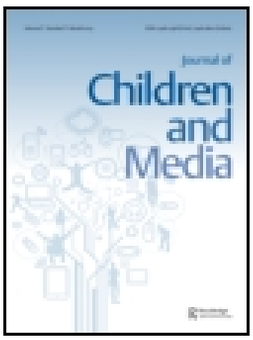

Routledge
Taylor & Francis Group

Journal of Children and Media

ISSN: 1748-2798 (Print) 1748-2801 (Online) Journal homepage: https://www.tandfonline.com/loi/rchm20

How The Internet Skills Of European 11- To 16-Year-Olds Mediate Between Online Risk And Harm

Nathalie Sonck & Jos de Haan

To cite this article: Nathalie Sonck & Jos de Haan (2013) How The Internet Skills Of European 11- To 16-Year-Olds Mediate Between Online Risk And Harm, Journal of Children and Media, 7:1, 79-95, DOI: 10.1080/17482798.2012.739783

To link to this article: https://doi.org/10.1080/17482798.2012.739783

HOW THE INTERNET SKILLS OF EUROPEAN 11- TO 16-YEAR-OLDS MEDIATE BETWEEN ONLINE RISK AND HARM

Nathalie Sonck and **Jos de Haan**

Not all children who use the internet will experience harm from the online risks they encounter. One of the factors that might moderate the relationship between risk and harm is children's internet skills. As there has been little research on this topic, this article examines the influence of internet skills on the prevalence of online risks and the degree to which 11- to 16-year-olds experience being harmed by these risks, using data from the EU Kids Online project. The findings suggest that, whilst older children (aged 13–16) are exposed to more online risks, younger children (11–12) report more often being harmed by these risks. After controlling for differences between children due to demographics and internet experience, as well as country differences (using multilevel analysis), the findings reveal that children with more self-reported internet skills experience more risks online. Such skills do not seem to contribute much to differences in being harmed by online risks.

KEYWORDS digital skills; online risks; harm; children; internet experience; multilevel analysis

Most European teenagers have access to the internet and use it regularly for various activities, such as schoolwork, entertainment, information-seeking, and communication (Hasebrink, Livingstone, Haddon, & Ólafsson, 2009). Young people today are taking their first steps into the virtual world at an ever younger age, which generally leads to positive educational experiences, but children using the internet might also be exposed to risks, which can sometimes produce harm. For example, children can easily get to know new people online, with whom they may subsequently arrange a personal meeting offline. Not all these meetings will go wrong, but they do carry the chance (i.e. risk) that something might happen, which children may experience negatively (i.e. being harmed).

By acquiring and improving skills, children could learn to avoid negative consequences from using the internet. As part of the broader concept of digital literacy (see Sonck, Kuiper, & de Haan, 2012), internet skills are multifaceted. They encompass several dimensions related to the technology of computers and the internet, as well as to the use and evaluation of information online (Gui & Argentin, 2011; Steyaert, 2000; van Deursen, 2010). Additionally, internet skills contain a social component relating to online safety in interpersonal communication, and a creative component relating to production knowledge and abilities (De Haan, Kuiper, & Pijpers, 2010). Previous studies have shown that digital skills are unevenly distributed not only amongst the general public, but also amongst young people who have grown up with the technology, and who are generally considered as highly skilled (Hargittai, 2002, 2010; Kuiper, Volman, & Terwel, 2008; Sonck, Livingstone, Kuiper, & De Haan, 2011; Sonck et al., 2012).

Journal of Children and Media, Vol. 7, No. 1, 2013
ISSN 1748-2798 print/1748-2801 online/13/010079-95
 http://dx.doi.org/10.1080/17482798.2012.739783

Routledge
Taylor & Francis Group

The main research question asked here is to what extent children's internet skills influence the degree to which they experience online risk and are being harmed. This question is addressed using European data from the EU Kids Online survey. The use of multilevel analysis enables us to investigate individual differences between children in risk and harm in relation to skills, whilst also controlling for possible differences between European countries. Children's internet skills are measured on the basis of self-reports from 11- to 16-year-old children about the range of their online activities and the degree to which they say they are able to perform specific internet tasks (hereafter, "self-reported digital skills").

Children's Experiences of Online Risk and Harm

Risks in the online world differ essentially from risks in the offline world (Boyd, 2008; Livingstone, 2010; Woolgar, 2002). Online events and their consequences can be easily magnified, may be visible permanently, and to a wide public. Furthermore, new contacts are easily made online, without any certainty about the true identity of those contacts (Boyd, 2008). These specific characteristics contribute to the exposure to online risks and to the real possibility of negative experiences (i.e. being harmed). Online risks comprise the possibility that harm may occur, not the certainty that it will (Livingstone, 2010).

Contrary to what is often assumed, not least because of media reports about incidents, young people are only exposed to online risks to a limited extent. The EU Kids Online survey showed that, on average, 14 per cent of European 9- to 16-year-olds said they had seen pornographic images online, and 15 per cent said they had received sexually explicit messages via the internet. Almost a third of these young people had engaged in online contacts with strangers, but only 9 per cent of this group actually met those online contacts in person. Finally, about 6 per cent of the young people reported that they had experienced bullying via the internet (Livingstone, Haddon, Görzig, & Ólafsson, 2011a). In addition, young people assessed whether and to what degree they were bothered by the risks they had encountered online. Most young people were not upset by these experiences, but a small minority were. Children most often said they were upset by seeing sexual images online (4 per cent of the 9- to 16-year-old internet users), and receiving sexual messages (4 per cent), followed by meeting an online contact in person (1 per cent) (Livingstone et al., 2011a).

