

## **Internet Filtering Technology and Aversive Online Experiences in Adolescents**

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**Short title:** Internet Filtering and Adolescents

**Abbreviations:** ISP – Internet Service Provider

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## **Abstract**

### **Objectives**

To evaluate the effectiveness of Internet filtering tools designed to shield adolescents from aversive experiences online.

### **Study design**

A total of 1030 in-home interviews were conducted with early adolescents aged from 12 to 15 years ( $M = 13.50$ ,  $SD = 1.18$ ) and their caregivers. Caregivers were asked about their use of Internet filtering and adolescent participants were interviewed about their recent online experiences.

### **Results**

Contrary to our hypotheses, policy, and industry advice regarding the assumed benefits of filtering we found convincing evidence that Internet filters were not effective at shielding early adolescents from aversive online experiences.

### **Conclusions**

Preregistered prospective and randomised controlled trials are needed to determine the extent to which Internet filtering technology supports vs thwarts young people online and if their widespread use justifies their financial and informational costs.

## Introduction

Children and adolescents are spending more time than ever online (1). Between 2005 and 2015 the time British 12-15 year-olds were online increased from 8 to nearly 19 hours weekly (2) raising concerns for parents, educators and politicians about the possible negative experiences children may have online. Though much of the research literature categorises such experiences as 'risky' or 'harmful' (3), a focus on *aversive online experiences*, events that are subjectively judged as unpleasant by individuals experiencing them, may be more accurate (3). Examples of aversive online experiences discussed in research literature are exposure to pornographic content, contact from strangers, bullying or sexting. It can be difficult to classify such experiences as inherently positive or negative. 'Being contacted by a stranger online', for example, may be negative if that stranger is a bully or fraudster, or positive, if another adolescent sharing common interests (4). A growing body of research provides varying accounts of aversive experiences (5–7). Reviews suggest that anywhere between 10% and 40% of adolescents experience online bullying (6), whilst between 10%-33% report receiving sexually explicit texts (7). Although this sounds alarming, pronounced methodological limitations hinder understanding of the wider scope of aversive online experiences. Existing work largely relies on self-report surveys often without convergent reports (8). Such data are liable to influence by so-called mischievous responders (9), participants whose extreme patterns of responding drive spurious correlations (10) and inflate estimates of problematic technology use (11).

Despite this, Internet filtering technologies have long been used in schools and libraries as a means of mitigating adolescents' experiences online (12). In the UK, major British Internet Service Providers (ISPs) now filter new household connections by default. Such technology is costly to develop (13) and maintain (14) but also carries significant informational costs. Even

sophisticated filters over-block legitimate content (15). This is onerous for those seeking information about sexual health, relationships, or gender identity, and might have a disproportionate effect on vulnerable groups such as LGBT teens. Striking the right balance between protecting adolescents and respecting their rights to freedom of expression and information is a formidable challenge (16).

### **Present Research**

Given the costs associated with Internet filtering we might expect clear evidence for its efficacy. However, studies by both Mitchell and colleagues (17) and Fleming and colleagues (18), indicate that home Internet filtering is uncorrelated with adolescents encountering inappropriate material, and other work reports only modest effects (19). Given advances in filtering technology, we might now expect evidence affirming the efficacy of Internet filtering in preventing unwanted exposure to aversive online experiences. The present study assessed the effectiveness of network-level Internet filtering. We hypothesised that adolescents living in households where caregivers use filtering will be less likely to report having aversive online experiences in the past year. Further, given that some young Internet users are more technically skilled than others (20), we predicted that effectiveness of filtering technology curbing aversive online experiences would be diminished for young people technically able to circumvent the technology.

### **Methods**

#### **Participants**

This study analysed data from a total of 1,030 in-home interviews with 515 adolescents (258 females) ranging in age from 12-15 years ( $M = 13.50$ ,  $SD = 1.18$ ) and an equal number of caregiver respondents collected as part of Ofcom's Children and Parents Media Use and

Attitudes Report (21,22). Interviews were conducted between April and June of 2015 and participating households were selected, at random, using a stratified sampling approach based on a joint distribution of U.K. census and geographic data. Sampling units were determined by defining the number of households present in a set geographic area and participants were identified within these units using stratified quotas based on age and gender of adolescents and the socio-economic status of the households. Structured interviews were conducted separately for caregiver and children in their homes. All code and relevant study materials are available for download using the Open Science Framework (23).

