of attacks was significantly associated with insomnia a month after the event. Further, particular types of social media were more strongly associated with insomnia than traditional media formats. This association occurred independently of concomitant PTSD symptoms.

Traumatic events stimulate a fear and stress response that stimulates the hyperarousal that underlies chronic insomnia. Mass media can prime individuals to be more fearful (Ridout et al, 2008), and think more about their mortality (Das et al, 2009). This is only poorly recognised within the current DSM-5 PTSD criteria, which does not include indirect exposure via such mass media. PTSD was higher amongst those Americans who watched more anniversary television a year after the 9/11 attacks (Bernstein et al, 2007). 'Media amplification' can explain stress responses away from the 'bulls-eye' of any event, and may be more strongly associated with stress than direct exposure. In our data exposure (as approximated through location within vs.

outside Paris) failed to have a significant additive effect on insomnia. Further, media use had an impact on psychological distress, controlling for insomnia (Supplementary Table 3), underlining the influence of this distal factor.

'Emotional contagion' between individuals can occur rapidly in social networks (Coviello et al, 2014; Monfort & Afzali, 2015). To the extent to which our anxiety is influenced by the anxiety of others, our results may help explain some of the adverse psychological impact of 'second hand' exposure to events. However, it is only recently that social media has been recognised as a particular risk following trauma (Goodwin et al, 2013). While there was some evidence of peritraumatic responses mediating the association between consumption of internet use and disrupted nocturnal behaviour following the Great Japan Earthquake (Bui et al, 2012), social media platforms such as Twitter and Facebook present a more personal and interactive media, with additional impact on an individual's risk assessment (Lemyre et al, 2010). Social media may offer different interpretations of events to that offered by traditional media, questioning 'official' interpretations and suggesting alternative views on event severity and its consequences (Friedman, 2013). Social media may also be harder to avoid than traditional media, given its tendency to regularly update on personal smartphones. Previous work has focused on the impact of social media on psychological distress; we go one step further to show the impact of media use on insomnia, independent of post-traumatic response. While PTSD and insomnia may often be comorbid, this media use had an additional toll on mental well-being independent of post-traumatic stress. This suggests the need for a 'safe space' application, allowing individuals to filter out potentially negative information across

platforms. Such interventions could also be extended to digital televisions, with TV use also significantly associated with insomnia symptoms.

Sleep disorders after trauma present a particular challenge for clinicians, with problems often persisting after PTSD has been successfully treated (Sinha, 2016; Schoenfeld et al, 2012). While sleep disturbance is considered to be a core symptom of PTSD, insomnia symptoms often also develop in the absence of full-blown PTSD (Sinha, 2016). Sleep disturbance in the aftermath of a traumatic event often precedes the development of PTSD and predict later PTSD-symptom severity (McLay et al, 2010). Therefore, it is possible that disturbed sleep acts as a vulnerability factor for the development of clinical PTSD. While CBT has had some success in improving sleep, there is need for further research into additional interventions to address trauma-associated sleep disturbance (Schoenfeld et al, 2012).

We recognise a number of limitations. Our study had a cross-sectional design, meaning that could not assess sleep pre- and post- trauma to measure predisposing factors for later stress response (Bui et al, 2012; Krakow et al, 2015), or assess whether individuals with pre-existing insomnia symptoms were more prone for media consumption. Moreover, we cannot rule out a general impact of media use on sleep also involving effects of watching screens at night on sleep. Electronic media use in bed at night is associated with sleep disturbance (Lemola et al, 2015), with exposure to the particular spectral composition of light from flat-screens having an alerting effect (Cajochen et al, 2011) that might underlie sleep disturbances. Respondents completed self-reports, which were potentially subject to recall bias, and we lack the clinical interviews necessary to verify diagnoses for either of the two symptom groups. Because of the nature of the survey panel used we cannot be certain that the 27% who did not