These prevalence figures about online risks and being harmed indicate that, in general, most children are able to look after themselves online. However, some may experience more risks and harm from the internet, or, in other words, be more "vulnerable". Children's vulnerability offline is related to individual characteristics, such as socio-demographic and psychological factors, as well as environmental characteristics, such as parent–child relationships and the school context (Livingstone, 2010; Schoon, 2006). Vulnerability in the online domain is still the subject of ongoing research. For example, Livingstone, Görzig, and Ólafsson (2011b) suggest that children who are disadvantaged economically (e.g. due to low parental education level), psychologically (e.g. having psychological difficulties), and socially (e.g. because of disabilities or discrimination) have a higher likelihood of experiencing risk and being harmed online. Although online skills are pinpointed as an important factor that may mediate the relationship between risk and harm, this has not been studied extensively (Hasebrink et al., 2009). Livingstone and Helsper (2010), for example, examined the influence of skills on online opportunities and risks

amongst 12- to 17-year-olds in the UK. They found that older teenagers encountered more risks online because they had better access to the internet, engaged in a wider range of online activities, and mastered more online skills. Also, boys encountered more risks, but this effect was not mediated by gender differences due to access or skills. Furthermore, socio-economic status (SES) was found to have only an indirect effect on the degree to which young people experienced risks online, via its influence on internet access. Finally, a positive relationship was observed between encountering opportunities and risks online (Livingstone & Helsper, 2010). Thus, children who have better access, wider usage, and more skills seem not only to benefit more from the internet, but also to exhibit more risky behaviour online.

Whether and to what extent digital skills diminish children's experience of harm from online risks has not been investigated empirically. This article aims to fill this gap, by using European data that are not confined to the context of a single country.

Digital Skills

According to the popular view, young people are growing up digitally with innate talents to operate new technology. These "digital natives" are often assumed to be highly skilled with the internet (Prensky, 2001; Veen & Vrakking, 2006). In contrast, research shows that a significant proportion of young people and older teenagers are not very digitally skilled, especially when it comes to more difficult tasks (Bennett, Maton, & Kervin, 2008; van Deursen & van Dijk, 2009a). Most young people, even college students, do not use many different applications (Kennedy, Krause, Judd, Churchward, & Gray, 2006), using the internet primarily for entertainment, and much less often to gain information on serious issues (Selwyn, 2009). Yet they are not a homogeneous group. Hargittai (2010) observed systematic differences in online skills even amongst young adults (18- to 19-year-olds), a group that are considered to be highly internet-savvy. There is heterogeneity with regard to both the level and dimensions of skills.

Skill Dimensions

In the previous research (Gui & Argentin, 2011; Steyaert, 2000; van Deursen, 2010), digital skills have been broadly divided into three dimensions: instrumental, structural/informational, and strategic skills. Instrumental skills refer to operational skills, or the ability to use the technology of computers, and nowadays also other devices such as tablets and smartphones, as well as the network hardware and software installed on these devices. Structural skills are related to the competencies needed to use information that is structured differently online from offline (e.g. through hyperlinks and dynamic information). Strategic skills involve being able to search for information proactively, to take decisions based on information found online, and to scan relevant information from the web. Van Deursen (2010) additionally differentiated formal internet skills, or being able to navigate on the internet, from informational skills, or being capable to locate required information on the web. Where the former refers to the correct use of websites and hyperlinks, the latter comprises skills in evaluating the reliability of websites.

De Haan et al. (2010) argue that children's safety online is related not only to the degree of these basic instrumental and informational skills that children possess, but also to their online social skills. These refer, for example, to children's ability to assess which

personal information they can give out online and when. In today's online environment, with SNS embedded in teenagers' daily lives, online social skills are mainly about communication, self-disclosure, and privacy. Additionally, skills and knowledge in creating and producing content that can be uploaded online have become more important due to the increased interaction that has been made possible with the advent of Web 2.0 (De Haan et al., 2010).

Measuring Skills

Ideally, the different dimensions of internet skills should be directly observed in performance tests, so that the actual competencies of internet users are measured. For example, van Deursen (2010) conducted performance tests amongst the Dutch population to measure actual digital skills, rather than self-reported abilities. He observed that most people possessed the operational and formal skills needed for using the internet and navigating websites. By contrast, a substantial group did not sufficiently master the informational and strategic skills needed to find relevant information, to evaluate it, and to base decisions on it (van Deursen, 2010). Kuiper et al. (2008) also used performance tests and found that 10- to 11-year-olds lacked evaluative skills when completing internet tasks. Using the broad dimensions of digital skills, Gui and Argentin (2011) tested a measure that included both performance tasks and survey questions, which were knowledge- and situation-based. Although this idea is appealing, the measurement of the skills needed to select, evaluate, and process information using a combination of survey questions and online tasks had reliability problems, and hence requires further research and refinement before it can be implemented.