## **Measures**

**Internet Filtering.** Parents were asked if they used technical tools to control or manage their child's access to online content. Specifically, they were asked if they use: "Content filters provided by your broadband Internet service provider (e.g. BT, TalkTalk, Sky and Virgin Media) where the filters apply to ALL of the computers or other devices using your home broadband service (also known as home network filtering)". One third of parents (115, 34% of valid responses) parents said they used this technology and two-thirds (277, 66%) said they did not. A total of 123 parents (24%) did not know or were unaware of these technologies on the day of the interview. Exploratory analyses indicated that lack of knowledge about filtering use was not associated with children's age, gender, or whether they lived in an urban or rural area.

**Aversive Online Experiences.** Adolescents were asked about their experiences online in the past year. A list of seven negative experiences ranging from "seeing something of a sexual nature that made you feel uncomfortable" to "Seeing or receiving something troubling online like a scary video or comment or something that makes you feel scared." Nearly one in six (71, 14.5%) reported at least one significant aversive experience online.

**Filter Circumvention.** Adolescents were also asked about their technical competencies, whether they knew how to: “Unset any filters or controls that are there to stop certain websites being viewed (49, 9.6% reported that they felt competent at being able to work around home network filtering).

## Results

### Preliminary Analyses

Table 1 presents the observed frequencies of seven aversive online experiences for participants; Table 2 shows the results from zero-order bivariate analyses. Identifying as female (coded 1) was positively associated with reporting receiving troubling communication, being contacted by a stranger, or feeling under pressure to send photos or personal information online. Older adolescents reported at least one negative experience, yet analyses did not show any differences in filtering by gender or knowledge about how to circumvent Internet filters observed. In nearly all cases, save the interrelations between difference forms of aversive online experiences, these correlations were modest.

### Primary Analyses

**Internet Filtering.** The primary hypothesis concerned the effectiveness of network-level Internet filtering in reducing exposure to aversive online experience. Given dichotomous data, contingency tables evaluating the effects of Internet filtering used two statistical methods. First, Null-Hypothesis Significance Testing (NHST; i.e., chi-squares) was used to determine whether there were statistically significant differences between filtered and non-filtered households. Second, Bayesian hypothesis testing using the default prior quantified the extent to which our data supported our versus the null hypothesis. For each comparison, a Bayes Factor (BF), a ratio of evidence supporting the null ( $BF_{01}$ ) and alternative ( $BF_{10}$ ) hypothesis was computed. If

observed BF for the alternative (i.e.,  $BF_{10}$ ) were 3.00 or above, we considered the alternative hypotheses to be supported; if BFs were 0.33 or below, we considered the null hypothesis to be supported. If BFs fell between 0.33 and 3.00, we considered the results equivocal (24,25). Results from these analyses did not support our hypothesis regarding Internet filtering. No chi-square tests rejected the null in the direction predicted. Contrary to our prediction, adolescents were *more* (not less) likely to report feeling pressure to share if caregivers reported using filters ( $p = 0.035$ ). BF evidence provided equivocal to strong evidence supporting the null over what was hypothesized ( $BF_{s01} = 1.44$  to  $12.29$ ).

**Filter Circumvention.** Our second hypothesis concerned whether knowing how to circumvent network-level Internet filtering impacts their effectiveness. Results derived from both NHST and BF tests did not support this prediction (all  $ps > 0.099$ ;  $BF_{s01} = 2.18$  to  $8.51$ ).

### Discussion

There is a clear presumption that household-level Internet filtering is an effective form of online protection by professional and policy organizations (26). This position may be justified by the ‘precautionary principle’, the view that policy should err on the side of caution in the face of uncertain evidence, particularly where potentially vulnerable groups risk harm (27). Given the social and financial costs associated with filtering, it is important to reassess the value of this position when as evidence emerges. This is particularly true when evidence, such as that reported here, informs the balance of potential costs and benefits of filtering. Contrary to expectations we found equivocal to strong evidence that caregivers’ use of Internet filtering technology did *not* reduce the chance of adolescents having recent aversive online experiences.

We have a degree of confidence that the relations observed from this study are not an artefact of erroneous information provided by those motivated to misstate the salutatory impact

of filters (9). That said, the results may be influenced by the extent to which Internet access is ubiquitous outside the home (28) and the adolescent participants might have blushed at admitting aversive events online to an adult interviewer. However even if the adolescents interviewed are recalling aversive online experiences that took place outside the home, this suggests the policy emphasis on household-level filtering is ineffective. Indeed, the availability of mobile Internet use (29) suggests that teenagers must be educated, supported and trusted to use devices responsibly outside the home. Despite the installation of family-friendly filters on public WiFi networks, and mobile operators' provision of 'walled gardens' of content over mobile networks to minor users, it is hard to rule out the possibility of aversive experiences online. To attain this goal a broader array of public measures may be needed. The formidable challenge of preventing all aversive experiences underlines the importance of helping parents, carers, and educators to support children and adolescents in developing the resilience to manage such experiences. Promising strategies worthy of further research include studying how family and interpersonal dynamics serve to mediate or moderate technological tools and meaningfully inform policy-based interventions.