175 respond did not differ from our respondents. Effect sizes were small, although in line with
176 others in the literature. Past and present levels of trauma exposure and emotional regulation
177 strategies could also be added as predictors of psychological distress and its consequences
178 (Monfort & Afzali, 2017). The relationship between exposure to mass trauma and PTSD is
179 complex, and other measures of psychological disorder could have been also included. As with
180 other work on the mental health impact of social media use (Cajochen et al, 2011) we need to
181 better understand the impact of quality as well as quantity of social media use on trauma
182 responses and the networks within it is spread (Monfort & Afzali, 2017), particularly given the
183 dynamic and interactive nature of so many of these media. This is likely to be particularly
184 significant when addressing the rumours and 'fake news' that often accompanies threatening
185 events.

186 Understanding the role of mass media in insomnia is likely to have significant clinical
187 implications. Insomnia is an important precursor for posttraumatic conditions, including PTSD,
188 depression or substance dependence (Sinha, 2016). Our work contributes to growing evidence
189 alerting us to the potential problems associated with social media use. Such use may also
190 detract from the formation of other relationships that might enable individuals to better deal
191 with stressful life events (Shahya & Christakis, 2017), including the mental health challenges
192 posed by mass trauma. Findings suggest the need for therapeutic interventions that target
193 social media use, particularly amongst those most vulnerable to distress.

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198 Authors' contributions

199 RG and MBE designed the study, obtained funding and organised data collection in France. RG
200 and SL analysed the data; all authors drafted the initial paper and commented on and approved
201 the final version. We would like to thank Dr. Anne-Cécile Hoyez for her help in translating the
202 inventories, and for helpful comments from two anonymous reviewers.

203

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290 Legend for figure:

291 Figure 1: Associations between individual media use and insomnia, controlling for age,

292 sex, location and PTSD (Standardised Betas).

293

	Mean	**SD**
TV	18.54	14.94
Radio	4.98	7.79
Newspaper	1.98	4.53
Facebook	4.59	8.33
Twitter	0.99	4.50
Youtube	1.40	4.20

Table 1: Reported media use in the fifty hours following Bataclan attacks.

	Traditional media				**Social media**			
	Without PTSD		**Controlling PTSD**		**Without PTSD**		**Controlling PTSD**	
R^2	.06		.18		.05		.17	
	Beta	T (sig)	Beta	T (sig)	Beta	T (sig)	Beta	T (sig)
Age	-.08	-3.07**	-.03	-1.48	-.00	-.03	.02	.94
Sex	.17	7.26***	.15	6.81***	.18	7.21***	.15	6.65***
Location	-.01	-.52	-.04	-1.95	-.01	-.41	-.04	-1.77
PTSD	-	-	.36	15.59***	-	-	.35	15.25***
Media	.15	6.26***	.10	4.31***	.15	5.73***	.12	4.99***

Table 2: Media and insomnia, controlling for age, sex, location and PTSD symptoms: Linear regressions. Data for sex and location was dummy coded, so that higher score indicates female, Paris location.

	Beta	T	P
Model 1: F change (4, 1573) = 76.83 p=.001, R^2 .16			
Age	-.01	-.36	.72
Sex	.15	6.64	.001
Location	-.04	-1.57	.12
PTSD	.36	15.60	.001
Model 2: F change (1, 1572) = 20.33 p=.001, R^2 .17			
Age	-.03	-1.23	.22
Sex	.15	6.50	.001
Location	-.04	-1.78	.08
PTSD	.35	14.81	.001
Traditional media	.11	4.51	.001
Model 3: F change (1, 1571) = 16.16 p=.001, R^2 .18			
Age	.00	-.00	1.00
Sex	.15	6.37	.001
Location	-.04	-1.84	.07
PTSD	.34	14.67	.001
Traditional media	.09	3.62	.001
Social media	.10	4.02	.001

Table 3. Association between social media and insomnia, controlling for traditional media use, PTSD, and demographics