In large-scale cross-national surveys, it is highly impractical to test the performance of respondents in the different countries in a standardized way. The most commonly used alternative is to ask people to assess their own skills when using the internet. With self-reported skills, possible under- or overestimation cannot be entirely excluded. Hargittai and Shafer (2006), for example, observed some dissimilarities between actual and perceived skill levels, which were also related to other characteristics, such as gender. A validated set of internet skills items is necessary, but still has to be developed. Van Deursen (2010) attempted to validate a set of skill questions based on actual performance tests, but it turned out to be especially difficult to obtain valid data about informational and strategic internet skills (Van Deursen, 2010, p. 141). A recent overview of survey measures of internet skills by Hargittai and Hsieh (2012) recommends including as many components of skills items as possible. However, due to rapid changes in the popularity of specific online activities, the testing of new items will require constant attention (Hargittai & Hsieh, 2012).

In the EU Kids Online survey, children were asked about their internet skills indirectly, based on the range of online activities they had performed during the past month, as well as more directly, based on the number of specific internet-related tasks that they assessed themselves as being able to complete. Both these approaches can provide an indication of children's digital skills. The data show a large correlation ($r = 0.55$; $p < 0.001$) between the range of online activities and self-reported digital skills. This means that children who perform a broader range of internet activities also report being able to complete more internet-related tasks. We consider a mutual relationship between both: those who perform more diverse activities might become more skilled, or, vice versa, those who consider themselves to be more skilled may start using a more diverse range of activities

(Sonck et al., 2012). The ability to perform diverse online activities and internet tasks most closely resembles the instrumental, and to a lesser extent informational, skills as defined by Steyaert (2000) and van Deursen (2010). Due to the nesting of the research in the European Commission's Safer Internet Programme, this survey focused on critical and safety skills rather than on creative skills and production knowledge (Livingstone et al., 2011a).

Skill Inequalities

The "digital divide" has long been conceptualized as the gap between those who are connected or have access to the internet and its information on the one hand, and those who are not connected or have no access on the other (i.e. between the "haves" and "have nots") (National Telecommunications and Information Administration [NTIA], 1999; Organisation for Economic Co-operation and Development [OECD], 1997). In addition to this binary classification of whether or not someone uses the internet, Hargittai (2002) distinguished the "second-level digital divide" based on the varying levels of people's online skills. Although physical access to digital material, through hardware devices and internet connections, is a necessary precondition for being connected, the divide due to access differences seems to be closing in most developed countries. However, inequalities in skills and usage are persistent and may even be widening (Hargittai, 2002; Steyaert, 2002; van Dijk, 2005). Thus, beyond the digital divide there are still digital inequalities.

Previous studies focusing on adults' information skills have found that older people, women and minority ethnic groups, in particular, exhibited difficulties in locating information on the web (Hargittai, 2002, 2010). Reports based on data from the EU Kids Online survey (Sonck et al., 2010, 2012) involving 9- to 16-year-old internet users also indicated that age and gender, especially, are related to the level of self-reported skills: boys and older children report more digital skills than girls and younger children. Furthermore, children with a higher SES have a wider online repertoire and can complete more internet tasks than lower-status groups (Sonck et al., 2010, 2012).

Digital skills are not only unevenly distributed within countries, but also between countries. Countries leading in the diffusion process of internet access are more likely to have a higher level of competent users (van Deursen & van Dijk, 2009b). There is usually a "competence gap" or a time lag between acquiring access and becoming a competent user (Marsh, 2001). For all countries, it holds that digital inclusion implies the acquisition of digital skills and the development of a broad array of online practices. Differences in the development of digital skills between countries may be related to economic differences (Norris, 2001), cultural contexts (Kirwil, Garmendia, Garitaonandia, & Fernandez, 2009), the type of welfare state (Esping-Andersen, 1990), and the related level of internet regulation. Since there is wide variation between countries on these factors, we expect to find country differences in the level of digital skills and possibly also in the relationships between skills and online risks experienced by children.

Research Questions

Young people who are skilled in using the internet may be able to judge for themselves when their online behaviour is risky and could lead to being harmed. However, it is also possible that children increase their digital skills by using the internet frequently and for a wide range of online activities and tasks, so that consequently the more

experienced and internet-savvy children might encounter more risks online. The relationship between children's skills and their experiences of online risk and harm has rarely been examined. Hence, it is unclear how digital skills mediate between risk and harm. With this in mind, the main research questions in this study are:

RQ1: To what extent do children's self-reported internet skills influence the degree to which they encounter online risks?

RQ2: To what extent do children's self-reported internet skills influence the degree to which they are being harmed by these online risks?

In addressing these, we controlled for children's socio-demographics (age, gender, parents' education, and family composition). We also accounted for children's degree of internet experience. Hargittai (2010), for example, observed that web user experience contributes a great deal to the variation in online skills between older teenagers. Therefore, the analyses additionally controlled for internet experience, conceptualized as internet frequency or contact intensity with the internet. By controlling for this factor in addition to internet skills, the relative contribution of each of the factors to the variation in risk and harm can be unravelled.

Method

Sample

Data from the EU Kids Online survey were used. A random stratified sample of 25,142 children aged 9–16 who use the internet, as well as one of their parents, were interviewed during 2010 in twenty-five European countries. Due to the rather technical content of the questions about internet skills, these were put to internet users aged 11 and older. Consequently, all analyses in this article are based on the data for 11- to 16-year-olds ($n = 19{,}406$).

The final data were weighted at country level according to the number of children in the household, age and gender of the child, region, and education level of the main income earner, and a European weighting was applied to ensure the aggregate data represented countries in accordance with the estimated population (Ipsos, 2011).

