



When adolescents receive sexual messages on the internet: Explaining experiences of risk and harm [☆]



Sonia Livingstone ^{a,*}, Anke Görzig ^{a,b}

^aLondon School of Economics and Political Science, UK

^bInstitute of Psychiatry, King's College London, UK

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ABSTRACT

This article reports new findings on the incidence of risk and the associated experience of harm reported by children and adolescents aged 11–16, regarding receipt of sexual messages on the internet (known popularly as *sexting*). Findings showed that the main predictors of the risk of seeing or receiving sexual messages online are age (older), psychological difficulties (higher), sensation seeking (higher) and risky online and offline behavior (higher). By contrast, the main predictors of harm resulting from receiving such messages were age (younger), gender (girls), psychological difficulties (higher) and sensation seeking (lower), with no effect for risky online or offline behavior. The findings suggest that accounts of internet-related risks should distinguish between predictors of risk and harm. Since some exposure to risk is necessary to build resilience, rather than aiming to reduce risk through policy and practical interventions, the findings can be used to more precisely target those who experience harm in order to reduce harm overall from internet use.

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1. Introduction

Public, policy and research attention has recently been paid to the peer-to-peer exchange of sexual messages using digital technologies (known popularly as *sexting*). Such messages may be created and exchanged via text or image messaging on mobile phones, though they also include peer-to-peer messaging on diverse internet-enabled devices, particularly using social networking sites and instant messaging services. Although in some respects now part of the fun, flirtation and identity-experimentation central to teenage culture (Buckingham & Bragg, 2004; Hope, 2007; Ringrose, Gill, Livingstone, & Harvey, 2012; Willett & Burn, 2005), this exchange of sexual messages is attracting considerable public anxiety, amplified by the often exaggerated media coverage of particular cases (Draper, 2012; Haddon & Stald, 2009). This anxiety arises partly because of aggressive or coercive nature of some messages (for links with sexual harassment, see Burgess-Proctor, Patchin, & Hinduja, 2009; Salter, Crofts, & Lee, 2013; for links with grooming, see Palmer & Stacey, 2004), and partly even if voluntary, some images involved are sufficiently explicit as to be potentially illegal (Albury,

Crawford, Byron, & Mathews, 2013; Arcabascio, 2010; Sacco, Argudin, Maguire, & Tallon, 2010; Willard, 2010).

Considerable research efforts are underway to progress beyond the moral panic (Cricher, 2008) associated with the exchange of sexual messages so as to identify appropriate policy responses. This is urgent insofar as children and young people are adopting digital communication technologies rapidly, often far ahead of the adults charged with their safety and well-being.

Thus far, researchers have struggled to agree on matters of definition and measurement, although this is vital if research is to produce robust evidence regarding prevalence, distribution and consequences (Lounsbury, Mitchell, & Finkelhor, 2011). In consequence, survey findings vary widely, ranging from a reported 7% (Mitchell, Finkelhor, Jones, & Wolak, 2012) to 15% (Lenhart, 2009) to as many as 48% (National Campaign to Support Teen & Unplanned Pregnancy, 2008). Qualitative research adds further complications. Some studies find that adolescents' own accounts emphasize the willing exchange of messages between romantic partners, typically involving self-generated images (Lenhart, 2009). They recognize that some adolescents who send and receive sexual messages find it fun or flirtatious, and it may even be seen as a form of creative media production (Hasinoff, 2012). Others distinguish primary from secondary sexting, arguing that different contexts apply to the voluntary creation and sending of a sexual image between partners and the subsequent circulation of such an image beyond the control of its creator (Lievens, 2012). Yet others recognize that there can be different forms of sexting, some

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* Corresponding author. Address: Department of Media and Communications, Houghton Street, London, WC2A 2AE, UK. Tel.: +44 020 7955 7710.

E-mail address: S.Livingstone@LSE.ac.uk (S. Livingstone).

harmful and some not (or, as Wolak & Finkelhor, 2011, term it, aggravated and experimental).

Thus, while some studies of 'sexting' focus on the mere exchange of sexual messages, others build in an assumption of harm (by focusing on the exchange of unwelcome or hurtful sexual messages). These latter tend to regard the production and circulation of such messages as the digital extension of the long-standing coercive pressure on girls, typically exerted by boys in their peer group, to conform to particular sexual expectations (Albury et al., 2013; Ringrose et al., 2012; Sevcikova, Simon, Daneback, & Kvapilík, 2012). Some who create and send sexual images feel pressured to do so (National Campaign to Support Teen & Unplanned Pregnancy, 2008) or are upset either on receiving such messages or when sexual messages they have created are circulated beyond the intended recipient (Phippen, 2012).