The evidence we presented fails to provide support for governmental and industry advice regarding the assumed benefits of filtering for protecting minors online. There are non-trivial economic, informational, and human rights costs associated with filtering that need to be balanced against any observed benefits. From an economic perspective, the costs of setting up and maintaining household-level filtering programmes (even if initially free at the point of use) will most likely be borne eventually by consumers, but our data suggests that demonstrating cost-effectiveness would be difficult. Of greater concern is the opportunity cost of over-blocking, which cannot be measured here. Such an opportunity cost would include the legitimate but

blocked searches for information on important issues such as alcohol or drugs, sexual relationships, health and identity, as well as the ‘chilling effects’ potentially resulting in self-imposed censorship in response to evident filtering. Whilst it may be the case that the installation of filtering in households provides reassurance for parents and carers, even this perceived benefit could be undermined by the findings presented here. On the basis of the evidence at hand it is thus hard to justify the assumption that the benefits of household-level Internet filtering outweigh these costs. We strongly suggest that more evidence is needed, necessitating a carefully designed randomised controlled trial with a significant sample of households signing up for Internet services (30).

### **Limitations and Avenues for Future Research**

The limitations of our study highlight areas where high quality science is needed to study Internet filtering. First, the data in this study are cross-sectional, we suggest prospective studies could provide needed detail about how exposure to online aversive experiences vary over time and would provide insights into experiences after the installation of filtering. Although we recognise that ethical and privacy concerns limit researchers’ ability to collect Internet history, particularly for adolescents, it is desirable to move beyond self-report data. Second, our study says little about the parents who did not know if they used Internet filtering. Although this was not associated with variables we observed, future research would do well to verify if a household uses filters as part of their designs. Third, this study cannot provide any data about the positive information or experiences which filtering unnecessarily blocks. Finally, any future research seeking to test the efficacy of Internet filtering for young users should consider both over- or under-blocking to ensure a balanced assessment of costs and benefits.

### **Closing Thoughts**

The Internet is now a central fixture of modern life. The positives and negatives of online Internet use need to be balanced by caregivers, and scientific evidence can help inform their decision making. Internet filters have been adopted as a tool for limiting the negatives, however evidence of their effectiveness is dubious. We conducted our study to address this uncertainty and we failed to find convincing evidence that Internet filters were effective at shielding early adolescents from aversive experiences online. Instead, we found convincing evidence they were not effective in our sample. Given this finding, we propose that evidence derived from a randomised controlled trial and registered research designs (30) are needed to determine how far Internet filtering technology supports or thwarts young people online. Only then will parents and policy-makers be able to make an informed decision as to whether their widespread use justifies their costs based on sound scientific evidence.

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AKP and VN are the sole authors of this work. AKP designed the analytic approach, both interpreted the findings and wrote the draft and final versions of the manuscript as submitted.

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**Table 1: Frequency of Aversive Online Experiences Reported By British Adolescents.**

	Overall		Gender		Age		
	Total	Boys	Girls	12 y	13 y	14 y	15 y
Another person pretending to be you online %	4.3	4.7	4.0	4.2	5.1	3.3	4.8
Another person using your password to get at your information %	3.9	3.4	4.4	3.2	2.9	2.0	7.6
Seeing something of a sexual nature that made you feel uncomfortable %	2.0	1.3	2.6	3.1	0.9	1.2	2.7
Seeing or receiving something troubling online like a scary video or comment or something that makes you feel scared %	3.2	1.3	5.0	1.8	2.9	5.1	2.8
Being cheated out of money online %	1.5	1.4	1.7	0.6	1.9	1.0	2.7
Being contacted by someone you don't know online who wants to be your friend %	8.1	5.3	10.9	4.8	5.6	9.1	12.9
Feeling under pressure to send photos or other information about yourself to someone %	1.8	0.0	3.7	0.7	0.9	3.0	2.6
Had at least one significant negative experience online in past year.	14.4	12.4	16.5	11.5	10.7	12.3	23.2

*Note.* Percentages reflect adjusted and valid proportions of adolescents reporting significant aversive experiences online in the past year weighted by representativeness across the United Kingdom.