Measures

Dependent variables: online risk and being harmed. Children were asked whether they had encountered a range of online risks in the past year (Yes/No). Based on the reports from 11- to 16-year-olds about seeing sexual images online (17 per cent), receiving sexual messages online (15 per cent), personally meeting online contacts (10 per cent), and being bullied on the internet (7 per cent), an additive index variable was constructed that ranged from 0 (encountered none of the four online risks examined) to 4 (encountered all four online risks; $M = 0.42$; $SD = 0.80$).

If children had encountered an online risk, they were successively asked whether this had bothered them (Yes/No). Being bothered was defined as something that "made them feel uncomfortable, upset, or feel that they shouldn't have seen it". Based on the responses of the 11- to 16-year-olds who were bothered by seeing sexual images online (5 per cent),

receiving sexual messages online (4 per cent), and personally meeting online contacts (1 per cent), an additive index variable was constructed, ranging from 0–5 ($M = 0.57$; $SD = 1.23$; $n = 5{,}291$).[1] Higher scores on this variable refer to being harmed from more of the risks encountered. The zero category represents children who did encounter risks, but were not being harmed by them. Children who had not encountered any of the four risks were not asked about being harmed, and hence were not included in the measurement of harm (although they were included in the measurement of risk). It should also be noted that for cyberbullying, the successive question about being harmed that followed the question about risk was not surveyed, as children who had been bullied online were considered to have experienced this negatively.

Independent variables: internet skills, demographics and internet experience. Internet skills were measured in two ways, based on the range of online activities (0–17) and the number of self-reported digital skills (0–8). Both are highly and positively correlated ($r = 0.55$; $p < 0.001$; also see Sonck et al., 2012). To ensure comparability, both were standardized to scales ranging between 0 and 10.

TABLE 1
Internet skills of 11- to 16-year-old internet users in Europe (see also Sonck et al., 2012)

Range of online activities		**Self-reported digital skills**	
Activities done in the past month	**%**	**Ability to perform specific tasks**	**%**
Used the internet for schoolwork	88	Bookmark a website	64
Played internet games on your own or against the computer	82	Block messages from someone you don't want to hear from	64
Watched video clips	81	Find information on how to use the internet safely	63
Visited a social networking profile	71	Change privacy settings on a social networking profile	56
Used instant messaging	70	Compare different websites to decide if information is true	56
Sent/received email	69	Delete the record of which sites you have visited	52
Read/watched the news on the internet	54	Block unwanted adverts or junk mail/spam	51
Downloaded music or films	51	Change filter preferences	28
Put or posted photos, videos or music to share with others	47		
Played games with other people online	46		
Put or posted a message on a website	36		
Used a webcam	34		
Visited a chatroom	27		
Used file sharing sites	22		
Created a character, pet or avatar	18		
Spent time in a virtual world	16		
Written a blog or online diary	13		

First, based on the range of activities performed by children online, an indication of children's internet skills can be provided (Hargittai, 2010; Sonck et al., 2012). On a scale from 0 to 10, children on average engaged in almost half (4.67; $SD = 2.13$) of the online activities listed. The reliability of the scale is reasonably high (KR-20 = 0.76; see also Sonck et al., 2012).[2] Second, children self-assessed their digital skills based on a list of specific tasks they reported that they were able to perform. As can be seen from Table 1, mainly safety-related skills were surveyed. On a 0–10 scale, European children said they had mastered about half (5.19; $SD = 3.33$) of the skills surveyed. The reliability of this scale is quite high (KR-20 = 0.84; see also Sonck et al., 2012).

In order to control for children's internet experience, two measures of internet frequency were taken into account. First, children indicated whether they used the internet

TABLE 2
Internet skills and experience by online risk and harm, 11- to 16-year-old European internet users

		Internet experience				Self-reported internet skills			
		% of daily internet use		Average daily time spent online		Average range of online activities (0–10)		Average self-reported digital skills (0–10)	
Online risk encounters									
	No	**61**	***	**1:27**	***	**4.19**	***	**4.58**	***
	Yes	**84**		**2:03**		**5.95**		**6.83**	
Seeing sexual images online									
	No	64	***	1:30	***	4.36	***	4.79	***
	Yes	82		2:04		6.04		6.95	
Receiving sexual messages online									
	No	70	***	1:35	***	4.73	***	5.28	***
	Yes	85		2:08		6.19		7.11	
Meeting online contacts offline									
	No	70	***	1:36	***	4.81	***	5.34	***
	Yes	90		2:19		6.38		7.38	
Being bullied online									
	No	66	***	1:34	***	4.57	***	5.08	***
	Yes	88		2:04		5.92		6.78	
Harm from online risks									
	No	**86**	***	**2:24**		**5.99**	**	**6.95**	***
	Yes	**79**		**2:21**		**5.81**		**6.46**	
Harm from seeing sexual images online									
	No	85	***	2:28	***	6.19	***	7.31	***
	Yes	75		1:58		5.8		6.27	
Harm from receiving sexual messages online									
	No	88	***	2:31	**	6.34	***	7.32	***
	Yes	79		2:21		5.9		6.66	
Harm from meeting online contacts offline									
	No	92		2:40		6.43		7.44	
	Yes	88		2:36		6.3		7.15	

Note. Differences are significant at * $p < 0.05$; ** $p < 0.01$; ***$p < 0.001$.

on a daily basis (68 per cent amongst 11- to 16-year-olds). Second, based on the estimated amount of time that children spend online on normal schooldays and on non-schooldays, their estimated daily online time was computed ($M = 96.72$ minutes; $SD = 61.59$ minutes).