Consequently, it is helpful to differentiate the prevalence of sexual messaging (which, as suggested by surveys, encompasses a sizable minority of adolescents) from reported responses (which, qualitative research suggests, are negative only for a further subset of those who see or receive such messages). To understand this distinction better, we draw on theories of risk (Aven & Renn, 2009; Breakwell, 2010) to distinguish risk (defined as the occurrence of an event which is associated with a probability of harm) from harm (defined as actual physical or mental damage as reported by the person concerned).

At present, awareness-raising initiatives tend to address all children and young people, creating the perception of a widespread problem. Possibly it would help diffuse public anxiety if research could resolve the uncertainty regarding which adolescents are likely to encounter sexual messages or to be harmed as a result, enabling better targeting of safety initiatives to focus on the minority particularly at risk of actual harm. To progress this, we observe that although the internet-enabled technologies are a relatively recent addition to adolescents' lives, much is already known regarding their vulnerability to risk in other domains (Donovan & Jessor, 1985; Jessor, 1991; Rutter, 1987; Schoon, 2006). Thus we turn to the well-established literature regarding risk and protective factors when examining the relatively new phenomena of such online risks as sexual messaging. Having argued above that risk and harm must be distinguished, it follows that the (offline) factors that influence adolescents' well-being can have two distinct effects – on the likelihood of encountering risk and/or on the likelihood that a risk encounter is experienced as harmful.

2. Explaining (online) risk and harm

Adolescence is characterized by the tension between dependence and independence. Adolescents are motivated to assert their desires and exercise their abilities, both means of building resilience, but this faces them with a host of personal, relational and educational demands that test their competences and reveal their continuing need for support. Psychological, social and economic advantage or disadvantage is particularly likely to impact on well-being and life chances during adolescence, with some young people experiencing more risks than others, and with one form of disadvantage tending to compound another (Currie et al., 2008; Feinstein & Sabates, 2006; Schoon, 2006). Adolescence is also the life stage in which young people experiment with identity and sexuality, including testing themselves against the adult-created boundaries designed to keep them safe (Coleman & Hagell, 2007). Characterized as a period of increased risk-taking (e.g., Burke et al., 1997; van Nieuwenhuijzen et al., 2009), this too contributes to vicious or virtuous circles, with those engaging in one type of risk behavior being more likely to engage in others (e.g., Guilamo-Ramos, Litardo, & Jaccard, 2005; Rice et al., 2012).

Recent approaches to the analysis of adolescent risk propose moving away from interventions designed for specific risk behaviors to embrace a more integrative approach focused on risk behaviors in general (Hale & Viner, 2012; Jackson, Henderson, Frank, & Haw, 2012). These are based on the notion of a general underlying risk factor, and assume that the personality or behavioral factors that lead people to engage in any one type of risk behavior will enhance the propensity to risks in general (Donovan & Jessor, 1985; Jessor, 1991). An influential personality factor associated with adolescent risk behavior is sensation seeking. Defined as the dispositional tendency to seek out new experiences, this is linked to a lack of inhibition and an attitude of risk-taking (Stephenson, Hoyle, Palmgreen, & Slater, 2003; Zuckerman, 1979, 1994). The motivational inclination of sensation seekers to look for new opportunities is associated with puberty-specific, maturational changes including sexual interest and emotional intensity (Steinberg et al., 2008). Sensation seekers find risky experiences more pleasurable and, in turn, this may contribute to resilience; conversely, those lower in sensation seeking are less likely to seek sensation-enhancing experiences and may be more easily upset when they encounter them (Farmer et al., 2001; Smith, Ptacek, & Smoll, 1992).

Also linking risk and harm, adolescents' psychological difficulties (such as emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship problems as measured by the Strengths and Difficulties Questionnaire, SDQ; Goodman, Ford, Simmons, Gatward, & Meltzer, 2003; Goodman, Meltzer, & Bailey, 1998) are associated with offline risks, online risks, and harm, apparently because they are associated with aggression and anxiety (Petermann, Petermann, & Schreyer, 2010; Sobanski et al., 2010) as well as disinhibition (SDQ total score: Minnis, Rabe-Hesketh, & Wolkind, 2002; SDQ hyperactivity and conduct problems subscales: Enoch, Steer, Newman, Gibson, & Goldman, 2010). Adolescents with psychological difficulties are more likely to encounter, or seek out risks online (Wells & Mitchell, 2008) and to employ maladaptive coping styles (Thabet, Tischler, & Vostanis, 2004), suggesting that psychological difficulties may not only predict risk but also vulnerability to harm in consequence.