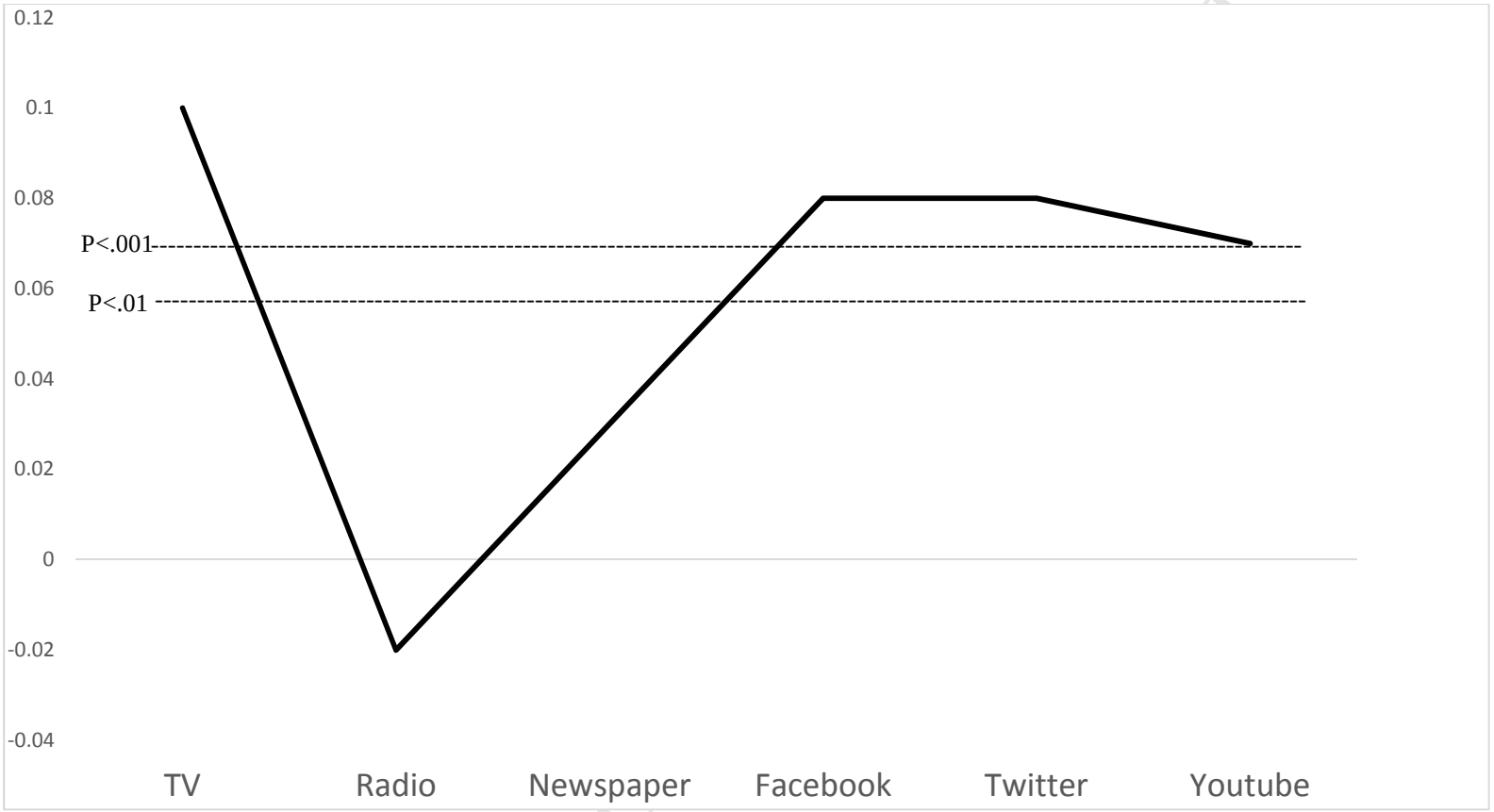

Figure 1: Associations between individual media use and insomnia, controlling for age, sex, location and PTSD (Standardised Betas).

Conflict of interest: None