Finally, the following socio-demographics were accounted for, as these might influence children's risk and harm experiences: age (11–16 years: $M = 13.54$; $SD = 1.68$), gender (50 per cent boys; 50 per cent girls), parents' education level (measured on a scale from 1 to 7 according to the national educational systems: $M = 3.70$; $SD = 1.47$), and family composition (86.2 per cent two-parent families; 13.8 per cent single-parent families).

Analytical Approach

To address the central research questions, bivariate correlations were explored, both at the individual level (between children) and at the country level (between European countries). Second, to investigate the relative influence of internet skills on risk and harm, multivariate multilevel analyses were performed, investigating differences in risk and harm between children whilst controlling for possible differences between European countries. Factors at the individual level were included in three steps. First, in an intercept-only model no factors were included, so that differences in online risk and harm due to individual characteristics and country-level characteristics could be discerned. Second, socio-demographics were included as determinants of online risk and harm experiences. Third, measures of internet skills and experience were added, so that the additional contribution of these characteristics in explaining risk and harm could be investigated.

Results

Differences in Internet Skills

As a first exploration, differences in internet skills and experience were examined between the 11- and 16-year-olds who had encountered online risk(s) and those who had not. Table 2 shows that children who experienced online risks reported mastering significantly ($p < 0.001$) more internet skills and also had more internet experience. Similar results are observed for the four different online risks. The difference in self-reported digital skills between those who had experienced risks online and those who had not is greatest in relation to seeing sexual images online. Children who had seen such images reported a higher level of specific digital skills (6.95) and on average performed more diverse online activities (6.04) than those who had not seen these images (4.36 and 4.79, respectively). The findings show a similar positive relationship between internet experience and online risks. For example, children who had been bullied online used the internet more on a daily basis (88 per cent) than children who had not been bullied online (66 per cent). The cyberbullied children also spent more time online per day (about two hours) than those who had not been bullied online (about an hour-and-a-half).

We also explored whether skilled children experienced being harmed by online risks or whether they were able to cope with the online risks encountered. Table 2 shows that children who had experienced harm from online risks had a lower level of self-reported digital skills and used the internet less frequently than those who had encountered online risks but did not report harm from these risks. For example, the average self-reported digital skills (6.27) were lower and the range of online activities (5.80) less for those children who

TABLE 3
Multilevel analysis of 11- to 16-year-olds encountering online risks and being harmed, controlled for European country differences (beta's)

	Online risk encounters (0–4)			Being harmed by online risks (0–5)		
	Model 0	**Model 1**	**Model 2**	**Model 0**	**Model 1**	**Model 2**
Socio-demographics						
Girl (ref. = boy)		−0.039***	−0.012		0.067***	0.074***
Age (11–16 years)		0.246***	0.125***		−0.067***	−0.067***
Education parent (1–7)		0.036***	0.024**		−0.011	−0.008
Single-parent family (ref. = two-parent family)		0.015*	0.015*		−0.005	−0.010
Internet frequency						
Daily internet use (ref. = less than daily)			0.029***			0.053*
Average daily time online (in minutes)			0.098***			0.016
Internet skills						
Range of online activities (0–10)			0.212***			0.085***
Self-reported skills (0–10)			0.092***			−0.033
Variance between countries	0.038	0.030	0.016	0.023	0.024	0.021
Variance within countries	0.963	0.865	0.794	0.976	0.945	0.944
R^2 at the individual level (%)		10.54	19.12		2.53	3.39
R^2 at the country level (%)		10.16	17.62		2.67	3.28

Note. Coefficients are significant at * $p < 0.05$; ** $p < 0.01$; ***$p < 0.001$.

experienced harm from seeing sexual images online than for those who did not report harm from this risk (7.31 and 6.19, respectively). In terms of their internet experience, it was similarly observed that children who were harmed by seeing sexual images online used the internet less frequently on a daily basis (75 per cent) and for a shorter time (about two hours) than those who did not report harm from seeing sexual images (85 per cent and about two-and-a-half hours per day, respectively).

A similar pattern in the correlations with skills and experience was observed for being harmed by seeing and receiving sexual images/messages online, but not for being harmed by meeting online contacts. In general, however, the results indicate that children with higher self-reported skills and more internet experience were better able to cope with online risks than those with less internet experience and lower self-reported skills.

These correlations were observed at the individual level (i.e. between children from different European countries). In addition to these individual differences, countries may also differ in their aggregated level of skills and in the relationship of the level of skills to risk and harm. For example, based on data from the EU Kids Online survey, Sonck et al. (2012) show considerable variation in the level of self-reported digital skills for 11- to 16-year-olds in Europe. Children in Finland report the highest level of skills in Europe (7.24 on a 0–10 scale), while children in Turkey report the lowest level (3.28) (Sonck et al., 2012).

A statistically significant correlation was observed at the European level between self-reported digital skills and online risk encountered ($r = 0.296$; $p < 0.001$). This relationship was positive for all European countries, ranging between 0.136 for Cyprus and 0.359 for Austria and Norway. The correlation between self-reported digital skills and harm was found to be borderline significantly negative at the European level ($r = -0.027$; $p = 0.052$). This relationship showed much more variation between countries, both in strength and direction, ranging from a negative correlation of -0.215 in France to a positive correlation of 0.228 in Turkey. Possibly due to the smaller group of children on which these figures are based, most correlations were not statistically significant. This means that the differences in the direction of the relationship might also be partly due to chance. Because of the variation observed between European countries, we need to control for these country differences.