In terms of behavioral factors predicting risk online, the nature of the internet itself adds a further complication. The interactional distance it inserts between people, the ambiguity of its social norms, and the promise of exciting new opportunities online have combined to support risky youthful practices such as making one's personal information public, looking for new contacts online, or pretending to be a different kind of person online (Baumgartner, Valkenburg, & Peter, 2010a; Livingstone, 2008).

Supporting the idea of a common factor underlying various kinds of adolescents' risk behaviors, it is generally assumed (although little demonstrated) that those who encounter risks offline are more likely to encounter risks online. This focus on propensity to risk recognizes the influence of personality (psychological difficulties, sensation seeking) and behavioral (risk-taking) factors which apply across domains, including across the offline/online boundary. Qualitative research has already shown that this boundary is much less salient to youth than to adults (boyd, 2008; Orgad, 2007). The hypothesis that those who encounter offline risks are more likely to encounter online risks, whether because of their personality or behavior, is supported by survey evidence (e.g., Palfrey, boyd, & Sacco, 2008; Wolak, Finkelhor, & Mitchell, 2008), clinical reports (Delmonico & Griffin, 2008; Mitchell & Wells, 2007; Palmer & Stacey, 2004), policy analysis (Byron, 2008) and criminal cases (CEOP, 2013).

It is less clear whether the same factors that shape encounters with online risks also influence whether such risks result in harm. Supporting the idea that the same factors influence risk and harm,

evidence suggests that adolescents with more psychological difficulties are both more likely to encounter risk online and also to be more vulnerable to harm associated with that risk (e.g. Wells & Mitchell, 2008; Wolak et al., 2008). On the other hand, supporting the idea that risk and harm require different explanations is the finding that, while sexual messaging is received by girls and boys equally, it is experienced more often as harassment by girls than by boys (Ringrose et al., 2012; Ybarra & Mitchell, 2008). Moreover, when risk is encountered as a result of greater sensation-seeking, that same orientation which leads to an increase in risk (Brady & Donenberg, 2006; Dowell, Burgess, & Cavanaugh, 2009; Slater, 2003; Slater, Henry, Swaim, & Cardador, 2004) may also enable adolescents to build resilience, thus reducing the likelihood of harm (Hasebrink, Görzig, Haddon, Kalmus, & Livingstone, 2011; Livingstone, Haddon, & Görzig, 2012; Valkenburg & Peter, 2008).

3. Hypotheses regarding risk and harm associated with receiving sexual messages

Although the literature on online risks is growing, there is still insufficient basis to ground detailed hypotheses on the basis of an agreed theoretical framework. However, the above discussion offers a tentative ground to formulate some hypotheses regarding the possible influence of psychological difficulties and sensation seeking which are consistent with the literature on adolescent risk as well as emerging findings on internet use. Additionally, the claim of a common risk propensity leads us to hypothesize that those who encounter more offline risks (for example, drinking excessive alcohol or getting into trouble with the police) will also encounter more online risks. Although there is little theory linking risk to the demographic variables of age and gender, we include these variables in our analysis because surveys suggest that the exchange of sexual messages is more common among older than younger adolescents and more problematic for girls (Baumgartner, Valkenburg, & Peter, 2010b; Ybarra & Mitchell, 2008), and because of findings linking risk-taking to boys (Brady & Donenberg, 2006; Byrnes, Miller, & Schafer, 1999).

It seems likely also that the nature of adolescent internet use matters, since young people who engage in more online activities encounter more risks as well as more opportunities (Livingstone & Helsper, 2010), possibly because they search more widely or have developed more digital skills. Although there is no easy line to be drawn between generally risky activities and those that carry a specific risk of harm, it may be that those who practice risky online activities (including identity and communication-related activities for which established norms of conduct and safety are undeveloped) also encounter more online risks. If so, as for sensation seeking or, indeed, risky offline activities, this increased exposure to risk may result in resilience rather than harm. Although such a hypothesis must remain tentative, we considered this worthy of investigation, partly because providing guidance on risky online activities has been and could yet be the focus of awareness-raising and safety guidance.