**Table 2: Zero-order correlations between observed variables.**

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Age	--	.049	-.076	.116**	-.001	.072	-.008	.033	.049	.113*	.066	.117**
2. Female		--	.071	-.063	-.017	.024	.047	.107*	.009	.103*	.137**	.057
3. Internet Filtering			--	-.021	-.001	-.052	.064	.054	.050	.069	.111*	.101*
4. Technical Ability				--	-.021	-.001	-.052	.064	.054	.050	.069	.111*
5. Being impersonated online					--	.418**	.218**	.205**	.403**	.210**	.149**	.519**
6. Personal information taken						--	.267**	.299**	.271**	.268**	.227**	.491**
7. Uncomfortable sexual content							--	.240**	.252**	.185**	.359**	.346**
8. Troubling online content								--	.198**	.315**	.294**	.440**
9. Cheated out of money									--	.288**	.126**	.305**
10. Contacted by stranger										--	.340**	.723**
11. Pressured to share											--	.332**
12. Any aversive event												--

*Note.* For Female, male participants coded 0, female participants coded 1. Correlation coefficients weighted by representativeness of participants across the United Kingdom general population. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table 3. Chi-Square and Bayes Factor Contingency Tables.**

Aversive Online Experience	Can Disable Filters	Internet Filter Used	Aversive Online Experiences		Contingency Chi-Square $\chi^2$	Significance Test $p$	Joint Multinomial Bayes Factor Test	
			No	Yes			(BF <sub>01</sub> )	(BF <sub>10</sub> )
Being Impersonated Online	No	No	197	30	0.29	0.591	9.70*	0.10
		Yes	74	21				
	Yes	No	24	8	1.21	0.272	3.00*	0.33
		Yes	9	3				
	Overall	No	226	38	0.01	0.922	12.29*	0.08
Yes	84	24						
Personal Information Taken	No	No	216	11	0.46	0.498	10.95**	0.06
		Yes	92	3				
	Yes	No	29	3	1.21	0.272	3.00*	0.17
		Yes	12	0				
	Overall	No	250	14	1.12	0.290	8.51*	0.04
Yes	105	3						
Exposed to Uncomfortable Sexual Content	No	No	222	5	2.09	0.149	5.28*	0.19
		Yes	90	5				
	Yes	No	32	0	N/A	N/A	8.01*	0.13
		Yes	12	0				
	Overall	No	259	5	2.19	0.139	5.81*	0.17
Yes	103	5						
Exposed to Troubling Content	No	No	220	7	0.89	0.346	8.38*	0.12
		Yes	90	5				
	Yes	No	31	1	0.55	0.460	3.25*	0.31
		Yes	11	1				
	Overall	No	256	8	1.35	0.245	7.25*	0.14
Yes	102	6						
Cheated out of Money	No	No	225	2	0.82	0.366	14.16**	0.07
		Yes	93	2				
	Yes	No	31	1	0.55	0.460	3.25*	0.31
		Yes	11	1				
	Overall	No	261	3	1.30	0.254	10.98**	0.09
Yes	105	3						
Contacted by Stranger	No	No	212	15	1.44	0.231	4.65*	0.22
		Yes	85	10				
	Yes	No	26	6	0.21	0.647	2.25	0.44
		Yes	9	3				
	Overall	No	243	21	1.54	0.215	4.45*	0.23
Yes	95	13						
Pressured to Share	No	No	224	3	2.63	0.105	4.99*	0.20
		Yes	91	4				
	Yes	No	32	0	2.73	0.099	2.18	0.46
		Yes	11	1				
	Overall	No	261	3	4.45	0.035	2.51	0.40
Yes	103	5						
Any Aversive Experience	No	No	197	30	3.97	0.046	1.04	0.97
		Yes	74	21				
	Yes	No	24	8	0.00	1.000	2.42	0.41
		Yes	9	3				
	Total	No	226	38	3.38	0.066	1.44	0.70
Yes	84	24						

*Note.* Values reflect observed proportions of aversive online experiences in the past 12 months. N/A denotes not applicable as there were insufficient values to compute contingency table values. P-values below 0.05 were treated as statistically significant. Bayes Factors (BF) for evidence favoring the Null hypothesis (BF<sub>01</sub>) and the alternative hypothesis (BF<sub>10</sub>) are presented above. BFs with marked with \* provided evidence moderately supporting this hypothesis whereas BFs marked with \*\* provided strong evidence supporting this hypothesis (30,31).