Explaining Risk and Harm by Skills

In order to investigate the relative influence of internet skills on online risk experience (RQ1) further, a multivariate multilevel analysis was performed. This enabled differences between children due to socio-demographic background characteristics and varying levels of internet experience to be taken into account, whilst simultaneously also controlling for differences between countries. Table 3 shows that differences in online risk experience were mostly related to individual differences between children, and to a lesser extent to differences at the country level (see model 0: 96 per cent of the risk variation is observed within countries and 4 per cent between countries). As there was still considerable variation across countries, it is important to control for these differences between countries when analysing differences between individual children.

In a next step (model 1), children's background characteristics were included in the model, namely their gender, age, parental education level and family composition. In a final step (model 2), measures of children's internet frequency and self-reported digital skills were added. As can be seen from Table 3, the explained percentage of the differences in

online risk experience between children increased from 10.54 per cent to 19.12 per cent at the individual level and from 10.16 per cent to 17.62 per cent at the country level, when the internet frequency and skill characteristics were added to the model comprising the socio-demographic factors. Both the self-reported skills and frequency of internet use appear to be important factors in explaining differences in online risks.

Amongst children's background characteristics, age in particular was positively associated with online risk experience, with older children encountering more online risks than younger children. Additionally, children with better-educated parents experienced more risk than children whose parents were less well educated. Children living in single-parent families also reported more online risks than children in two-parent families. The influence of gender on online risk experience was no longer significant after adding characteristics relating to internet frequency and skills to the socio-demographics. This suggests that internet skills contribute more to online risk experience than differences between boys and girls. As with the bivariate results shown in Table 2, a positive relationship was observed between self-reported digital skills and the degree of online risk experience, after controlling for varying levels of internet experience or frequency between children. Thus, even after taking into account the finding that more experienced children encountered more online risks, simply because they spent more time online, the influence of skills on risk experience was still statistically significant. This finding provides further evidence for the observation that children with a higher level of self-reported internet skills encountered more internet risks.

A similar analysis was performed to address the second research question (RQ2) about the influence of self-reported digital skills on the degree of harm experienced from online risks by 11- to 16-year-olds. In line with the results for online risk, Table 3 shows that differences in harm from online risks were mainly due to differences between children, and only to a limited extent due to differences between country characteristics (see model 0: 98 per cent of the variation in harm is found within countries and 2 per cent between countries). The explanatory power of basic background characteristics and internet skill measures is much lower for harm (around 3 per cent) than was observed for risk (around 18–19 per cent). This means that other factors contribute more to children's harm from online risks than those examined in this study. As regards the socio-demographics, age and gender produced statistically significant results. Whereas a positive relationship was observed between age and online risks, a negative relationship was found between age and experiencing harm from these online risks. This indicates that whilst older children encountered more risks on the internet, younger children reported more harm from those risks. Furthermore, girls experienced significantly more harm from online risks than boys. Of the internet skill measures, only the range of online activities showed a statistically significant relationship with harm, whilst amongst the internet frequency measures, only the percentage of daily internet use was found to be related to the degree of harm from online risks. In contrast to the bivariate results in Table 2, these measures of both internet skills and experience showed a positive relationship with harm in the multivariate analysis. In other words, the more skilled children say they are with the internet, the more harm they report from it. This result was observed after controlling for differences between children due to socio-demographics and varying levels of internet experience, whilst simultaneously also controlling for country differences. This reversed direction of the relationship might be due to different underlying relationships in the European countries studied between socio-demographics, skills, and risk/harm. As shown earlier, the relationship between

self-reported digital skills and harm, for example, differed widely between countries, both in direction and strength.

Discussion and Conclusion

The EU Kids Online survey has shown that children encountered online risks (i.e. seeing sexual images, receiving sexual messages, meeting online contacts and being bullied online) and reported harm from these risks to only a limited extent (Livingstone et al., 2011a). However, some children experienced more risk and harm than others (Livingstone et al., 2011b).

The findings in this article have shown that encountering online risks was not only related to children's socio-demographic characteristics, but also to their online experience and their claimed level of internet skills. Young internet users with a wider online repertoire and a higher level of self-reported digital skills saw more sexual images online or personally met an online contact more frequently. In exploring this influence of skills, the study controlled for children's internet experience, in terms of the frequency with which they spent time online. The finding that more experienced and skilled internet users also encountered more online risks might be considered remarkable, as it might be expected that these internet-savvy youngsters would exhibit less risky behaviour online. However, this observation is in line with a previous study by Livingstone and Helsper (2009), which also found that children with wider and more frequent internet usage not only benefited more from online opportunities, but also encountered more online risks.

As previous studies have not examined the relationship between internet skills and harm experienced by children, this article aimed to fill this gap. Based on bivariate analyses, a negative relationship was observed between self-reported digital skills and being harmed by online risks: children with less experience and fewer skills experienced more harm from seeing sexual images and receiving sexual messages online. It thus appears that, although children who say they possess more skills encounter more online risks, they experience less harm from those risks compared with children who report fewer skills. However, after controlling for differences in children's socio-demographics and internet experience, as well as for differences between countries, this relationship was no longer clearly present. In fact, indications were even observed of this relationship operating in the opposite direction. This might be due to underlying interrelationships between socio-demographics and skills for different European countries. Furthermore, considerable variation was also observed in the correlations between self-reported skills and being harmed between countries, both in direction and strength. Finally, it should be noted that a rather low explained variance in harm was observed based on the demographics, internet experience, and skill measures included in the model. This means that other factors contribute more to harm than those examined, such as psychological factors or the context in which children use the internet (e.g. school context, peer influence, etc.).