As argued above, it is important to examine the influence of these factors on both risk (here, operationalized as receiving sexual messages online) and harm (operationalized as being upset by such messages). It is a strength of our study that, having measured these separately, we can examine the influence of the same factors on both. Thus we anticipate that higher psychological difficulties will be associated with higher risk and more harm, and that offline risk-taking, online risky activities and sensation seeking will be linked to more risk but less harm (insofar as repeated encounters with risk can build resilience). We also include in the analysis

the variables of age, gender and internet use (operationalized as range of online activities) in order to control for and explore their effects before examining the variables of interest. Acknowledging the limited evidence base on which to ground our analysis, we hypothesize as follows:

H1. Adolescents are more likely to receive sexual messages online when they:

- Are higher in psychological difficulties
- Are higher in sensation seeking
- Engage more in risky offline activities
- Engage more in risky online activities

H2. Adolescents are more likely to be upset by receiving sexual messages online when they:

- Are higher in psychological difficulties
- Are lower in sensation seeking
- Engage less in risky online activities
- Engage less in risky offline activities

4. Method

4.1. Participants and procedure

A random stratified sample of approximately 25,000 internet-using European children aged 9–16 years were interviewed at home during spring and summer 2010. Interviews were conducted face-to-face for questions about internet access and use, with private completion for sensitive questions, including those on sexual messages. This was managed either via a pen-and-paper questionnaire which the respondent put into a sealed envelope, or using a portable computer handed to the respondent so that neither interviewer nor parent could see their answers, depending on the technology available to fieldworks in different countries. Questions about sexual messages were posed only to 11–16 year olds, with a core sample size of 18,709 (50% girls/boys). For full details of sampling and procedures, see Livingstone, Haddon, Görzig, and Ólafsson (2011) and Görzig (2012).

4.2. Dependent measures

4.2.1. Risk (receiving sexual messages online)

Respondents received the following introduction: “[People] may send sexual messages or images. By this, we mean talk about having sex or images of people naked or having sex. In the past 12 months, have you seen or received sexual messages of any kind on the internet?” The risk measure of receiving sexual messages was coded “1” for those who responded “yes” and “0” for those who had responded “no”. Non-respondents (answering “don’t know” or “prefer not to say” to any measure) were excluded from the analyses resulting in a sample size of $n = 15619$.¹

Fifteen per cent ($n = 2214$) of 11–16 year olds indicated that they had received sexual messages on the internet.²

¹ Missing values were less than 5% for each of the covariates and therefore not considered to cause bias in estimates. The dependent variable showed 15% missing values for risk and 11% missing values for harm. We decided against using imputation techniques to account for missing values in the dependent variables as these have shown to bias estimates when applied to dependent variables (Von Hippel, 2007). However, missing data in the dependent variable does not lead to biased estimates if sufficient covariates (as in our analysis) are included in the model (Sterne et al., 2009). Hence, we concluded that our results would be least and not substantially biased if complete case analyses were performed.

² This and the following analyses were performed on unweighted data.

4.2.2. Harm (from receiving sexual messages)

Those who had received sexual messages online were further asked: “In the last 12 months, has any sexual message that you have seen or received bothered you in any way? For example, made you feel uncomfortable, upset, or feel that you shouldn’t have seen it?”

The measure for harm from receiving sexual messages was coded “1” for those who responded “yes” and “0” for those who had responded “no”. Missing values were excluded from the analyses resulting in a sample size of $n = 2036$. Twenty-four per cent ($n = 519$) of those who had experienced sexual messaging online indicated that this experience had upset them.

4.3. Independent measures

4.3.1. Demographic and psychological factors

Demographic variables were age (11–16 years) and gender (50% girls). We employed two psychological measures which showed good internal consistency for the EU Kids Online sample as a whole. (1) *Sensation seeking*, a two-item version of the Sensation Seeking Scale-Form V (SSS-V; Stephenson et al., 2003): 2 items, $r = .64$, $p < .001$. (2) *Psychological difficulties*, adapted from Goodman’s (1998) SDQ using items measuring psychological difficulties only: 16 items, $\alpha = .71$; for scale properties of the adapted psychological scales, see Livingstone et al., 2012). Items for sensation seeking and psychological difficulties were measured on a scale from 1 (“not true for me”) to 3 (“very true for me”) and averaged within the sample of 11–16 year olds ($N = 18\,709$), (sensation seeking: $M = 1.39$; $SD = .53$; psychological difficulties: $M = 1.40$, $SD = .25$).