The limitations of this study are mainly related to the self-reports of being harmed and skills. First, harm was measured based on whether children had been bothered by something they had encountered online. "Being bothered" was defined as feeling uncomfortable, upset, or feeling that they had seen something that children should not see online. This measure thus gives a subjective indication of children's negative experiences online. Furthermore, due to translations, "being bothered" might have highlighted slightly

different aspects in the different European languages. Finally, there might have been some variation in how children understood and interpreted the notion of "being bothered".

Second, the study included a rather narrow measurement of children's internet skills. Skills are multifaceted and comprise instrumental, structural/informational and strategic dimensions, as well as social and creative components (De Haan et al., 2010; Gui & Argentin, 2011; Steyaert, 2000; van Deursen, 2010). However, the EU Kids Online survey only asked about eight specific digital skills that most closely resemble the instrumental, and to a lesser extent informational, skills as defined by Steyaert (2000) and van Deursen (2010). Furthermore, the survey focused on critical and safety skills, rather than creative skills and production knowledge (Livingstone et al., 2011a). This narrow measurement of digital skills might also have contributed to the observation of a rather ambiguous relationship between skills and harm. In order to cope with negative internet experiences, children might need more than strictly instrumental skills in relation to internet safety. Social abilities might, for example, contribute more to reducing negative experiences, and might thus improve children's coping strategies more than technical skills. A more detailed measurement of digital skills might improve the explanatory power. This degree of detail in the measurement might go as far as specific skills to counter specific risks. The analyses here are based on the assumption that general skills will provide protection from harm for a series of risks. However, these risks have limited common ground. Specific instructions might be needed for effective protection.

The method used to measure digital skills could also be improved. Using experimental tests instead of self-reports would reduce the amount of under- and overestimation that may disguise the actual impact of skills. Hargittai and Shafer (2006), for example, found differences between actual and perceived skill levels (e.g. finding that gender does not generate differences in actual online skills, whereas women assess their own skills as lower than men). For large-scale survey research, the testing of digital skills is hard to organize and very expensive. More detailed research based on testing will need to rely on smaller-scale investigations. These investigations will hopefully produce a validated set of questions for survey research in the near future.

It is generally believed that digital skills will empower children to cope with online risks. By showing that skilled children are not necessarily safer in an online environment than less skilled children, we have raised some scepticism on the idea of empowerment through digital skills. However, there is wider relevance for the importance of digital skills. Growing evidence suggests that more skilled children benefit more from online opportunities. Online, they gather more information, are socially more active, and in particular they create more content than less skilled children (Schols, Duimel, & De Haan, 2011). This gives digital skills a pivotal position to life in an information or network society. It raises new questions on social inequality (who is benefiting more than others?), on social cohesion (who becomes better socially embedded and who more socially excluded?), and on social change (who is ahead and who is lagging behind?). It also raises the issue of responsibility for teaching these skills. Whilst children learn instrumental skills by doing, there is also a growing consensus that other kinds of skills, such as information skills and online social skills, need to be taught. The education system is often considered to be the primary actor for teaching these more advanced skills. And parents and other educators have their role to play in teaching more advanced skills even if basic skills seem so easily mastered by the young. Those concerned with the wellbeing of children should be

continually aware that the ease of use and apparent control amongst children are not a guarantee of safety.

NOTES

1. In the questionnaire, the measure of harm was conditional upon whether a child had encountered the respective online risk. For this reason, the harm variable was constructed based on the number of risks encountered and the amount of harm experienced. The values assigned were as follows: 0 = encountered at least one of the four online risks studied, but did not report harm from any of these experiences; 1 = encountered one risk and reported harm from this one risk; 2 = encountered two risks and reported harm from only one of these risks; 3 = encountered three or four risks and reported harm from only one of these risks; 4 = encountered two risks and reported harm from both risks; 5 = encountered three or four risks and reported harm from two or more of these risks.

2. This measure is the Kuder-Richardson Formula 20 (KR-20) that is analogous to Cronbach's alpha, but computes the reliability coefficient of a set of dichotomous items. It ranges between 0 and 1; the higher the scores, the more reliable the index variable.

REFERENCES

Bennett, S., Maton, K., & Kervin, L. (2008). The "digital natives" debate: A critical review of the evidence. *British Journal of Educational Technology*, *39*(5), 775–786.

Boyd, D. (2008). Why youth love social network sites: The role of networked publics in teenage social life. In D. Buckingham (Ed.), *Youth, identity, and digital media* (pp. 119–142). Cambridge: MIT Press.

De Haan, J., Kuiper, E., & Pijpers, R. (2010). Young children and their digital skills in the Netherlands. *International Journal of Media and Cultural Politics*, *6*(3), 327–333.

Esping-Andersen, G. (1990). *The three worlds of welfare capitalism*. Cambridge: Polity Press.

Gui, M., & Argentin, G. (2011). Digital skills of internet natives: Different forms of digital literacy in a random sample of northern Italian high school students. *New Media & Society*, *13*(6), 963–980.

Hargittai, E. (2002). Second level digital divide: Differences in people's online skills. *First Monday*, *7*(4), 1–19.

Hargittai, E. (2010). Digital na(t)ives? Variation in Internet skills and uses among members of the "Net Generation". *Sociological Inquiry*, *80*(1), 92–113.

Hargittai, E., & Shafer, S. (2006). Differences in actual and perceived online skills: The role of gender. *Social Science Quarterly*, *87*(2), 432–448.

Hargittai, E., & Hsieh, Y. P. (2012). Succinct survey measures of web-use skills. *Social Science Computer Review*, *30*(1), 95–107.

Hasebrink, U., Livingstone, S., Haddon, L., & Ólafsson, K. (2009). *Comparing children's online opportunities and risks across Europe: Cross-national comparisons for EU Kids Online*. London: EU Kids Online, London School of Economics and Political Science.

Ipsos (2011). *Technical report*. London: EU Kids Online II, London School of Economics and Political Science.

Kennedy, G. E., Krause, K. L., Judd, T. S., Churchward, A., & Gray, K. (2008). First year students' experiences with technology: Are they really digital natives? *Australian Journal of Educational Technology*, *24*(1), 108–122.

Kirwil, L., Garmendia, M., Garitaonandia, C., & Fernandez, G. M. (2009). Parental mediation. In S. Livingstone & L. Haddon (Eds.), *Kids Online: Opportunities and risks for children* (pp. 199–216). Bristol: The Policy Press.

Kuiper, E., Volman, M., & Terwel, J. (2008). Students' use of web literacy skills and strategies: Searching, reading and evaluating web information. *Information Research*, *13*(3), 1–18, paper 351.

Livingstone, S. (2010, May). e-Youth: (Future) policy implications: Reflections on online risk, harm and vulnerability. e-Youth conference. Antwerp, Belgium: University of Antwerp.

Livingstone, S., & Helsper, E. (2010). Balancing opportunities and risks in teenagers' use of the Internet: The role of online skills and Internet self-efficacy. *New Media & Society*, *12*(2), 309–329.

Livingstone, S., Görzig, A., & Ólafsson, K. (2011b). *Disadvantaged children and online risk (Short report)*. London: EU Kids Online, London School of Economics and Political Science.

Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2011a). *Risks and safety on the Internet: The perspective of European children. Full findings*. London: EU Kids Online, London School of Economics and Political Science.

Marsh, J. B. T. (2001). *Cultural diversity and the information society: Policy options and technological issues*. Brussels: European Parliament, DG for Research.

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the internet worldwide*. Cambridge: Cambridge University Press.

NTIA (National Telecommunications and Information Administration) (1999). *Falling through the net: Defining the digital divide*, Report on the Telecommunications and Information Technology Gap in America. US Department of Commerce.

OECD (Organisation for Economic Co-operation and Development) (1997). *Literacy skills for the knowledge society: Further results from the International Adult Literacy Survey*. Paris: OECD.

Prensky, M. (2001). Digital natives, digital immigrants. *On The Horizon – The Strategic Planning Resource for Education Professionals*, *9*(5), 1–6.

Schols, M., Duimel, M., & De Haan, J. (2011). *How cultural is the digital generation?* The Hague: Sociaal en Cultureel Planbureau.

Schoon, I. (2006). *Risk and resilience: Adaptations in changing times*. New York, NY: Cambridge University Press.

Selwyn, N. (2009). The digital native – myth and reality. *New Information Perspectives*, *61*(4), 364–379.

Sonck, N., Kuiper, E., & De Haan, J. (2012). Digital skills in the context of media literacy. In S. Livingstone, L. Haddon & A. Görzig (Eds.), *Children, risk and safety online: Research and policy challenges in comparative perspective* (pp. 87–98). Bristol: The Policy Press.

Sonck, N., Livingstone, S., Kuiper, E., & De Haan, J. (2011). *Digital literacy and safety skills (Short report)*. London: EU Kids Online, London School of Economics and Political Science.

Steyaert, J. (2000). *Digital skills: Literacy in the information society*. Working document 76 The Hague: Rathenau Institute.

Steyaert, J. (2002). Inequality and the digital divide: myths and realities. In S. Hick & J. McNutt (Eds.), *Advocacy, activism and the Internet* (pp. 199–211). Chicago, IL: Lyceum.

van Deursen, A. J. A. M. (2010). *Internet skills. Vital assets in an information society. PhD dissertation*. Enschede, Netherlands: University of Twente.

van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2009a). Improving digital skills for the use of online public information and services. *Government Information Quarterly*, *26*(2), 333–340.

van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2009b). *Trend report: Motivation, access, use & skills*. Enschede, Netherlands: University of Twente.

van Dijk, J. A. G. M. (2005). *The deepening divide: Inequality in the information society*. London: Sage Publications.

Veen, W., & Vrakking, B. (2006). *Homo zappiens. Growing up in a digital age*. London: Continuum International Publishing Group.

Woolgar, S. (Ed.). (2002). *Virtual society? Technology, cyberbole, reality*. Oxford: Oxford University Press.

Dr Nathalie Sonck is a senior media researcher in the Time, Media and Culture research group at The Netherlands Institute for Social Research/SCP. She specializes in research on media use, and in particular the consequences of internet use by young people, their digital skills, and the role of parental mediation strategies. E-mail: n.sonck@scp.nl

Prof Dr Jos de Haan is Head of the Time, Media and Culture research group at The Netherlands Institute for Social Research/SCP and Professor at Erasmus University Rotterdam. He specializes in research on cultural interests and media use. His recent research on new media focuses on the digital divide, the digital generation, and the rise of e-culture. E-mail: j.de.haan@scp.nl