4.3.2. Online activities

Respondents were asked about behavior in the previous month, based on the number out of 17 options: “Used the internet for school work”, “Played internet games on your own or against the computer”, “Watched video clips”, “Visited a social networking profile”, “Used instant messaging”, “Sent/received email”, “Read/watched the news on the internet”, “Played games with other people on the internet”, “Downloaded music or films”, “Put (or posted) photos, videos or music to share with others”, “Used a webcam”, “Put (or posted) a message on a website”, “Visited a chatroom”, “Used file sharing sites”, “Created a character, pet or avatar”, “Spent time in a virtual world”, “Written a blog or online diary” ($\alpha = .76$; $M = 8.13$; $SD = 3.47$; $N = 18\,709$).

4.3.3. Risky online activities

Respondents were asked about behavior in the previous month, based on the number out of five options (adapted from Livingstone & Helsper, 2010): “Looked for new friends on the internet”, “Added people to my friends list or address book that I have never met face-to-face”, “Pretended to be a different kind of person on the internet from what I really am”, “Sent personal information to someone that I have never met face-to-face”, “Sent a photo or video of myself to someone that I have never met face-to-face” ($\alpha = .72$; $M = 1.29$; $SD = 1.42$; $N = 18\,709$).

4.3.4. Risky offline activities

Respondents were asked about behavior in the previous 12 months, based on the number out of five response options (adapted from Currie et al., 2008): “Had so much alcohol that I got really drunk”, “Missed school lessons without my parents knowing”, “Had sexual intercourse”, “Been in trouble with my teachers for bad behavior”, “Been in trouble with the police” ($\alpha = .63$; $M = 0.47$; $SD = 0.92$; $N = 18\,709$).

5. Results

Separate analyses using identical procedures and predictor variables were conducted to test the hypotheses regarding risk and harm associated with receiving sexual messages online.

5.1. Risk of receiving sexual messages

A multi-level hierarchical logistic regression analysis was performed for internet-using 11–16 year olds ($N = 15\,619$). Although country differences were not part of our theoretical model, we performed multi-level modelling analyses to control for country differences and account for the equal sample sizes between countries despite unequal population sizes. As a first step, a model with no predictors (the null-model) was conducted to assess variation in the odds of receiving sexual messages online across countries. The variation between countries was significant ($\chi^2_{(1)} = 170.43$, $p < 0.001$), but only 4% of the variation in the odds of receiving sexual messages online was attributable to between-country differences (variance partitioning coefficient (VPC); cf. Goldstein, Browne, & Rasbash, 2002). The odds of receiving sexual messages online ranged from lowest in Italy and Ireland ($Exp(B)$ ’s = 0.05 and 0.10) to highest in Estonia and Romania ($Exp(B)$ ’s = 0.25 and 0.28).

Predictor variables were entered in three sequential models (Model 2, 3 and 4; see Table 1). Demographic variables (age, gender: female coded ‘0’) were entered in Model 2 to test and control for differences in the range of sexual messages received. The risk of sexual messaging increased significantly with age with an increase of almost 50% per year ($Exp(B) = 1.47$; $p < .001$) and was around 30% greater for boys than girls ($Exp(B) = 1.27$; $p < .001$). Psychological factors were entered in Model 3 to determine their effect over and above the effects of age and gender. Higher sensation seeking was associated with a more than two-fold greater likelihood of receiving sexual messages per scale point ($Exp(B) = 2.21$; $p < .001$), with a similar effect showing for psychological difficulties ($Exp(B) = 2.69$; $p < .001$) and these effects hold independently of age and gender while reducing the effect of gender slightly below statistical significance ($Exp(B) = 1.10$; $p = .051$).

In Model 4 we entered variables associated with risky behaviors, i.e., risky online activities and risky offline activities, while controlling for engagement in online activities in general. Risky online activities ($Exp(B) = 1.44$) and risky offline activities ($Exp(B) = 1.49$) were both associated with an almost 50% increase in the likelihood of receiving sexual messages per single activity. Online activities were also but less strongly associated with receiving sexual messages ($Exp(B) = 1.13$), all (p ’s $< .001$), further reducing the effect of gender to null ($Exp(B) = 1.01$; $p = .812$) and considerably reducing the effects of age ($Exp(B) = 1.20$; $p < .001$), sensation seeking ($Exp(B) = 1.34$; $p < .001$) and psychological difficulties ($Exp(B) = 1.54$; $p < .001$) (i.e., by almost half). The significant log-likelihood ratios (all p ’s $< .001$) show that each model improved the fit compared with the previous model.

5.2. Harm from receiving sexual messages

A multi-level hierarchical logistic regression analysis was performed for internet-using 11–16 year olds who indicated to have received a sexual message on the internet in the past year ($N = 2036$). The model with no predictors (the null-model), showed that the variation in the odds of harm from receiving sexual messages was significant between countries ($\chi^2_{(1)} = 52.81$, $p < 0.001$): 8% of this variation was attributable to between-country differences (VPC; cf. Goldstein et al., 2002). The odds of harm from receiving sexual messages online ranged from lowest in Finland

Table 1
Multilevel models to predict risk of receiving sexual messages online.

<i>Fixed: Intercept, age, gender (Base = Female)</i>									
Model	Constant			Age			Gender		
	B	SE B	Exp(B)	B	SE B	Exp(B)	B	SE B	Exp(B)
1. Null	–1.81	0.080	–	–	–	–	–	–	–
2. 1 + Demographics	–2.08	0.092	–	0.38	0.015	1.47***	0.24	0.047	1.27***
3. 2 + Psychological factors	–2.10	0.091	–	0.36	0.016	1.44***	0.10	0.049	1.10
4. 3 + Risk factors	–2.27	0.090	–	0.19	0.018	1.20***	0.01	0.053	1.01

<i>Fixed (continued): Sensation seeking, psychological difficulties</i>						
Model	Sensation seeking			Psychological difficulties		
	B	SE B	Exp(B)	B	SE B	Exp(B)
3. 2 + Psychological factors	0.79	0.043	2.21***	0.99	0.096	2.69***
4. 3 + Risk factors	0.29	0.049	1.34***	0.43	0.106	1.54***

<i>Fixed (continued): Online activities, risky online activities, risky offline activities</i>									
Model	Online activities			Risky online activities			Risky offline activities		
	B	SE B	Exp(B)	B	SE B	Exp(B)	B	SE B	Exp(B)
4. 3 + Risk factors	0.12	0.009	1.13***	0.36	0.018	1.44***	0.40	0.026	1.49***

<i>Random</i>					
Model	Level 2 (country)		VPC ^a	Model statistics	
	variance			Log-likelihood	X ² (df)
1. Null	0.149		4.34%	–6424.70	170.43(1)***
2. 1 + Demographics	0.175		5.06%	–6061.33	726.75(2)***
3. 2 + Psychological factors	0.172		4.96%	–5770.63	581.38(2)***
4. 3 + Risk factors	0.160		4.64%	–5174.87	1191.52(3)***

Note: N = 15 619.

*p < .05; **p < .01; ***p < .001.

^a Variance partitioning coefficient (VPC): Proportion of variance explained by between group differences (countries).

and Slovenia ($Exp(B)$'s = 0.06 and 0.14) to highest in Romania and Turkey ($Exp(B)$'s = 0.69 and 0.73).

As for the analyses for risk, predictor variables were entered in three sequential models (Model 2, 3 and 4; see Table 2). Model 2 showed that harm from sexual messaging is associated with younger children, a likelihood increase of 14% per year ($Exp(B) = 0.76$; $p < .001$) and girls, 60% more likely than for boys, ($Exp(B) = 0.40$; $p < .001$). Model 3 showed that higher sensation seeking is associated with less harm, a 16% decrease per scale point ($Exp(B) = 0.74$; $p < .001$), while more psychological difficulties are strongly associated with more harm, an almost four-fold increase per scale point ($Exp(B) = 3.82$; $p < .001$). Both effects occurred over and above the effects of the demographic variables (the effects of the latter variables decreased very little when psychological factors were added to the model). In Model 4, the behavioral variables were statistically insignificant although the variable controlling for usage showed a significant but small negative effect, a decrease of 5% per activity ($Exp(B) = 0.95$; $p < .01$). Each of the four models in the hierarchical regression improved the fit compared to the previous model significantly (all p 's < .05).

6. Discussion

Risk of harm to children and young people as they use the internet has attracted considerable public, research and policy attention. The fast pace of technological and social change has made it hard for parents, teachers and child welfare services to keep up with risky adolescent practices or to intervene in shaping norms of acceptable or unsafe behavior. With the goal of producing evidence useful to policy making, this article has addressed two press-

ing concerns. First, it has distinguished the incidence of risk (here, the receipt of sexual messages online) from the incidence of harm (here, reported upset from receiving such messages). Second, it has examined which factors predict risk and which factors predict harm in order to pinpoint which adolescents are particularly at risk of harm. Building on prior theories of risk and protective factors operating in adolescence generally, particularly as these may undermine or contribute to resilience, we tested contrasting hypotheses that could account for risk and harm within a large sample of 11–16 year old internet users.

The risk of receiving a range of sexual messages increases with age from 11 to 16 years, as expected from prior research, but the finding for gender (slightly more boys encountering the risk of receiving sexual messages) qualifies prior findings of no notable gender differences. As predicted, risk was greater among those higher in sensation seeking and in psychological difficulties. How adolescents behave on-and offline also makes a difference: those engaging in more risky offline and online activities (controlling for internet usage in general) were more likely to receive sexual messages online. Adding the behavioral variables reduced the effect of the psychological variables and age, suggesting that the behavioral variables mediate the effect of the psychological variables and age. That is, adolescents who are older as well as those with psychological difficulties and with sensation seeking tendencies are more likely to take risks offline and online and, in consequence, they are more likely to receive sexual messages online. How adolescents behave both on-and offline seems to matter more or less equally. These findings on the relations among risk behaviors and their association with demographic and personality factors support our initial notion of a common factor underlying diverse adolescent

Table 2
Multilevel models to predict harm from receiving sexual messages online.

<i>Fixed: Intercept, age, gender (Base = Female)</i>									
Model	Constant			Age			Gender		
	B	SE B	Exp(B)	B	SE B	Exp(B)	B	SE B	Exp(B)
1. Null	–1.31	0.123	–	–	–	–	–	–	–
2. 1 + Demographics	–0.89	0.138	–	–0.27	0.037	0.76***	–0.93	0.116	0.40***
3. 2 + Psychological factors	–0.99	0.141	–	–0.25	0.038	0.78***	–0.81	0.120	0.44***
4. 3 + Risk factors	–1.02	0.141	–	–0.22	0.040	0.80***	–0.78	0.120	0.46***

<i>Fixed (continued): Sensation seeking, psychological difficulties</i>						
Model	Sensation seeking			Psychological difficulties		
	B	SE B	Exp(B)	B	SE B	Exp(B)
3. 2 + Psychological factors	–0.30	0.102	0.74**	1.34	0.215	3.82***
4. 3 + Risk factors	–0.23	0.109	0.79*	1.38	0.222	3.99***

<i>Fixed (continued): Online activities, risky online activities, risky offline activities</i>									
Model	Online activities			Risky online activities			Risky offline activities		
	B	SE B	Exp(B)	B	SE B	Exp(B)	B	SE B	Exp(B)
4. 3 + Risk factors	–0.23	0.109	0.79*	0.05	0.042	1.05	–0.09	0.056	0.91

<i>Random</i>					
Model	Level 2 (country)		VPC ^a	Model statistics	
	Variance			Log-likelihood	$\chi^2(df)$
1. Null	0.291		8.13%	–1052.77	52.81(1)***
2. 1 + Demographics	0.323		8.94%	–992.67	120.20(2)***
3. 2 + Psychological factors	0.323		8.93%	–972.18	40.98(2)***
4. 3 + Risk factors	0.321		8.88%	–967.43	9.51(3)*

Note: N = 2036.

* $p < .05$; ** $p < .01$; *** $p < .001$.

^a Variance partitioning coefficient (VPC): Proportion of variance explained by between group differences (countries).

risk behaviors which might affect the occurrence of any particular risk (here sexual messaging).

Interestingly, albeit in line with prior research the demographic findings for harm are the inverse of those for risk. While receiving sexual messages is more common as adolescents get older, and among boys, when this risk is encountered by younger adolescents and girls, they are more upset by it. The explanation for harm also differs from that found for risk. As predicted, those with higher psychological difficulties experience more harm; those with higher sensation seeking less, supporting the claim that a degree of sensation seeking permits adolescents to cope with risk, thereby building resilience to harm. Other than a slight effect for internet usage (more usage, less harm), again supporting the resilience claim, the behavioral variables had no effect on harm, contra the prediction advanced earlier. Thus, among those who receive sexual messages, whether or not it upsets them depends mainly on their age and gender as well as their psychological make-up, and is largely unaffected by their level of online or offline risky behaviors – even though, as already noted, this is the most important factor in explaining risk.

Policy makers, parents, industry and child welfare professionals face several difficulties in determining how to respond to the online exchange of sexual messages among adolescents. As noted in the introduction to this article, these include matters of definition and legality, as well as the challenge of determining whether such messaging is coercive or voluntary, and whether it is experienced as harmful by one or more of the participants. Further, since risk exposure is a necessary but not a sufficient factor for the experience of harm, strategies designed to reduce harm must attend to the conditions that sustain risk.

As we have seen, the incidence of risk across the population is fairly small, and the incidence of harm is even smaller, making it a costly and, potentially, inefficient use of resources to target safety initiatives at the entire youth population. The findings in this article suggest that older compared to younger adolescents receive a greater range of sexual messages, both because their practices of internet use are more diverse and because they encounter or seek out more risks – online and offline. But for most adolescents, the consequences are unproblematic, possibly enjoyable. So, while awareness raising efforts should continue to address the sending and receiving of sexual messages among adolescents, these should recognize the cultural complexities of emerging cultural, sexual and social media norms and practices within the peer group (see Baumgartner, Sumter, Peter, & Valkenburg, 2012; Mitchell et al., 2012). Moreover, given today's risk averse culture (Gill, 2007), it is useful to note that, while sensation seeking increases risk, it does not increase harm, even reducing it somewhat.

However, we suggest that the primary target of future policy initiatives designed to ameliorate harm should, precisely, focus on those likely to experience harm resulting from receiving sexual messages online (i.e. girls, younger children and those who face psychological difficulties), rather than on the far larger minority likely to encounter the risk. To the degree that such harm is gendered, particular safety measures are called for – since girls are particularly likely to suffer from peer practices publicly considered 'just a bit of fun' or, alternatively, a private affair, though in reality they can be exploitative. As Ringrose et al. (2012) argue, this should include recognizing the blurring between voluntary and coercive practices, and between 'sexting' and bullying, with practi-

cal interventions embedded in sexual and health education – including sometimes in gender-segregated sessions – rather as part of computing or technology classes. Insofar as younger children report more harm than older adolescents, this raises particular challenges for awareness raisers and educators who are reluctant to raise sexual matters with young children. It may be that such efforts should be conducted in tandem with parents, as well as embedding messages of sexual rights and respect in education even for young children. Finally, since harm is more often reported by those who face psychological difficulties, the challenge is that this group already tends to need more social, parental and psychological support than it may receive. Although the finding of a negative association between adolescents' range of online activities and experience of harm was small, there may be scope to work with vulnerable children to extend their range of online activities, thereby building their online confidence and resilience and so potentially reducing future harm by providing them with more coping strategies.

The study reported in this article was novel in its effort to uncover the potentially different conditions that explain risk and harm. However, it has several limitations and more research is needed to guide future policy initiatives. First, there must be further factors yet to be examined that may account for risk and harm, not captured in the EU Kids Online survey: possibilities include adolescents' level of sexual maturity (as distinct from their age), their parental values and norms, and practices of communication within specific peer groups or subcultures (Brown, Keller, & Stern, 2009). Further, since it is possible that adolescents who are older, with more psychological difficulties and sensation-seeking may simply be more willing to admit to receiving sexual messages, the results of this study should be triangulated with results that do not rely on self-reported effects of sexual messaging. These might derive from direct examination of adolescent message exchanged online, for instance. Qualitative methods, too, may offer a deeper understanding about the circumstances in which such messages are exchanged, possibly as part of a sexualized school environment (Ringrose et al., 2012, 2013), long-established sexual double standards in the culture (Albury et al., 2013) or as part of the drama of peer culture (Marwick & Boyd, 2011).

Last, we observe that we have examined the risk of harm to children and young people online in relation to the receipt of sexual messages, as is common in this field (where researchers tend to examine the nature and consequences of sexual messages, or pornography, or cyberbullying with each analysis embedded in its own research literature). However, our findings established risky behavior, both online and offline, as the main predictors for adolescents' risk experience. This is in line with the risk literature which increasingly focuses on the broader propensity to risk, encompassing both online and offline contexts. Moreover, previous research has shown that children and young people who encounter one risk, say, online pornography are more likely to encounter other risks, such as cyberbullying or meetings with strangers (Livingstone & Helsper, 2010; Wells & Mitchell, 2008). The connections across the array of risks that affect adolescents should be explored in more depth. Our findings suggest that it might be productive to combine research on different risks within a general model in order to explain any adverse consequences of internet use on adolescents.

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